Symptoms:- In the acute cases, principally dysentery there are frequent and paihful stools, containing mucous and blood, with associated tenesmus. There may perhaps be sloughslarge encugh to be recognized. There is little or no fever, but sometimes the temperature is high. Accompanying there may be emaciation, feeble heart, and death may occur in a week or month from the severe hemorrhage. A perforation and peritonitis may cause death, usually, however, these cases become chronic, showing symptoms of indigestionas alternating constipation and diarrhoea, continuing in this for 6 -12 months.

The diarrhoea with bloody stools and mucuous are associated with pain and straining. more or less fever, which is irregular intermittabr and usually not high, emaciation, anemia, red glazed tongue. Sometimes these symptoms are so mild as to be latent, and the disease runs such a subacute course as to be called dyspepsia.

The complications whibh are not mentioned above are malarial, typhoid and tuberculosis, etc.

Diagnosis:- is made upon the clinical history and finding the amoeba in the stools. Be careful not to mistake a large round epithelial cells for the amoena, for it does not have the outer clear hyaline zone or the pseudopods. Look for the hepatic abscesses, and their attendant symptoms are enlargement of the liver, pain in the shoulder, septic fever, cough and the characteristic sputum when the abscess has ruptured thru the diaphram. Thrtr is usually a elucocytosis, however, it may be latent and you cannot find the amoeba even after purges or use of the rectal tube, again the pus from the abscesses and the sputa may be free of the amoeba.

Prognosis:- These cases usually last from 6-12 weeks or as many months. There may be remissions and periods of improvement but later they die of exhaustion or other complications.

Treatment:- As the disease is produced by the ingestion of infected water and food, it can be prevented by boiling the water and cooking the foods.

In the acute cases put the patient to bed and prescribe an easily assimilated diet of milk and broths. Injections of 1-2000 quinine high into the bowel and begin with a pint or a quart and increse to one gallon should be given every day until the amoeba have disappeared from the stools for sometime. Of the injection may consist of ice water, in one pint or one quart amounts at first and increase to one gallon. If there is much pain and tenesmus combine laudanum and starch water with the above, or give morphine hypodermatically.

Locally apply hot turpentine stupes or hot compresses over the abdomen.

Ankylostomiasis.

Anklyostomiasis

or Uncinariasis. Is a disease produced by the anklyostoma or hookworm. The chief clinical symptom is anemia.

Etiology:- The worm is greyish yellow, round or cylindrical, sometimes red from the ingestion of r.b.c. The male is from 8-10 M,M. long and from 0.4 tp 0.5 broad; the female is longer, 12-18 M,M. the head is turned back and the mouth has a row of hooks surrounding it. The generative organ in the male is atthe back end and is known as the bursa, while in the female it is situated at the junction of the middle and posterior thirds. It is especially found in the duodenum and the jujenum. The disease is most often found in the tropics and temperate climates. The eggs are oval, 35x60 microns and mature outside of the body. They have no intermediate host, the eggs becoming encysted and live for many months in water and moist clay. The American form of the worm is shorter and smaller = the male measuring from 7-9 M. M. long by 0.3 M.M. broad, and the femal is 9-11 M. M. by 0.4-0.5 M. M. and the vulval opening is in the middle of the body. The eggs are larger than the European being 36x75 microns.

Symptoms:- These begin frequently with dyspeptic symptoms as tenderness and colic, but the most important is the anemia. There may be dyspepsia as the anemia increases accompanied by weakness, cachexia, headache, rapid heart action and it may hypertrophy and dilate. Murmurs of a haemic orggin are frequent; there are also drowsiness, ringing in the ears, little fever, which isusually irre-

gular; but sometimes it may be as high as 103-4. As the ane mia and toxemia increase there is edema, especially in the ankles, and it may also be marked in the face. The parasites are supposed to excrete a toxin which retards the coaculation of the blood and thus predisposes to free bleeding. A fatty substance is found in the parasites mouth and this destroys the r.b.c. as does the cancer toxins. The liver and spleen may be enlarged, accompanied with effusions in to abdomen, producing a marked protrusion.

Frequently inky spots are found on the tongue. The joints may be painful and the condition closely resemble rheumatism. In those who go bare footed, itching ~~in~~ of the soles is not infrequently noted this is the "Ground-itch" , and it is probably due to the parasite penetrating the skin.

Diagnosis:- is made upon the anemia, and eosinophilia and is confirmed by finding the parasites or their eggs. The e nosinophilia may vary greatly and in fact there may be none at all or as high as 2%-38%. the Hb is also decreased.

Treatment:- is simple but not uniformly successful.

The diet should be light and for seve ral hours before the treatment no food should be taken at all.

Give a purge of salines in the morning or calamel at night, then 3-4 hours after give ~~xxxxxxx~~ Thymol in 10-30 grain doses, repeat the Thymol in 2 hours, then 2-3 hours later give a purge of salines or castor oil and examine the stools for the ova. By repeating this treatment at seven to ten intervals it will affect a cure.

Eucalyptol (1/2 dr.) or Male fern (1-1 1/2 dr) will do very well.

After the worms and ova are expelled the patient improves rapidly, but you must give ~~xxxxxx~~ iron and arsenic in their ordinary doses for the anemia.

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Please settle up for your Medicine notes as soon as possible for we need the money and your $1.50 will be gratefully received.

1st Term Pathology.

INTERNATIONAL

LEGAL CAP

20 SHEETS

JUJIOR SENIOR PATHOLOGY SESSION 1908-1909.

FALL TERM. LECTURE 1. 10/2/'08.

GENERAL OUTLINE.

1. Urinary System.
2. The Blood.
3. Blood formingg Organs.
4. The Nervous System.
5. The Skin.
6. The Muscles.
7. The Bones.
8. The Joints.

Outline of the diseases of the urinary System.

1. The Kidney.
I. Anatomical Considerations.
II. Congenital Malformations.
1. Of the kidney itself.
2. Of its position.
III. Circulatory Disturbances.
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2. Hyperemia.
3. Congestion.
4. Hemorrhages.
5. Edema.
6. Thrombosis.
7. Embolism and infarcts.
IV. Atrophy.
V. Hypertrophy.
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2. Calcarious.
3. Uratic.
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1888. Inflammations.
1. General scheme for discussmon.
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1a. Chronic parenchymatous.

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XI. Parasites.
1. Bacteria.
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B. Pelvis of the Kidney and the Ureters.
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II. Congenital Anomalies.
III. Calculi.
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2. Chronic.
V. Specific Infections.
1. Tuberculosis.
VI. Tumors.
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C. Urinary Bladder.
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Q. Si ze size.
2. Shape.
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1a. Simple.
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Vii. Specific Infections.
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1, Etiology and Formation.
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D. Urethra.
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II. Congenital Anomalies.
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1. Etiology.

2. Morbid Anatomy.
3. ~~Mxmaxxxxxxxxx~~.Associated Lesions
4, Results.
la. Stricture.

IV. Mechanical Injuries.
V. Specific Inflammations.
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VII. Tumors.

Lecture 2. 10/5/'08.

Diseases of the Urinary System.

I. Anatomical Considerations.

The kidney develops in the embryo from the lower end of the Wolfian duct, this is called the mesonephron, the kidney being mesoblastic in origin. As to the situation- the right kidney is usually a little lower then the left, projecting below the twelfth rib. The surface should be smooth, but in infants and small children it is usually lobulated, a condition which may perisist into adult life. The capsule should strip easily, leaving a smooth surface and the red color of the kidney should show through it. On the cross section the cortex and medulla normally are easily differentiated, the cortex being about one half as wide as the medulla. In the cortex we find the glomerules, convoluted tubules and the medullary rays (pyramids of Ferrein). In the medulla we have the malpigi nian corpuscles and the colums of Bertini. It should be remembered that the renal artery enterin at the hilum breaks up sending large branches alon side the pyrmads to the zone between the cortex and medulla, where these large vessels bend sharply at right angles, running then approximately parallel to the convex surface and fro m this then are given off vessels which run straight toward the capsule, supplying the cortex. It is from these that the arteriole running into the glomerulus has its origin. Another set of arteries are given off which run straight down to the pyramids. The renal venules and veins follow outward in a like direction. The beginning of the renal tubule is the glomerulus, and expanded blin extr extremity closing investing the arteriole, the epithelia here being flat.

With reference to the function, remember that the kidney is probably the greatest excretory organ that we have and the bllood supply to its is comparatively greater than to any other organ. While the functions of the various parts of the renal tubule is still soomewhat in dispute, it is probable that the water and inorganic salts are secreted in the glomerules and the urca and allied substances through the epithelia of the rest of the tubule, particularly the convoluted portion. One must remember, also, the probability of an absorption function of the epithelia of the tubules.

II. Congenital Anomalies.

1. Of the Kidney itself.

Aphasia, or absence of both kidneys is quite rare, and, of course incompatable with life. Congenital absece of one kidney is relatively frequent, a fact always to be kept in mind when operating upon the kidney.

Hypoplasia, or a congenital smallnes of one or both kidneys, is found usually on one side. This is due to a congenital smallnes of the r enal artery, or perhaps to intrauterine inflammation, or to a stricture of the ureter.

As a second congenital anomaly of importance, is the socalled horse shoe kidney resulting from the partial fusion of the two kidneys. This may occur at either pole, and the bridge may be fibrous tissue or true ren enal tissue. As a rule, each portion of this horse shoe kidney has its wn ureter, and these may open separately into the blaader as normal, or hey may be fused into one; this fusion most frequently being low down, t may, however, be quite nigh.

Anomalous distributions of the blood supply are also to be kept in mind. It is a frequent thing for such a horse shoe kidney to be located much lower than one would expect, even as low down as the brim of he pelvis or the promontory of the sacrum. The persistent foetal lobulations are fairly common but are of no clinical significance. Supernumerary kidneys, one or more, habe been reported.

2. Anomalies of Position.

Congenital malpositions of the kidney are more frequent in the male than in the female and usually affect the left kidney. The kidn may be as low as the promontory of the sacrum, it may be fixed in this position, or again the kidney may be entirely transpo sed to lie below its mate on the opposite side.

The acquired malpositions of the kidney more frequently affect the female and the right kidney. Such a kidney is spoken of a s movable, if it can be felt, but not pushed below the umbilicus; it is called floating kidney if it has a greater range of mobility. In rare cases such kidneys may become fixed in their position by inflammatory adhesions. Torsion of the vessels or the ureter may give rise to clinical symptons, to be followed by an anurea with an increase of flow when the torsion is relieved. The bile ducts or the duodenum may be dragged out of position, with appropriate symptons. As to the cause or causes of such mis, placements probably alteration in the depth of the normal cavity in which the kidney lies, will serve to explain the greater number of cases. It is possible, although not proven, that tight lacing may have the effect of beginning displacement of the kidney.

III. Circulatory Disturbances.

1. Anemia of the kidney is found in severe anemias of any kind whet er due to henorrhage , pernicious anemia, etc.. Also blocking of the renal artery, as by an embolis or the pressure of a tumor of fibroid adhesion may bring about some degree of anemia. This anemia may be temporary from spasmodic contraction of the renal artery, as in certain cases of hysteria, where for a time there may be complete anuria. The suppression of the urine from catheterization or from injury to the urethra, is probably due to a reflex vaso-constriction of the renal artery. If recent and of short duration, the kidney is smaller, pale, and firm; if long continued, it is sure to be folloed by various degenerations, especially fatty. In either case the amount of the urine is less and it may have albumen from degeneration in the glomerule.

2. Hyperemia.

The causes of hyperemia of the kidney may be tabulated:-- (a) from acute inflammations, (b) from irritant poisons, as turpentine and cantharides, or toxins from infectious fevers, (c) from removal of one kidney, (d) frequently in diabetes, either melitus or incipitus, (e) in conditions of high arterial pressure. The border line between simple hyp remia and acute infections is often quite vague. The organ is usually large, red, cortexsmall, and the red points of the glomerules are plainly seen. One may have small hemorrhages.

3. Congestion:- Any cause operating to dam back the blood in the renal vein will, of course, give rise to congestion. Prominent among s such causes are mitral disease (either stenosis or regurgitation), weakened heart from myocardial disease, some forms of pericarditis, and emphysema. Of the local causes , thrombosis or compression of the vein by tumors or fibrous adhesions are to be r membered. If of comparatively sho duration, the kidney is too large, dark red, the capsule strips easily, and the stellate veins are very prominent. On section the organ drips blood, the cortex may be to broad, but the medulla is especially dark perhaps almost blue, especially at the bottom of the pyramids. If long continued, cyanotic induration occurs, the kidney is then somewhat smaller dark red, capsule adherent in places, and the organ is quite hard. The cut section shows the medulla dark red, with a decidedly paler cortex. The veins show as large dark red lines. This condition may pass into def inite chronic interstitial nephritis, a conditon which it closely resembles. In the earlier stages the urine is usually less in amount, darker in color, with a higher specific gravity, perhaps a little albumen, a few casts, and may be a few r,b,c.

4. Hemorrhages:--Punctate hemorrhages are found in severe hypere mias and the socalled hemorrhagic nephritis. Larger or massive hemorrhage may occur in the kidney of the newborn in difficult labor, but they most often result from definit traumatisms, as a fall on the side, a stab wound, puncture by a rib, etc.. The blood may escape into the perirenal tissues, giving rise to a hematoma, or into the urinary passages, causing hematuria. In the smaller hemorrhages the blood may escape into the renal tubules and appear in the urine or it may remain in the

interstitial tissues and later be broken down and carried away.

5. Edema:-- This results from the obstruction of the venous flow. The kidney is large, soft, and juicy and microscopically, the lymph spaces between the tubules are quite large.

6. Thrombosis:-- It is rare and occurs in the larger renal vessels. If a vess el of much size is involved there will be a hyperemia or congestion or hemorrhage or edema and finally eemes, if the nutrition is cut off, various degenerations ensue.

Lecture 3. 10/9/'08.

7. Embolism:-- It is fairly frequent in the branches of the renal artery. The emboli usually being flakes of fibrin which have formed on the roughened heart valves or on athromatous patches in the aorta. The condition is especially frequent in vegetative or ulceratiive endocarditis An infarct is the usual result and this infarct is most oten anemic, orwhi It has the usual typical appearance of a white infarct, being cone shaped, based turned toward the capsule, bulging outward, of a dull yellowish appearance, firm and dry, with a peripheral hyperamic zone. If bacteria are carried in, as sometimes in endocarditis, this infarct may break down into a pus eavity. If there are numbers of these healed infarcts, so as to pucker the kidney much, we speak of it as an embolic, contracted kidney

IV. Atrophy of the Kidney.

Aside from the congenital hypoplasia previously mentioned, the usual cause of atrophy of the kidney is arterio-sclerosis, especially that accompanying old age. This senile atrophy, as it is called, closely resembles chronic interstitial nephritis and will be mentioned again in the discussion of that condition.

V. Hypertrophy.

This is usually compensatory, one kidney emlarging to take on the function of its mate, this function having been destroyed by disease or lacking through congenital absence, hypoplasia, or surgical removal. In any case, the younger the patient the better able is the kidney to hypertrophy to such a degree as to perform the function of both. In such real or true hypertrophy both cortex and medulla are enlarged. If the hypertrophy has occured during the growth of the individual there is a numerical increase in the elements: later the increase in size is due to an increase in size of the glomeruli and other parts of the urinary tubule, these sometimes being even twice as large as normal.

Pseudo or false Hypertrophy;-- This may occur in such conditions as diabetes mellitus or incipitus, sometimes in beer drinkers, but here the increase in size is due rather to definite pathological lesions. Sometimes a localized hypertrophy takes place in the kidney which has been diseased in some way, especially in chronic interstitial nephritis.

VI. Infiltrations.

1. Fatty:-- A real infiltration or invasion of fat into the renal tissue is rare, and indeed some claim that it never takes place, however, in some conditions as in beer drinker's kidney or in chronic interstitial nephritis, sometimes in general obesity, there is a marked excess of peripelvic fat. This is of its self unimportant but it must be taken into consideration when judging the amount of real renal tissue.

2. Calcareous:-- This deposit of lime salts is found first, in the kidneys of old people and others suffering from a destruction and absorption of bone, a form of so called metastatic calcification. Second, in the necrotic epithelial cells in certain poisons as, bismuth, phosphorus, and $HgCl_2$; third, in certain chronic interstitial mischiefs. In the latter case the lime salts are deposited in the dense fibrous areas, also, about or within the fibrosed glomerules. In any case the deposits may be too small to be seen with the naked eye ot they may appear as fine white or grayish white lines, usually in the cortex, but in certain rares cases the apices of the pyramids may be crusted over with a deposit of calcium salts. They can be recognized microscopically by the deep blus stain with hematoxylon and their irregular outline, also, if they be composed of calcium carbonate, as an acid causes them to give of CO_2. Their cheif importance probably lies in the fact that they may fine their way into the urinary tubules or pelvis to be the nucleus of a renal calculus.

3. Uratic:-- Such deposits of urates are usually sodium or potassium salts and they occur in gout and the socalled uric acid diatheses.

these deposits show as yellowish white lines, usually in the cortex, at times in the pyramids. These amy collect in large enough masses to form little concretions in the kidney substance. The so-called uric acid infarct are an almost constant feature in the kidneys of the new born and of infant. They may last up to the age of two maonths, but most frequently disappear before this. They show up as glistening golden, or yellowish red lines converging toward the apex of the pyramid. The urine is turbid and glistening. Microscopically, these urates and uric acid are to be seen to be deposited in the collecting tubules. The cause of this deposition is not known. At one time it was thought that fthey occur only in the kidneys of those infants who have breathed and thus it was believed sn evidence of the fact that the child was born alive , taken on thus a medico-legal interest, however, they have been found in the kidneys of still born infants and thus their medico-legal importance is not so great. If they do not disappearprobably their presence may cause an irritation or possibly a blocking up of the tubules.

4. Gȳycogenic:__ This occurs particularly in diabetes mellitus, for some reason involving especially the epithelia of Henle's loop. The cells are too large and are filled with a somewaht glistening, homogeneous material, the deposits of which do not tend to run together, nor to destroy the nucleus. The nucleus is frequently too large and vesicular. In ordinary preparations the gȳycogen is dissolved out, leaving the cytoplasm vaculoated. The best stain is a frozen section of unfixed, (fresh) tissue, by Lugol's solution in thick gum arabic, which gives a brownish red color.

VII. Degenerations.

1. Cloudy Swelling or Parenchymatous Degeneration:__ This is one of the most common affections of the kidney since it accompanies practically all of the inflammations but it may be met apart from the inflammations, although the line of demarcation is by no means sharp. The causes are to be found in toxins or other poisons. The toxins are especially those of infectious fevers, as diphtheria, scarlet fever, cholera, yellow fever, typhoid fever, etc. Certain chemical poisons may cause it as, arsenic, P. HgCl2, and the mineral acids.

Grossly, the kidney is somewhat emlarged, the capsule is tense, and on section the cut surfaces bulge, forming convex surfaces which can no longer be approximated. The cortex is too wide and of a grayish turbid appearance, as though it had been scalded. The cortical markings are somewhat obscured.

Minutely, the change is seen to affect first and principally, the epithelia of the convoluted tubules although those of other parts may also be involved. These cells are swollen, not infrequently occluding the lumen: the cytoplasm is very granular, and the nucleus may ne obscured, the outer edges of the cells may be frayed, the cells even desquammating. The nuclei are somewhat too large and too pale or as suggested before, absent, this last feature is not so marked in cloudy swelling as in fatty degeneration. Unless the nucleus is completely destroyed, complete recovery of the cell is possible. This condition not infrequently passes into fatty degeneration or is associated with it.

2. Fatty Degeneration:-- Of All the causes given for cloudy swelling may operate to give rise to fatty degeneration, except that here they are probably more severe. Do not forget the inhalation of CHCl3 as a possible cause, also ether, but not to such a marked extent. This explains the albuminuria sometimes met afte anaesthesia.

The appearance of the kidney varies with the degree of fatty change: it is too large, capsule tense, the cut surface is bulged, the knife has a greasy feel, and scraping the surface with the knife may bring away little fat globules, the cortex is too wide, the color varies from a grayish yellow to a deep yellow (butter yellow), the cortical striations are lost and in severe cases the cortex gives a distinguished from the medulla with difficulty. The tissue becomes quite friable.

Microscopically:-- Here again we find the convoluted tubules first and chiefly affevted. In side the cytoplasm of the swollen cell are numerous globules of fat not tending to fuse and best shown by stain ing with osmic acid. The nucleus disappears, much fraying and desquammation is seen, so that the lumen may be filled up with a fatty detritis which sometimes fuses into a fatyy cast. The individual cells, fattily degenerated, cannot recover, and if replaced at all this must be done with new epithelia. In many cases it is practically impossible to distinguish grossly between cloudy swelling and fatty degeneration, or even microscopically until the differential stain of osmic acid is used.

All gradations up to definite inflammations are to be found. Indeed the best example of fatty degegeration of the kidney is found in chronic nephritis. Excesses of bllod, either arterial or venous, will serve to obscure the pidture and confuse one in the disgnosis.

3. Amyloid Degeneration of the Kidney:-- This accompany similar changes in other organs as in the liver and spleen in cases of chronic long standing suppuration, particularry tuberculosis of the bones, or of the lungs and sometimes in syphilis. Certain degenerations of it are not unusual in emphysema, bronchiectasis, pyonephrosis, etc. Here again we meet with all stages, however, a typical amyloid kidney is very much enlaged, is quite pale, firm, indented from the pressure. On section, if the degenertain is very marked, the surface has a semitranslucent, pale, grayish, somewhat bacon appearance.

Microscopically, one finds that the earliest changes has taken place in the arterioles of the glomeruli tufts, at first converting these vessels into a clear homogeneous material taking the mahogany stain with iodine, or the rose color with gentian violet. Later the glomerulus is converted into a solid lobulated mass. Patches now begin to appear in other vessels, then in the walls of the tubules; degenertions of the epithelia are to be expected and in many of the tubules homogeneous waxy like casts show. Sometimes much milder degrees occur, as inchronic interstitial change, and these will be found only upon special search or by accident. In a typical amyloid kidney the urinary changes are somewhat constant. There is much albumen, probably from .6 to .8%, decreased amour of urine, high specific gravity, decrease in the daily urea and various urinary casts , some of the waxy ones taking the mahogony color with iodi these are the amyloid casts. Where the amyloid change accompanies cases of chronic interstitial nephritis the urinary changes will be some what different. With a chronic parenchymatous nephritis we find a marked increase in the amount of albumen with a deminished amount of urine and probably also a decreased specific gravity. If there be marked interstitial change in connection one will find an increased amount of urine with a low specific gravity but much albumen.

Lecture 4. 10/12/'08.

VII.I. Inflammations.

2. Acute Nephritis:-- Here we place all the inflammations of the kidney which are essentially acute in their process, leaving all those which rppresent an acute flaming up, recrudescence, or exacerbation of a chronic process. We attempt, also, to exclude those not always satisf the simple degenerations as cloudy swelling, fatty and amyloid degeneratic

1a. Acute Parenchymatous nephritis:-- By this we mean an acute inflammation affecting chiefly and essentially the epithelial elements. Synonyms:-- Acute tubular nephritis, desquammative nephritis, degenerative nephritis, catarhhal or croupous nephritis, and acute Bright disease.

Etiology:-- Prominent in the cause of this disease are the infect diseases, poisons, anemia, jaundice, and pregnancy. This is the most typic form of the kidney of pregnancy. The toxins of the infections are probable the most potent causes. The resulting infection may be slight or severe. In many caseses it will be practically impossible to grossly differentiate this from cloudy swelling or even fatty degener ation.

Gross Appearance:-- The kidney is usuall y larger, paler, capsule tense and thin, and stripping easily. The organ cuts easily, the cut su face from pale to gray or grayish yellow in color, bulging or becoming convex from the release of tension, usually juicy, surface turbid, almost as though as scalded. The cortex is somewhat widened, marked with red striae, the glomerules perhaps seen as small red dots, the tissue is too friable and the pyramids darker than the cortex.

Microscopically:-- Although there may be some granular albumous deposit or exudate within the capsule of Bowman, many of the glomerules m be unchamged, except perhaps for excess of blood. The chief change then is in the epithelia of the convoluted tubule s. These are large, swollen quite granular, often dropsical, perhaps fatty, fused, and the free edges are frayed. The nuclei are too few in number, with an occasional mytotic figure, (evidence of repair). The lumina are closed by the swelling of the cells or by granular debris. There is an occasional tube cast. The arterioles and capillaries may be filled with blood, but this is not constant. There is occasionally a number of leucocytes in the interstiti tissue, but this is by no means marked.

Effects:-- The changes in the urine naturally vary with the severity. The amount for 24 hrs is less, perhaps only 8/8 as much; Specific gravity is high, from 1020-1025; albumen present in distince amounts; in the sediment one finds some renal casts, usually braod hyaline, and the pale granular; some of these may have renal cells adherent; also there may be some free renal cells.

2a. Acute Interstitial Nephritis:-- Here we include those acut cases where the interstitial tissue is primarily and chiefly involved.

1b. Simple Acute:-- Definition. This is an acute inflammation of the kidney, involving both parenchyma and stroma without suppuration. SYNONYMS:__ Called also acute diffuse nephritis, acute glomerulo-nephritis, acute interstitial non-suppurative nephritis.

Etiology:-- This is the most frequent form of acute nephritis and may arise under many conditions, as in the acute infectious diseases, especially scarlet fever, diphtheria, ulcerative endocarditis, small pox, yellow fever, cholera, typhoid, erysipelas, pneumonia, measles, and acute articular rheumatism. Here the iritant action is from the toxins of the disease and the excretion of the bacteria themselves. The blood supply to the tubules for the most part passes first through the glomerulus, where there is abstracted from the blood water and inorganic salts. This concentrates the toxins in the blood so that their action upon the tubular epithelia, while this epithelia in attempting to sepatate the urea and uric acid, is more severe. Also any of the toxins which have passed into the glomerula space pass on along the tubule coming thus in contact first with the epithelia of the convoluted tubule, where a certain amount of it may be absorbed and give rise to trouble. Certain poisons seem to have a selective action, as some affect mostly the epithelia of the glomerules, giving rise to glomerulo-nephritis; while other toxins affect chiefly the epithelia of the convoluted tubules. Among the poisons which are important in causing this form of nephritis are =HgCl2, phenol, turpentine, cantharidese, As, ether, ChCl3, etc.. Any substances producing methemaglobin aemia, as the chlorates, are important also. Simple exposure to cold, clinically has been known to produce this form of nephritis but how, we do not know.

Gross Appearance:-- This varies with the duration and intensity, also with the amount of blood contained. The kidneys are usually emlarged, frequently much so, white,to grayish white in color or grayish red, or perhaps even deep red depending upon the amount of blood, or it may be mottled gray and r d. The sapsule is tense, thin, and strips easily but usually it carries way little tags of renal tissue. The stellate veins are prominent, but the surface is smooth except where torn. The organ cuts easily and the surface bulges, becoming convex. The cortex is too wide, dull grayish pink or grayish yellow, its striations indistinct, and the glomerules show as red dots. The zone of arched vessels between the pyramids and cortex is red. The pyramids are usually much too dark, the tissue quite friable, and, if more advanced, areas of distinct yellow fatty change are found in the cortex.

Microscopically:-- The change affects the glomerules, tubules, and the stroma.

Glomerules:--The change may be slight or very marked, (glomerulo-nephritis). The endothelia of the glomerula tufts may be so proliferated as to fill the capillaries with large cells, which fuse into a mass becoming fatty. Then again, the epithelia may proliferate and desquammate to lie free in the space together with a few leucocytes or r,b,c. In very severe cases this exudate into the space may be fibrinous of hemorrhagic. The Tubules:-- The changes here are chiefly degenerative, as c cloudy swelling, fatty degeneration, dropsy, and necrosis. In the necrosis the karyolisis and kariorexis are more common. Granular debris, tube cast desquammated cells, hyaline material, and r,b,c, are also found in the tubules. The collecting tubules may show extensive desquammation.

Interstitial changes:- These vary in degree and are most marked in scarlet fever and diphtheria. The stroma is edematous and loose, so that th glomerules and tubules seem to be wide apart. The infiltration of the leuc cytes seems to be a constant feature, most frewuently confined to the corte and most prominent about the glomerulus and the vessels. While the leucos are usually small leucocos, the polys may appear in considerable numbers. Occasionally one may see a distinct proliferation of the fibrous tissue, but in these acute cases this is not usually marked. Plasma ceells may be seen in numbers. In all of these cases the vessels are full of blood, at

times the glomerula tuft being stuffed tight. Some interstitial gemorrhage are not unusual. Indeed these may be numerous and so prominent feature as to make the kidney distinc tly red. When examined microscopically this may have fused into blood hyalin. When the hemorrhages are prominent or intense we speak of the condition as an acute hemorrhagic nephritis.

Effects:-- The amount of urine is distinctly decreased, at times much less than half; has a high specific gravity, perhaps 1025; there is much albumen, a distinct number of tube casts, hyaline, pale granular, some repithelial casts, free renal cells, frequently some r,b,c,, and the tatal urea distinctly decreased, usually the percentage also but not necessarily.

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2b. Acute Interstitial suppurative nephritis.

This is practically always secondary in origin, though it is true some cases seem to be primary. The kidney appearing to be the sight of lowered resistance toward organisms circulating in the blood, however, even here it is probable that some localized area has been overlooked. Leaving out the very rare cases where a penetrating wound has caused the suppuration of a kidney there are two general groups of infection:- (@) through the blood, causing the hematogenic form; (b) through the urine, causing the urogenic form.

(a) Hematogenic form:-- Here the infection, as the name signifies, has been brought by the blood and the condition has been found in pyemia, ulcerative endicarditis, osto-myelitis, purulent thrombi of veins and arteries, and some times with localized abscesses. The bacteria usually responsible are the pus organisms, the pneumococcus, B typhosis, and in certain other rare cases the actinomycosis.

Gross Appearance:-- Both kidneys are usual y affected, are large, soft and underneath the capsule are to ve seen yellowish white areas of various sizes. These are surrounded by hemorrhagic zones or distince hem orrhages. On section the cortical markings are lost, cortex increased in width, and both it and the medulla show the yellow areas of suppuration. These abscesses vary from minute up to ~~xandx~~ 1 1/2 cms, rarely larger.

Microscopically:-- The abscess areas are made up of great numbers of polys which have filled the interstitial tissues and broken into the lumina of the tubules. Sometimes the remnants of a destroyed glomerulus markes the center of an area. Groups of bacteria may be made out by prope staining. The kidney tissue in the area ~~gives~~ is of course, dastroyed, and the epithelia of the other parts show various degenerations. The vessels are full of blood and hemorrhages in and about the abscess areas are frequent.

asked (b). Urogenic suppurative nephritis:-- Suppuration of any part of the lower urinary tract may ex tent up to and involve the kidney. The principle causes, therefore, are pyelitis, ureteritis, and cystitis, the latter by far the most frequent starting point. Usually only one kidney is affected, particularly if the irritant mischief has been a pyelitis, as from a stone, but when the inflammation is ascending from the bladder it may be bilateral, although not necessarily so. The kidney mischief begins in the apices of the pyramids and extends along the straight collecting tubule until it reaches the cortex, which in this form is less affected than the medulla. The kidney becomes enlarged, red, hyperemic and soft. The abscessee may be small but they usuallu coalesee and form larger collections, when we have the typical surgical kidney. At first the pus shows as yellow radiating lines in the pyramids, then the apices are destroyed and finally in ext reme cases almost the whole of the kidney may be destrayed, converting it into one large pus sac = pyo-nephrosis. These pus cavities may rupture into any of the adkacent structures. A general infection possibly with pyemia may arise. The B Coli is the most usual organism isolated in these cases and the protius vulgaris the ne xt most frequent. The B Coli is said to occur when the urine is acid and the protius vulgaris with ammonical decomposition.

Microscopically:-- The collecting tubules early are filled with leucos, cellular debris and bacteria. When the destruction is greater there is much necrosis about the pus collection. The rest of the kidney shows more or less severe acute inflammation, but where the process is slo in developing a good fibrous capsule may wall off the pus.

Effects:-- In the pyemic, (hematogenic) form the urine will show only the changes indicated before with acute nephritis. But with the urogenic form we have the urine so loaded with pus cells as to sometimes make it look like pus.

In these cases the pus cells will probably obscure any renal cells or renal casts. Sometimes in the sediment one may make out transitional epithelia (5ailed cells), which probably come from the ureter or the pelvis of the kidney.

3. Chronic Nephritis:-- The principle characteristics of chronic nephritis are the productive inflammations in the intertubular or interstitial connective tissues. Along with this in all forms there are change in the epithelia. At times thss latter is so marked that we speak of it as a chronic parenchymatous nephritis.

1a. Chronic Parenchymatous Nephritis:-- Here we place all the forms of chronic nephritis in which the epithelial involvement seems to be the prominent change. We recognize two forms one without induration or contraction, the large white kidney; the other with induration or contraction, small white kidney. Bear in mind that all forms of chronic parenchymatous nephritis are also called diffuse nephritis and from ~~xxxxx~~ ~~xxxxx~~ certain stand points the latter is a better name.

Etiology:-- We shall discuss the etio logy of all the forms oc chronic parenchylatous nephritis together. As the small white kidney is probably only an advanced stage of the large one , being more fibrosed and secondarily contracted-. This affection may follow the acute diffuse nephritisdue to scarlat fever, malaria, erysipelas, exposure to cold, etc.. However, most of then begin insiduously and seem to be chronic from the very start. It is quite possible that the continued elimination of small numbers of bacteria from time to time, not only in the acute infection but at other times may be important. That is to say it is not unreasonabl to suppose that small numbers of bacteria enter the blood from time to time through ulcers of the mouth, about the teeth, tonsils, pharynx, alimentary mucosa, and mucosa of the genito-urinary tract. These must be gotten rid of somehow and even if destroyed by the leucocytes or other protective forces of the body the resulting products, if not neutralized, frequently toxic must be eliminated. Upon the kidney falls much of this work and this may be a potent cause of our chronic inflammation. Then in addition to the above the elimination of metabolic poisons produced in the intestinal tract and elsewhere is thrown upon the kidney. This muay hav an important bearing. ~~xxxx~~ Chronic parenchymatous nephritis occurring in men especially between ages of 20 and 40, but it may be found in women and children.

1b. Chronic Parenchymatous nephritis without induration large white kidney:-- The organ is increased in size, sometimes twice the normal, the color is whitish yellow, yellow or red, depending upon the amount of blood present and the degree of fatty change. The organ is flacid , almost doughy. The capsule is tense, as a rule slightly too thi and for the most part it strips easily but tears out little plugs of renal tissue. The stripped surface is smooth, except for the torn places. The surface is red, yellow, or frequently mottled red and yellow. The ste llate veins are prominent. The organ cuts with some increased resistance, although not much. The cortex is markedly increased in width perhaps twice fthe normal, has a yellow or mottled color. The medullary rays have a gray translucent color contrasting with the yellow of the res of the cortex. As a rule the pyramids are much darker than the cortex, although in some cases they too may become yellow. The cut surface has a oily feel, greses the kinfe and little drops of oil may be scraped off.

asked

Microscopically:-- The changes are found in the glomerulus, tubul and the interstitial tissue. The principle change is fatty de generation and when this is accompanied by relatively small amount of b lood we get the yellow color.

Glomerula change:-- These are constantly present and are both prc liferative and degenerative. The degeneration may be both fatty and hyali affecting the epithelia and also the endothelia. This may lead to almost complete destruction of the glomerulus. At the same time there may occur a proli feration of the epithelia with their desquammation so that the capsular space may seem to be filled with cells, sometimes arranged in a semilunar shape about the tufts. Along with these epithelia are leu cytes, granular material, and probably r,b,c,. In some of the glomerules there occurs an adhesive glomerulitis, so that the glomerule may be completely fibrosed.

Tubular Changes:-- Theis most prominent change here is the fatty degeneration in the epithelia of the convoluted tubules.

In advanced cases the epithelia of the straight tubules may be involved. The cells amy be large but more frequently are eroded, the lumina may be idilated, filled with granular material, fatty anf hyaline deposit s and tube casts. Where this dilitation of the tubules is very ,arked the epithelia may be flattened. If hemorrhages accompanies the process the r,b,c, may appear in the tubule, altered blood pigment shows in the epithelia and also in the stroma.

Interstitial changes:-- There is an edema and round cell infiltration of the stroma, some newly formed fibrous tissue appears as the result of cellular prolieration about the glomerules and tufts. Foe some reason the newly formed tissue remains loose. Fat dropplets and pigment granules may be demonstrated in the stroma. At times even in the large whote kidney the fibrous changes may be much more marked and the glomerulus begins to be obliterated by the fibrous changes. However, they above description is that of a typical large white kidney and every gradation between this and the next form is to met.

2c. Chronic Parenchymatous Nephritis with Induration:-- It is also called small white kidney, secondarily contracted kidney and secondary chronic interstitial mephritis. In these cases, in all probability, the large white kidney has preceeded and this one merely results where the fibrous proliferation has been more marked and it has now contrac However, numbers of cases with the large white kidney do not live long enough for this contraction to occur.

Gross Appearance:-- Typically, the organ is less than normal in isze, is white or yellowish white, perhaps mottled red and yeelow. The capsule is distinctly thickened and when stripped away tears up distinct plugs of renal tissue, leaving a roughened finely granular surface and subcapsular renal cysts are frequently seen. The organ cuts wiht increased resistance, the cut surface is mottled whitish yellow and red. It is distinctly too tough. The cortex varys in width, in places being normal in width or even too wide and in others much too narrow.

Microscopically:-- There is a distinct increase in the amount of interstitial tissue, this being of the adult typs but showing many round cells and fibroblasts. The chief change, however, is in the cortex. The glomerules being affected the most. There is a hyaline degeneration of the capillaries, many of the glomeruli surrounded by thickened capsules of Bowman, from which the fibrous tissue may penetrate into the interior, giving rise to an adhesive glomerulitis completely obliterating many of the glomerules. The glomerules which do escape may become larger, this is the kind of a compensatory hypertrophy. The epitehlia of the tubules degenerate, many of the tubules being entirely destroyed by pressure of the fibrous tissue, others may dilate into cysts, having been closed below by the contraction of the fibrpus tissue. Tube casts are frequent.

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Effects:--

The urinary effects are not constant. As a rule, however, in the large white kidney the amount of urine for the 24 hours is less, has a higher specific gravity, the percentage of urea is decreased and the amount in 24 hours much so; albumen is present in relatively large amounts and microscopically, we find casts of all descriptions, hyaline, pale and dark granular, epithelial and fatty casts. Most of these casts are broad. Free renal cells will probably be found also compound granule cells (full of fat globules). As this condition passes into the small white kidney (secondarily contracted), the urine approaches that which will be described for chronic interstitial nephritis although the amount of albumen present is likely to be greater, there is a greater variety of casts.

2a. Chronic Interstitial Nephritis.

Definition:-- This is a chronic inflammation of the kidney, insiduous in its beginning and characterized anatomically by a great increse in the interstitial fibrous tissue.

Synonyms:-- It is also called primary chronic interstitial nephritis, primarily contracted kidney, gouty kidney, granular kidney, and red granular kidney.

Etiology:-- briefly told the important conditions causing chronic interstitial nephritis are gout and uric acid diatheses, alcohol, syphilis, certain of the chronic poisonings as with lead, perhaps mental strain combined with sedentary life. In all probability heredity is a factor of considerable importance. This condition is most common in men at middle age

nd beyond but sometimes it may occur even in children. It is of insid-
ous beginning and of long duration. It seems that any cause producing
rterio-sclerosis may bring about chronic interstitial nephritis. A cer-
in degree, which may be though of as the least approaching chronic in-
erstitial nephritis, is almost constant in very old people. Senile atro-
hy of the kidney is of this type.

asked Gross Appearance:-- The kidneys are much too small, in extreme
ases one third the normal size; they are red in color, capsule is quite
hick adherent to the perirenal (pararenal) fat and also to the kidney
issue, so much so to the latter that it strips with difficulty tearing
he tissue and leaving behind a rough red granular surface. Subcapsular
rinary cysts of varying sizes are almost constant. The kidney cuts with
ncreased resistance, the knife may perhaps even creak. The cortex is
oo thin, in places the base of the pyramids reaching almost to the capsule.
he distinction between the cortex and the medulla is nor kept because of
he bands of fibrous tissue which run from the one to the other. The peri-
elvic fat is increased in amount, the pelvis may be too large, and the
ut vessels stand wide open.

asked Microscopically:-- The intertubular fibrous tissue throughout is
reatly increased, showing as adult connective tissue with or with out the
Φinger cells, the vessel walls are much thickened with fobrous tissue.
he capsules of Bowman are much too thick, many of the glomerules converted
nto completely fibrosed areas, showing as homogeneous or finely granular
yalin like balls or rounded areas. There may be some large hypertrophid
lomerules; the glomerules appearing closer togethet than they should.
he tubules which arise in the obliterated glomerules are atrophic, being
mall collapsed, with low cells and darker nuclei. Other tubules may be
ilated into cysts and while most of these are urinary cysts, some of them
ay be filled with a colloid like material of uncertain origin. The amount
f degeneration in the more normal tubules will vary considerably. Where
he arteries are especially affedted and the increase of fibrous tissue
eems to start from around the vessels we have the arterio-sclerotic type,
nd this is the form usually found in senile atrophy of the kidney.

Changes Elsewhere in the Body:-- Remember the hypertrophy of the
eft ventricle which may be excessive; the retinal changes as sclerosis
f the vessels and hemorrhages: and the well marked general arterio-scle-
osis.

Effects:-- The daily output of urine is very much increased, even
o as much as 6 liters. It has a very low specific gravity, 1010 pr lower;
he daily amount and percentage of urea is decreased; there is very little
lbumen often none, and microscopically one finds only a few urinary
asts, usually narrow, hyaline or pale granular.

Acute Exacerbation of Chronic Interstiti l Nephritis:-- Not infre-
uently through exposure to cold, alcoholic excess, during acute infections
ven mild forms, there is superadded to a case of chronic interstitial nephr
tis an acute process. Here the appearance of the kidney, the symptons of
he patinent and the urinary findings will be altered, sometimes so much so
hat the original chronic character may be overlokked. The urine decreases
n amount, specific gravity increases, albumen is profuse, broad casts
ake their appearance and parhaps some r,b,c,. At the autopsy one finds
he changes menticned for chronic interstitial nephritis with the exception
hat the kidney will be mottled, pale red or yellow, there is a marked
xcess of blood and microscopically, we have the picture of an acute neph-
itis in addition to the sclerotic changes mentioned before.

4. Uremia:-- Definition:-- This is a toxemia developing the course
f a nephritis or with suppression of the usrine or anuria from any cause.

Symptons:-- Of the cerebral symptons we have headache, convulsions,
oma, local palsies, dyspnoea, acute mania, and delusional insanity. The
astro-intestinal symptons:-- we have nausea and vomiting, sometimes dior-
hea. A rise in the temperature is not a constant feature, as the temper-
ture may be even subnormal but in some cases there may be a marked rise,
05 F. In the case of suppression the breath may have a urinous odor. Not
nfrequently the case is carried by a socalled terminal infection as acute
eritonitis, pericarditis, pleurisyl endocarditis, meningitis, etc. The
ault here probably being a lowering of the patient's resistance to the
ausative organisms, permitting their more ready entrance into the blood
and failure to destroy them after thay have thus entered.

As to the real cause of the uremia we are still in doubt. Indeed differ cases present such totally dissimilar clinic al pictures as to lead one easily to suppose that more than one substance is to blame. Most of th substances normally exc reted through the kidney and found in the urine are of slight toxicity, such as urea, uric acid, purin bases, creatinin, Therefore it is probable that the responsible toxins or poisons, are not normal excretory substances but abnormal substances, perhaps some of the antecedents of some of these subst ances and among these pprominently to be thought of are the amido acids and ammonium carbammate. That this is not the only one is evidenced by the fact that other substances abnorma are present also. We can not lay the blame to the inorganic salts, for the resan that these have been found experimentally in that the freezing point of the urine is a great deal too much depressed to be due to the p ence of inorganic salts, pointing to an increase in the inorganic substa in the urine even though these have not been definitely isolated and identified. Another factor to be lept in mind as a cause of urema is th possible existence of an internal secretion of the kidney. It is very po sible that such an internal secretion is actually formed and taken up in the blood in much the same wat that the other internal secretions are. The exact action of this is not known. Indeed it has not been definitely proven but still must be kept in mind. Another factor in bringing about the cerebrwl symptons is possibly the edema of the brain and cord. That such transudation of fluid does occur in other parts of the body during nephritis is well known and carefully held autopsies have revealed xxxals at least in numbers of cases, an edema of the brain and cord. The exact value of this is still in doubt.

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IX. Specific Granulomata or infections.

1. Tuberculosis.

1a. Miliary:-- This form of tuberculosis of the kidney is always hematogenic, the tubercle bacilli having been brought to the kidn by the blood stream. It is most frequently a part of a general tbc and a a rule involves both kidneys. Certain cases of apparently primary tbc o the kidney are probably due to small renal primarysource which has been overlooked, such as a caseous abdominal node or a bronchial node. In suc cases the bacteria have found the kineys a place of lowered resistance an thus the disease has started here.

The lesions show as smalm grayish areas , varying somewhat in siz and considerable in numbers, and usually confined to the cortex.

Microscopically:-- The usual histological structure of the tubhem is seen with perhaps more leucocytes than usual about it. The surroundin kidney structure shows hyperemia with degeneration of the tubal epithelia

2a. Massive or Chronic Tuberculosis of the Kidney.

Etiology:-- Undoubtedly quite anumer of these cases of chronic tb of the kidney are primary if we accept that term to mean that there is no well advanced or large size tubercles in the body. On the other hand man of these cases of massive tbc of the kidney are accompanied by tbc ulceration of the pelvis, ureter, bladder, testicle, or seminal vessicles and it may be impossible to say which is the primary lesion, especially since en the lower urinary passages are involved both kidneys are not always involved. Also even though both kidneys be involved at the time of death it does not necessarily folow that the infection was primary in the lower urinary passages, because the second kidney can become tuberculous from the first one either through the circu lation or by first infecting bladder, from which it may ascend to the other kidney. This is the form tbc kidney which is of surgical importance. Perhaps in most cases only kidney is involved, but one must remember always the possibility of the other being likewise diseased.

Morbid Anatomy:-- This chronic tbc may show itself in one of two general forms: (a) either as involving the kidney substance proper, or (b) as a tuberculous ulceration of the apices of the pyramids. The forme the more frequnet and the more important. Here the organ is much enlarge but the shape is preserved. On handling it usually gives a fluctuating sensation or a doughy feel. Externally, it may show nodules or lobulatior over which the capsule is thickened and adherent. The part first involved is usually one pole, more frequnetly the lower. On section, one or more large distinctly caseous areas may be found, separated by trabecula of more normal kidney tissue, which, however, microscopically is tuberculosis Advanced cases will show an extension and fusion of these areas,

so that the kidney may be converted into a large sack with only a rim of cortical substance. This sack is filled with a thick dirty white or yellowish white curdy pyoid material . The inner wall of such a sack may be smooth or somewhat irregular, from the persistane of parts of the former trwbeculae, or they may be covered with a more adherent caseous material. Along with this there may be an extension in to the perinephric tissue, causing a great increase in the surrounding fibrous tissue some parts of which will most surely show tubercular invilvement.

Microscopically:-- The usual changes met in a tuberculous cavity are seen. With reference to the form which shows an ulceration in the pyramidal apices, this is probably arisen from an ascending infection and the amount of caseation of kidney tissue prpper will vary according to the stages of the process.

Effects:-- In the miliary form only evidences of a cloudy swelling or acute nephritis will be met in the urine. In the chronic form the urin is practically always loaded with pus cells which may obscure all the other elements. It is acid in reaction unless accompanied by cystitis wit ammoniacal decomposition. R,b,c,, either a few or many, are almost consta features . In addition to this, a careful search will reveal the tubercl b cilli. a characterisitc of which in the urine is th at they tend to form clumps as though it were a small pure colony of tubercle bacilli. In the form which shows chieflay as an ulceration of the apices bleeding is a constant, early and important sympton.

2. Syphilis of the Kidney.

Aside from the fact that syphilis may be a predisposing cause fo or furnish ideal conditions for the development of nephritis, eiter acute or chronic , we may also find definite gummata, although they are rare. They occur in congenital or acquired syph and in any part of the kidney. Thir size varies from miliary up to 2 cms in diameter. Sometimes, however, there occurs a wide spread gummatous cgange giving rise to a much enlarged kidney. The gummata found here present the usual gross and microscop ical appearances of such lesions. In healing there is a distinct retraction of the capsule producing a stellate scar. When there are many such healed gummata the kidney may resemble very closely that described as the embolic contracted kidney. However, absence of the fresh infarct o of a source for the emboli together with evidence of syphilis in other pa of the body will serve to differentiate it.

X. Tumors.

1. Benign:-- These are rare and usually unimportant whereas the malignant tumors, especially if we include the hypernephroma, are fairly frequent.

Fibromata:-- While these are usually small and of no clinical i import, certain cases have been described in which large fibromas mixed w a certain amount of smooth muscle have been found arising usually from th capsule of the kidney. These are very like uterine fibroids both grossly and minutely and like them are very liable to degenerations, cyst formati and calcification. At times smaller fibroids may be multiple, well encap sulated, white, and glistening o n section.

Cavernous Anginoma:-- These may be found as brighy r d patches from minute in size up to thre or four cms in diameter. Usually, they ar just under the capsule, more rarely just beneath the mucosa of the pelvis where they may give rise to hemorrhage. In all points they resemble thos so frequently found in the liver. Other rarer benign connective tissue tumors such as lipoma, myoma, chondroma, and osteoma are met.

Adenoma:-- True adenoma of the kidney are not frequnent. They ar usually small , rounded, white or yellowish, often multiple, and usually definitly encapsulated, and practically always in the cortex. Microscopically but not grossly, it is possible to distinguish two general types: the tubular and the papillary. In the tubular form the microscopical picture is that of a proliferation of fairly well formed tubules lined by columnar epithelium. In the papillary from the tubules are much larger and many small clubbed or branched processes of fibrous tissue project in them, covered over or surmounted by epithelia. At certain times the epithelia is distinctly fatty, so much so that it may give a yellow color in the gross. Either from may become cancerous by proliferwtion of the epith lia, a penetration beyond the basement membrane and an invasion into the kidney tissue. Hence its importance.

2. Malignant Tumors.

1a. Sarcomata.

Etiology:-- If patients of all ages are included the socalled sarcoma of the kidney is perhaps the most frequent tumor found in that orga It is essentially a disease of child hood, although not unknown in adults. It is frequnetly congenital, having been found in the still born and in those dying a few days after birth. Both kidneys may be involved, some authors say in as much as 50% of the cases. The females is the sex of preference. Trauma seems to be an eitological factor of importance, at least in starting the growth into vigorous activity. They are rarely composed of a single kind of cells and it would be more proper to class them as mixed tumors; possible a better name being adeno-sarcoma. The exact tissue from which they origi nate is uncertain but it is probable from s some misplaced embryonic tissue, as portion sof the Wolfian duct.

Gross Appearance:-- Typically at first they are of slow growth, the from some reason, possiblt trauma, they assume a rapid growth, so much so that in a few months time they may almost completely fill the child's abdomen. The kidney tissue id compressed into a thin rim; the general shape of the kidney is retained although it may be somewhat lobulated. On sectio it ia gray or pink] rarely red. Degenerative softenings, cysts and hemorrhages are frequnet. At times the tumor is made up of a number of distinct nodules. A capsule is usually present although toward the surface this may be identical with the capsule of the kidney. The tumor is usually sharply demarkated from the kidney substance.

Microscopically:-- It is here that one begins to see the complex nature of the growth, sections from different parts of the tumor frequently showing totally different pictures. In one portion or part you may find definite gland tubules similar to the collecting tubules of the kiney lined by columnar or low columnar epithelium, yet practically always having a definite basement membrane even though the cells may have so proliferated as to fill the lumen. A penetr ation of these cells beyond the basement membrane is quite rare and there is no peripheral growth of the cells such as one finds in carcinoma. Thus this part is adenoma.

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When one comes to examine the stroma the sarcomatous nature is made manifest. Here are the round or spindle cells with large prominent hyperchromatic nuclei and a minimun of intracellular substance. Indeed whole sections may show only this appearance, so that if these parts alone were examined one might say that he was dealing with an unmixed sarcoma. In additon to these may be met definite muscle cells, both striated and smooth with all gradations between these. Isolated patches of hyaline cartilage are not rare.

Metasteses of these Tumors:-- This as a rule, occurs late, the liver, lungs and abdominal nodes being first involved. These secondary tumors show the same heterologous nature as the primary ones.

Prognosis: This is always grave. The frequent involvement of both kidneysm the tender age of the patient and the metastases render surgical interference of doubtful utility.

2a. Carcinoma:

The occurence of carcinoma arising in the kidney substance is rare. They may, however, start from the epitheliaof the pelvis and involve the renal structure. More rarely we have an adenoma-carcinoma, whose tubules simulate those of the kidney. Such a carcinoma may grow to a very large size. There is a distinct tendency for these carcinomata to ulcerate into the pelvis, from which condition there may arise serious hemorrhage. Secondary carcinoma in the kidneys are not unusual in general carcinomatosis.

3a. Hypernephroma:

The gross and minute appearances of these tumors have already been given under the discussion of tumors of the adrenals. It is sufficient here then to call to mind that the usual sites of these hypernephromata are in the kidney and that they arise from early foetal inculsions of bits of misplaced adrenals, which are usually just under the capsule where the hypernephromata most frequently arise. These tumors are usually marked off from the renal tissue by definite fibrous walls, which, however, may represent condensed kidney structure.

3Cysts:

Askel First:-- The congenital cystic or poly cystic kidney is not inrequntly met at postmortem or in operations upon the kidney. The kidney is found to assume one of two gemer appearances:--(a) in the more frequent

form the outline of the organ, which may be much enlarged, is frequently very nodular; many rounded elevations occur under the capsule varying in size from very minute to as much as 2 1/2 cms in diamater. Unless the capsule be too thick these cysts show contents of a clear fluid or possibly amaterial more brown in color. On section in this form practically the whole organ is seen to be occupied by these cysts, separated from one another by fibrous trabecula or possible by some tissue in which it is possible to recogmize renal structure. The inner wall of these cysts is smooth, unless possible in some of the larger ones you may find remnants of fibrous trabecula as though one or more had fused together. The contents are usually clear, light yellow fluid, containing traces of urea, but in some it is to be found a brownish colloid like substance whose composition and origin has not yet been de finitely determined.

Second:-- In this form instead of multitudes of smaller cysts the entire kidney substance may be gone or nearly so and its place occupied by several very large cysts. Here again the organ is decidedly too large. These cysts may communicate one with another and in rare cases with the pelvis, although these openings are likely to be quite samll.

In either of these two forms, microscopically one always meets with some remnats of kidney tissue. The inner lining is epithelia, which may be low cuboidal or possible from pressure besomes flat epithelia.

An occasional form of a congenital cystic disease is where one meets one or possible two large cysts in the kidney which is practically normal otherwise. The exact mode of origin of these poly cystic conditions is not definitely settled, but possibly the preferable theory is that they have come about from an intrauterine inflammation of the papillae, which may be due to constrictions or to the extension of a pyelitis. Such an inflammation may block up the straight collecting tubules, preventing drainage. The glomerules and the convoluted tubules still having the functuating power, continue to secrete the urine and its gradual accumulation, in excess of absorption causes the cyst. It is true that some of thses cases seem to arise frm diseased conditions after birth but the greater number are undoubtedly congenital.

Inflammatory Cysts:-- In almost every case of lone standing nephritis, especially of the interstitial type, some renal cysts will usually be seen, especially just under the capsule. At times they may be a prominent feature of the gross appearance. These are undoubtedly retemtion cysts, the retraction of the excess of fibrous tissue having shut off the drainage. They contain a clear urinary fluid or the brownish colloid. They vary in soze from minute to as much as 1 cm in diameter. Their lining is again low cuboidal or flat epithelia.

Dermoid Cysts:-- While these do occur they are very very rare.

Echinococcus Cysts:-- These are due to the scolices of the Tenia Echinococcus or Dog Tape Worm. Such cysts are rare in the kidney and may be metastatic. As a rule they are rounded and smooth, sometimes lobulated and may reach the size of z child's head. The cyst may rupture into the pel vis of the kidney and some of the daughter cysts may be discharged in the urine. Rupture into any of the neighboring structures is possible.

XI. Parasites.

1. Bacterial:-- The causative organisms of many infectious diseases are paetially eliminated by the kidney and may be found in the urine. A prominent example of this is the B Typhosis, which is found constantly during the acute attack and may be discharged in the urine for months after the case has recovered from the acute infection. In this way the patient may become a chronic thphoid carrier and distributer, a menace to the community, however, this is not so great a source of danger as the stools.

2. Animal Parasites:-- The Echinococcus has been described under the cysts.

The Distonum Hematobium :-- In certain cases this has been found in the veins of the kidney and its eggs may get into the parenchyma. The Filaras Sanguinus Hominus has also been found in this organ. Other rarer animal parasites have been recorded.

B. Pelvis of the Kidney and the Ureters.

I. Anatomical Considerations:-- The pelvis of the kidney is the epithelial sack into which the collecting tubules empty, and the apices of the pyramids project into it. It has a fibrous wall which, however, is quite thin over the apices and it is lined throughout by transitional epithelia, usually stratified.

This structure gradually merges into the ureter where we begin to find a coat of smooth muscle, with usually normally a single layer of tr ansition al epithelium.

II. Congenital Anomalies.

The pelvis and ureters on one or both sides may be absent. Either the pelvis or ureter or both may be doubled. Where the ureter is double it may remain so through out its course, each portion having a separate opening into the bladder, usually, however, they may join before reaching the bladder. Abnormal openings of the ureter have been recirded, as into the prostatic urethra or seminal vessicles in mah, into the vagina, uterus, urethra, or intestines of the female. Dilitation of the pelvis and ureters while most frequently acquired, may be congenital, so we describe this condition here. The cause is obstruction somewhere as by an impacted foreign body, stone, blood clot, parasites, a bit of tumor, or by stricture of the ureter, either by inflammatory changes within or by pressure without. Such external pressures may be due to a tumor, retroflexed uterus, distended bladder, deformed pelvis, a kink with a misplaced kidney or some abnormal formation of the kidney (horse shoe kidney). Stricture of t the urethra is frequently an important cause. The obstruction may be partial or complete. The largest dilitations are usually where the obstruction is partial. As the urine a ccumulates it backs up into the ureters and pelvis, compressing the kidnay structure and finally distending the pelvis so that only a comparativelt rim of renal structure remains, the organ apparebtly having been conveeted into one large renal cyst, which condition is known as hydro-nephrosis. The contents are usually fluid, clear, light yellow, of a low specific gravity, (rarely over 1012. most frequently 1004 to 1006.), a very small percentage of urea and other solids At times this material may be gelatinous. The sedimant shows desquammted epithelia, a few leucocytse, sometimes r,b,c, and in the fluid small amounts of albumen may be present. Sometimes the sack becomes infected and is converted into a pyonephrosis.

xxxxxx&a&xxuxxx Lecture 8. 10/30/'08.

III. Calculi or nephrolethiasis.

It is in the pelvis of the kidney that the renal calculi chiefly form. Sometimes the pelvis is seen to be filled with innumerable granules, at others the pelvis and calices may be a lmost completely filled with large branching calculi. The constituents of these stones are derived from the renal secretion and are deposited either because of the supresaturation of the urine with the material or because of an alteration in the composition of the urine where by its solubulity for these materials is diminished The most frequent is the uric acid calculis. Here probably the underlying disturbance is not so much the increase in the maount of uric acid being excreted, although this may be a factor, so much as it is a decrease or absence of the substances which normallu hold the uric acid in solution. The next most frecuent is the calcium oxalate calculi. As usuall, these calculi always present some sort of a nucleus and frecunetly the materials are held together by some cement substance, principally mucus.

The uric acid calculi are quite hard, are yellow or yellowish red, from the presence of pigment substance (urochrome and urobin), they may be large or quite small. Calculi composed of urates, usually the ammonium urate, are rare in adults but are found in the kidneys and in the pelves of the new born or of infants. They are distinctly softer and deeply colored. A calciun oxalate calculus is brown, slick, has numerous little rounded projections like the mulberry calculi of the bladder; is very hard and when broken has a distinct crystalline, usually radiating appearance. From their roughness and hardness they usually give rise to bleeding. With ammoniacal decomposition one may get calculi of the triple phosphates, either the ammonio-potassium, and sometimes the calcium phosphate. These may be secondary deposits upon one of the other froms. They are dirty white, irregular in shape, crumble and are easily dissolved in weak acids. As a rule, few of these calculi are pure, often consisting of combinations in varying amount of the constituents named above. The nucleus may be a bit of desquammated epitelia, a gropp of bacteria, or blood clot: Sometimes animal parasites or their ova. These calculi may cause hydronephrosis, pyelitis, pyonephrosis, and ureteritis, with or without ulceration. They may become impacted in some of the passges, giving rise to the intense renal colic. They may ulcerate into the surrounding tissues; not infrequantly the smaller ones pass into the bladder where they may in turn become nuclei for larger stones.

IV. Inflammations of the pelvis and Ureters.

Pyelitis and ureteritis are so similar in nature and their origin, and are so frequently associated that we will consider them together.

1. Acute Inflammation:--

Etiology:-- The organism most frequently isolated in acute pyelitis is the B Coli. It occurs in acid urine. Acute pyelitis may arise from the extension of a cystitis, with or with our oreteritis. It may be produced by the irritation of a stone, by the extension of a purulent mischief from the kidney or it may hematogenic. Not infrequently it is grafte upon a chroinc pyelitis. The condition is usually bilateral.

Gross Appearance:-- The process may run the stages of catarrhal, suppurative, pseudomembranous, or gangrenous. In the catarrhal stage or form the mucosa is red, swollen, and may show minute hemorrhages. The urine contained in the pelvs shows leucocytes, desquammated transitional cells and r,b,c,. These may also be found in the urine passed naturally but their diagmostic value is not so great. Howeverifthe ureters have been catheterized, examination of the urine may be of value in diagnosis, a point which holds for other forms of pyelitis.

In the suppurative form the pelvis is filled with pus or pus and urine mixed. If the pus is greatly in excess and the pelvis considerably dilated we have a pyohephrosis. The mucosa is thick, diryt white, wit hyperemic places and under the micrpscope one finds much desquammation and erosion of the surface epithelia, with much hyperemia, perhaps interstitial hemorrhage and a marked infiltration of the mucosa and submucosa with leucocytes, the polys predominating. (Pyonephrosis = pelvis full of pus, while pyelonephritis = inflammation of the kidney and pelvis with out reference to suppuration).

In the pseudomembranous form there is added to the above picture a false membrane, a prominent constituent of which is fibrin. Where the condition has become gangrenous the mucosal surface becomes a dirty,red, brownish or even greenish, with evidences of ulceration. Perforation of the pelvis may occur in such cases. Where there has been extensive involvement of the kidney tissue proper in any form pf pyelitis we designate this by the term pyelonephritis.

2. Chronic Pyelitis:--Under the etiology of this chronic inflammati come the same factors as those mentioned for the acute, but they are acting in a milder degree and over a greater period of time.

Grossly:-- The mucosa becomes thickened and thrown into ridges , even at times showing papillary outgrowths. Sometimes the epithelia become flattened, horny and shiny from the deposit of cholestrin. Do not forget that such chronic inflammations are very liable to have acute processes grafted onto them.

V. Specific Infections.

1. Tuberculosis:--

Miliary Tuberculosis:-- In rare cases one may fine miliary tubercle in the pelvis or ureter. It is very rare for them to be primary hsre. Chronic tuberculosis is almost always secondary, either from a similar process in the kidney or from extension upward of a tubercular cystitis or from other tissues lower down. The mucosa becomes thickened and caseous perhaps ulcerated. In the ureter a favorite site for the tuberculesis to involve is just before the ureter opens into the bladder. Tuberculosis of the ureter may cause such a thickening of its walls as to produse partial stricture. In the tuberculosis of the palvis or the ureter the tubercle bacilli may appear in the urine with various nubers of leucecytes and r,b,c,.

VI. Tumors.

A villous papilloma extending into the pelvis is sometimes met. It has a soft velvety appearance and microscopically it consists of finely branching fibrous tissue cores surmounted by the transitional epithelia. It is possible that these have their origins in inflammatory changes. Ulceration and hemorrhage may occur.

True carcinoma may arise in the pelvis and show a marked tendency t invade the renal substance. These are not infrecunetly accompanied by calculi, such as ones finds in carcinoma of the gall bladder.

At times the pelvis and ureters are the seats of mulitple little c cysts, the origin of these is uncertain, some claiming that they arise

rom the proliferation and softening of the lymphoid areas, others that hey are parasitic in origin.

VII. Parasites.

Eystrongulus Gigas, or round worm are sometimes found in the pelvis f the kidney. Also the schistotoma hematobium, or blood flike, and the ilaris Sanguinis Hominis may be found in the pelvis.

. Urinary Bladder.

I. Anatomical Considerations. (See Texts)

II. Congenital Malformations:-- Complete absence may occur. Here the reters open into the urethra, vagina, sometimes at the umbalisus.

Exstrophy:-- In this condition the anterior wall of the bladder is anting, the mucus membrane being continuous with the skin surface. There s nearly always some abnormality present, such as failure of union of the ymphesis pubis, epispadias, or split clitoris, sometimes the anterior bdominal wall is partially deficient. This fault arises from the failure f that part of the urogenital clefts to unite.

Urachus:-- This normally is the channel connecting the bladder with he atlantois at the umbalicus but should finally close up into a fibrous ord running from the summit of the bladder in the anterior abdominal wall o the umbilicus . This may remain open, resulting in a permanet vesico- ,balical fistula or portions of the tube may persist to form cysts, and n the cysts calculi have been discovered. A septum, either partail or omplete may divide the bladder, viae partitae bladder. (versteh?)

III. Acquired Malformations.

1. Size :-- Dilitation :--The commonest cause is the interference ith drainage as by stricture, hypertrophis prostate, partially impacted tone, or paralysis from spinal disease. The sixe may be very great. If a onsiderable time has been consumed in the dilitation the wall thickens ut if the obstruction has been fairly sudden the wall may be avry thin r even ruptured.

Hypertrophy:-- Any cause increasing the difficulty of urination, uch as those mentioned for dilitaion, if not tooo acute, will cause a hy- ertrophy of the bladder = adaptive hypertrophy. The cavity may be larger r smaller than normal. If there be considerable hypertrophy a peculiar ibbed appearance is presented from within, froming recesses in which alculi may lodge or becoming xxxx sites of origin of herniation of the ucosa.

Atrophy:-- Sooner or later in hyperdistension atrophy will occur, g, a decrease in the amount of the bladder wall. It also accompanies old ge.

2. Shape:-- Diverticula:-- These may be either one of two kinds; he true, in which at least a part of the muscular wall anters into the ormation of the wall of the projecting portion; and herniation of the ucosa is the second form. While some of these are truly congenital, thers may arise from increased internal pressure where the walls have een weakened either congenitally or by disease. These puches form pints f weakness and are favorite sites for rupture.

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3. Position:--

Vaginal Cystocele:-- Here part of the bladder descends into the vagina, there has usually preceded this a prolpas of the uterus dragging the bladder down. In the female a prolapse pf a portion of the bladder through the urethra has been known to occur.

Inguinal Cystocele:-- Here a portion of the bladder has herniated through the inguinal ring and this may or may accompany an intestinal her- nia. Acquired Changes in the Motility and paralysis of the Bladder:-- This occurs with hyperdistension, prolonged compression as by a pregnant uterus or by injury or disease of the spinal caord. It results in loss of contractile power, retention of urine and later incontinence.

Irritable Bladder:-- This occurs in hysteria, with excessive acidit of the urine, and possible a similar condition is found in cystitis. The bladder tends to contract frequently and there is a constant or almost constant desire to urinate.

IV. Wounds And Rupture:--

Wounds:-- If the part wounded is covered with peritoneum and that also be broken the urine escapes into the peritoneal cavity and a perito- nitis is sure to follow. If the wound be in other parts, the urine escapes into the cellular tissues, infiltrates diffusely and is frequently followed by a cellulitis.

Rupture:-- This may be due to traumatism, overdistension, either from obstrcted drainage or from the injection of too much fluid in washing out the bladder. Many of these cases are in alcoholics, and here the troul is two fold, the alcohol causes an increased amount of urine and blunts the sensibilities so that the man does not notice the fullness of the bladder. This predisposes to rupture upon fairly slight traumatism. The tear may be either entra-or extra peritoneal.

V. Circulatory Changes.

1. Hyperemia:-- It is difficult to tell a hyperemia of the bladder after death, since the blood drains away. However, with a cystoscope it is shown as a diffuse redness of the mucasa and is seen in acute cystitis and also where irritants are being excreted in the urine.

2. Congestion:-- This may result from pressure on the vena cava as by tumors or a pregnant uterus. It also accompanies chronic cystitis. Where it is due to pressure, if long continued, the veins may become varicosed and project into the bladder pushine the mucosa before them. This condition is known as hemorrhoids of the bladder. These may break or ulcerate giving rise to hemorrhage.

3. Hemorrhages:-- These are due to ulcerating tumors, ulcerated inflammations, varicose veins, calculi, injury, not infrequently in fracture of the pelvis and in the socalled hemorrhagec diathesis. These hemorrhage while most frequently slight, may be very intense, especially those from tumors. If the urine be examined immediately the r,b,c, retain their shap and color, not being crenated or washed out.

VI. Inflammations.

1. Acute Cystitis.

1a. Simple Acute or Catarrhal:-- Etiology:-- The essential cause is always some bacteria. The protius Vulgaris can itself decompose the urine and produce an acute cystitis. The socalled gonorrheal cystitis is nearly always a mixed infection. The typhoid bacillus and the pus organisms seem capable of themselves of producing an acute cystitis, however, the most frequnet organism responsible is the B. Coli. In this case, however, it must have been preceded by some predisposin cause as, lesions of the spinal oord, pressure of calculi, retention of urine(from -any cause), traumatism, irritant qualities of the urine, or even exposure to cold.

Morbid Anatomy:-- Grossly after death the bladder may be contracte and practically empty, the mucosa edematous, vessels perhaps injected and if a little more severe interstitial hemorrhages or ulcerations may show. These changes are best seen about the trigone and the urethral and ureteral orifices.

Microscopically:--We have the usual appearance of a caterrhal inflammation of a mucous surface. These cases of acute cystitis may recov or repeated attacks lead to chronic cystitis.

2a. Pseudomembranous Cystitis:-- This is frequnelt superimposed upon a chronic cystitis and may be found in severe ammoniacal decomposition, especially if this be due to a paralysis of the bladder. It may also occur in a waoma afte labor. There froms a more or less extensive dirty white membrane, usually fairly adherent, consisting of fibr mucous and epithelia. Sometimes flakes or masses of this memebrane may b passed in the urine, an evidence of extensive exfoliation of the membrane.

3a. Phlegmonous Cystitis:-- This again is practically alway engrafted on a chronic cystitis and consists essentially of pus collectio in the submucosa which may break into the bladder, leaving ulcers or spre externally to involve the cellular tissues as a para-or pericystitis. Such phlegmonius conditions are most frequnet in retention, after stricture or enlarged prostate.

4a. Gangrenous Cystitis:-- Again a chronic cystitis practica always antidates. (This should be Gangrenous Cystitis). The gangrene is most frequent in paralysis, in acute septic conditions, and in very sever injuries. The base is usually affected. The part is covered by a dirty green slough about which the mucosa is very red.

Effects of Acute Cystitis:-- In any form there is pain, frequent desire to urinate and a difficulty of urination. The disease may ascend, producing a pyelitis lyelonephrosis, or ureteritis. The urine is usually acid, except when engrafted upon a chronic process. It contains pus cell whose numbers will vary with the from of cystitis, desquammated bladder cells, varying numbers of r,b,c, and a little albumen.

2. Chronic Cystitis

2. Chronic Cystitis:--

Etiology:-- Any of the causes named for acute cystitis acting in a mild degree and over a greater period of time may produce a chronic cyst tis. Here there is nearly always an hypertrophy, especially of the muscular coat, so that in extreme cases the walls a y be 2-3 cms, in thickness. The interior shows the ribbed appearance, the neins stand out prominently, the mucosa is somewhat yellow, covered with mucous and deposits of urinary salts, especially in the recesses. Sometimes we may get a very thin wall, especially if there has been paralysis with hyperdistension.

The urine in chronic cystitis is practically always alkaline, has a very bad odor as of decomposition, is turbid and does not filter clear. It may be somewhat stringy and albumen may be present. Microscopically, i the urine one usually finds many triple phosphates, ammonium urates, pus cells, bladder cells, and bacteria. Here also the inflammation mat extend to the upper urinary passages. Upon a chronic cystitis we not infrequentl have an acute process placed as indicated before.

VII. Specific Infections.

asked 1. Tuberculosis:-- This is most frequently secondary to a primary lesion at some point along the genitozurinary tract. It may also accompan pulmonaru or intestinal tuberculosis. In the former case , from the genit urinary tract, the primary point may be in th kidney, prostate, or seminal vessicles. The first change is a thickening of the mucosa, usually about the trigone, then an ulceration, perhaps to and including some of th muscular coast, at times to the perivesicular tissue or even into the rectum. The edges are undermined and the base of the ulcer may be covered by a soft, grayish, caseous material. Upon removing this small tubercles may be seen. Ordinarily there is an accompanying cystitis and hypertrophy of the bladder.

The urine may show the ordinary changes of chronic nephritis and i addition to it may be found some tubercle bacilli. Usually, however, the amount of urinary decomposition in this tuber cular cystitis is not so great as in the ordinary shronic form.

2. Syphilis:-- Involvement of the bladder by syphilitic changes is very rare.

VIII. Vessicle Calculi:--

Etiology and Formation:-- Some of the stones have their origin in the kidney or in its pelvis, at least the nucleus. Drinking hard water various diets, predisposing to altered urine, chronic cystitis, presence of bacteria and foreign bodies may be mentioned as predisposing causes. Vessicle calculi are rather more common in the extremes of life, in the very young and the very old. They are quite rare in the females, the shortness and size of the urethra permitting a more ready passage of the calculi.

Practically always the calculus consists of three parts: eg, (a). The nucleus, which ma y be a bit of blood clot, mucous, foreign body, or a smaller renal calculus; (b). The body, consisting of layers of the constituent salts held together by mucous. (c). A cr ust of varying thickn of soft phosphatic material. These calculi may be single or multiple and when multiple may be faceted and there may be an excessive deposit of urinary salts which can hardly be classed as calculi.

Composition and Description:-- The calculi are rarely pure, but consist of a mixture of various salts. They are named, however, from thei cheif ingredients.

The uric acid calculus is usually an oval or spheroidal shape, fairly hard, smooth or nodular, brown, distinctly laminated, and frequentl encrusted with phosphates. This is perhaps the most frequent stone and may reach the size of 3-4 cms' in diameter. When very small and multiple they may be passed by the urethra as gravel.

Ammonium Urate Calculi:-- These are verylike the above but lighter in color and the laminations are less distinct.

Calcium Oxalate Calculi:-- These are the hardest found in the blad der. They are rough, have an irregular surface covered by little rounded nodules or sharper spicules to from the mulberry calculi. They are very dense, hard, laminated, of a dark reddish brown colo r or almost black from the presence of blood. As a rule they are not large, as they grow slowly and their roughness casuses much irritation attracting attention to them earlier than in the other forms.

Phosphatic Calculi:-- In the pure state these are quite rare. They from the usual encrustations on foreign bodies when an alkaline decomposition has ensued. They may, however, be fairly pure when deposited in the recesses of the hypertrophied bladder, however, when they begin to encrust other aalculi they form the largest bladder stones with which

we meet. This then gives the stone a grayish white, somewhat chalky appearance, granular surface, friable, of an offensive odor, and very litt appearance of lamina can be seen. They are composed usually of a mixture of calcium and ammonium phosphates.

Cystin Calculi:-- This is a rare calculus. It is of a greenish waxy appearance.

Xanthin Calculi:-- This is quite rare and of a distince red color.

Results:-- A frequnet desire to urinate, pain, especially at the end of urination when the stone or atones are pressed down upon the sensitive trigone. At times a sudden cessation of urination, as the stones occlude the beginning of the urethra is noticed. Sooner or later a chroni cystitis with hypertrophy occurs. Later ulceration with an ascending inflammation involving the renal pelvis of the kidneys is seen.

IX. Foreign Bodies.

It is marvelous, the variety of foreign bodies which find their way into the bladder, as pieces of catheters, hair pins, pins, etc. They become encrusted with phosphates and cause a chronic cystitis if allowed to remain.

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X. Tumors of the Bladder.

Benign:-- Polyps of fibrous tissue covered over with the epithelial linging of the bladder are not unusuall results of a chronic inflammation.

Papillomata:-- These tumors also at times seem to arise a s the result of a continued irritation, but then again there is no apparent cause. They are usually situated near the base of the bladder (trigone), and appear as villous or cauliflower like excressences, the whole tumor having a soft , gray or pink appearance. They are very vascular and liable to give rise to bleeding. Microscopically, the little processes are composed of connective tissue centrally placed, in which are numerous capillary blood vessels and covering over this connective tissue is the lining epithelia of the bladder, which, however, may show a greater or less number of layers than normal. Sometimes the connective tissue may have an almost mucoid appearance (very loose).

Fibro-myoma and Myxoma have been recorded, but are rare.

2. Malignant Tumors:-- Sarcoma almost never occurs, except as a secondary invasion from a tumor in the neighborhood.

Carcinoma:-- In nearly all the cases of ca rcinoma of the bladder there has preceded it a papilloma. The bladder wall is thickened and infiltrated, there is an increased tendency to bleeding, and on cystoscopic examination one sees a rough, raw, necrotic area. In the female, secondary extension to the bladder by cancers of the cervix and vagina are the most frequnet complication of carcinoma in these situations.

D. Urethra.

I. Anatomical Considerations:-- Remember that the course of the urathra in the female is comparatively shott, that in the male much longer and for convenience we speak of an anterior and posterior portions. The lining epithelia is at first of a transitional character, quite similar to that of the bladder but gradually approaching a squammous variety to merge with that covering the glans or vagina as the case may be.

II. Congenital Anomalies:- Complete absence, either partial or complete may lead to the death of the foetus. Double or even triple urethras have been observed, which may have a common opening or separate ones. Congenital absence of the roof, epispadias, or of the floor, hypospadias, or not so rare.

III. Inflammations. Urathritis.

1. Etiology:-- By far the most frequneny cause of urethritis is the Gonococcis and in practically in all the cases this comes about from impure sexual intercourse. In deed, nongonorrheal inflammations of the urethra, except post operative, are so rare as to be almost negligible.

2. Morbid Anatomy:-- The gonorrheal inflammation is at first superficial and confined to the anterior part of the urethra. The mucosa becomes swollen red, the epithelia desquammates to leave a raw surface, there is a thick yellow irrit ating pus which in the male, if remaining in contact with the glans may cause it to become swollen, edematous, and of an angry red color.

3. Microscopically:-- In the early stages the biscuit shaped diplococci are to be found within and between the lining epithelial cells and within the polys. Later on these organisms are found in the submucosa and beneath it, here frequently inhabiting the leucocytes. Unless properly intelligently and thoriughly treated this acute inflammation practically always becomes chronic by involving the urethral glands and the posterior urethra (posterior Urethritis or Gleet). Now in the submucosa

results a dense infiltration of leucocytes, a multiplication of fixed connective tissue cells forming embryonic connective tissue cells and fibroblasts which finally go on to the formation of adult connective tissue. It is the contraction of this latter which causes the common complication of stricture. In place of the normal transitional epithelia we now have definite flat cells which are usually stratified and may even cform papillomatous projections. It is impossible to say and often difficult to demonstrate just where the gonococci in these chronic cases make their abode.

4. Associated Lesions:-- Lymphadenitis:-of the nodes of the groin is not fr equent in uncomplicated cases. Other tissues near by are frequently involved. In the male epididemytis, prostatis, periurethral abseesses, cystitis, and pyelitis are common. In the female vaginitis, which is usually the primary seat, cystitis, pyelitis, endometritis, salpyngitis, and oophoritis are found.

Distant Lesions:-- These usually result from an infection through the blood as, arthritis, teno-synovitis, endocarditis, myocarditis, pericarditis, pleurisy, peritonitis, neuritis, myelitis, and myoscitis. (Nearly all the serous membranes may be involved by the gonorrheal infection). Do not overlook the gonorrheal ophthalmia, which is estimated the cause of at le ast one third of all cases of blindness.

5. Results:-- Here we deal not with the associated lesions but with the condition of the urathra itself. The important complication here is stricture. This is a very frequent sequella of gonorrhea and gleet. The most frequent site is in the bulbo-membranous portion, possible the next most frequant is the anterior 2 or 2 1/2 inches. There may be one stricture or several. This is due to the excessive formation of fibrous tissue and the older the stricture the more dense and firm this fibrous tissue becomes. The stricture usually appears late after the acute infection, rarelt under a year, more often after 3 or 4 years. As the result of the stricture the portion of the urethra behind it is dilated, then the bladder, then a chronic cystitis with all of its attendant possibilities. Periurethral abscesses, fistula, infiltration of the tissues with urine with a subsequent cellulitis are not infrequent.

Prognosis:-- It is doubted by many good authorities whether chronic gonorrhea or gleet can ever be surely cured.

IV. Mechanical Injuries of the Urethra.

These are usually due to too forcible introduction of sounds or catheters or the passage of foreign bodies, calculi, and stones, and to external injuries. If the injury be longitudinal, as in surgical operation it heals without trouble. If transverse, the mucosa retracts, healing by granulation and stricture practically always results. False passages produced by instruments, wounds, etc., may lead to extravisation of urine. The blood from such injuries is usually bright red passed with the first urine, but blood clots in the form of casts of the urethra are sometimes passed.

V. Specific Inflammation.

1. Tuberculosis:-- This may due to deseending infection when it is usually situated in the posterior urethra. It may be situated anywhere as the result of an infection from penile tbc.

2. Syphilis:-- The primaru Chancer may be situated in the anterior portion of the urethra and on healing will produce a stricture. Gummata are rare.

VII. Tumors:-- Tumors of the urethra are uncommon. The papillomatous projection in chronic urethritis are usually insignificant.

Carcinoma may be of the flat cell variety, arising from the lining cells or adeno-carcinoma beginning in Cowper's glands. Secondary invasion sometimes occurs.

Diseases of the Blood, Outline of---

I. Preliminary Considerations of the Blood.

1. Physico- Chemical.
   - 1a. Specific Gravity.
   - 2a. Reaction.
   - 3a. Hemoglobin.
   - 4a. Plasma.

2. Cytology.
   - 1a. Red Blood Cells.
     - 1b. Normal.
     - 2b. Abnormal.
   - 2a. Leucocytes.
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Lecture 11. 11/16/'08.

Diseases of the Blood.

I. Preliminary Considerations of the Blood.

1. Physio-chemical properties of the bllod.

1a. Specific Gravity:-- This, in the normal individual, varies from 1055 to 1060, it usually being somewhere about 1059. One may ffine an ncrease in the specific gravity of the blood in those living in high altitudes, in the new born infant, sometimes after profuse sweating accompanied by muscular exercise, sometimes after a serious diorrhea, in certwin skin diseases, sometimes in old age, and after menstruation. It will be seen then that with the exception of the skin diseases the increased specific gravity of the blood may be practically regarded as physiological.

The decreases in the specific gravity are more distinctly pathological and are found in chlorosis, in the anemias, (especially pernicious), malignant diseases, leukemia, and in certain cases of dropsy.

2a. Reaction;- The normal reaction of the blood is aklaline, although it is quite difficult to ascertain a normal standard because the difficulties of determining the degree of alkalinity are such as to make possible many errors of operation, however, it is probably of almost the same degree of alkalinity as a .2 to .3% solution of sodium hydrate. This alkalinity is decreased in fevers, in cachexia of carcinoma, and in diabetic coma. Indeed, in the latt er the alkalinity is so much decreased as to almost justify the belief that there is an acid intoxication.

3a. Hemoglobin:-- This is the coloring matter of the blood and is found in the erythrocytes, combined with oxygen giving the bright red color to the blood in mass, this is oxyhemoglobin. When it is combined wit carbon dioxide it produces a dark red color, = reduced hemoglobin. As a rule, the number of rd cells per cubic millimeter is reduced correspondingly to the reduction in the hemoglobin. For convenience we say that the normal hemoglobin is an hundred percent, this means 13.6 gms, of hemoglobin(=⅌) (Hb), to ever 100 cc of blood. The Hb index, or color index, is the quotient obtained by dividing the percentage of Hb by the percentage of r,b,c,, taking 5 000 000 per cumm as the standard; ie, if the patient have a hemoglobin of 50% and a r,b,c, count of 3 000 000 per cumm, his Hb index

would be 50 divided by 60 = .83. If, however, the Hb be 60% with a r,b,c, count of 3 000 000 (60% of normal r,b,c,), the inflex would be 60 divided by 60 = 1. The fluctuations in the Hb and the Hb index will be indicated later.

4a. Plasma:-- This is the fluid part of the blood and carries in solution a whole host of chemicals, both inorganic salts and organic material, the latter including not only the urea, uric acid, etc., but many other socalled specific bodies, whose nature and chemical composition we do not know, as anti bodies, complimemts, etc.. Let us mention specifically only one of these, the fibrin forminig bodies or fibrinogen. These are increased in certain diseases such as pneumonia, articular rheumatism, suppurative processes etc, so that the blood clots more quickly and firmer than usual. They are decreased in pernicious anemia, hemophilias, etc, so that the coagulation time is longer and the clot less firm. The injection of peptones, you may recall, m ay inhibit the coagulation altogether.

2, Cytology:--

1a. Red Cells or Erythrocytes.

1b. Normal:-- The normal red cell is a biconcave disc, from 7-8 microns in diameter, about one micron thick, is very elastic, has no definite cell wall, but the cytoplasm is somewhat more condensed on the surface. Remember, that in early embryonic life and in the early stages of formation of r,b,c, after birth, these cells are nucleated, however, in the circulation nucleated r,b,c are not normal. In a properly prepared Wright's stain, the red cells have a light pink or slightly orange color, the center being slightly lighter in color than the periphery. The normal number of red cells in the adult male is usually given at 5 000 000 per cu in the female at 4 500 000. This number is subject to slight normal variations even at different times in the same day.

2b. Abnormal:--

Size and Shape:-- While in normal individuals there may be a slight variation in the size of the r,b,c, this is not marked and as to shape the red cells may elongate to squeeze through the fine blood vessels but they quickly reassume their ordinary shape. On the other hand, in certain diseases which will be given later, many variations in size and shape appear in the r,b,c, to which the general term poikilocytosis is given. A cell smaller than the normal red cells = microcyte, one larger = macrocyte or megalocyte.(None of these are nucleated). The microcytes are usually from 1-4 microns and the megalocytes 10-20 microns in diameter.

Changes in the staining properties:-- Pathological changes may occur in the cytoplasm of the red cell where by it looses its affinity for acid stains and either takes no stain at all or the basic stain. This may be true of the cell as a whole or it may occur in little areas through out the cell irregularly. This is spoken of as polychromat ophylia or polychromasia. These are probably degenerated changes, however, some look upon them as regenerative.

Nucleated Red Blood Cells:--As indicated before all nucleated red cells in the circulation are abnormal. Their significance will be given under the various diseases. With Wright's stain they have a deep blue nucleus and a distinct amount of pink or very light blue cytopasm. There are four kinds: (a) Normoblasts, which are of the same size as the ordinary red cell, 7-8 microns, have a deeply stained centrally placed nucleus occupying about one third of the cell. They may be told from the small lymphocytes, which they resemble, in that the nucleus is not so large and the relatively greater cytoplasm is not so blue but shows a distinct tendency to take the ordinary staining of the red cell cytopasm. (b) ~~Normo~~ Microblast These are nucleated reds, smaller thsn the ordinary red cell, from 2-5 microns. It is like the ordinary normoblast, except in size. (c) Megaloblast from 10-20 microns, larger than the ordinary cells, gemerally rounded, although their shape may be somewhat distorted when spread on a slide. Their single nucleus, while usually quite dense, may be fragmenyed, lobed, perhps showing varoius mytotic figures or even a nucleolus. (d) Gigantoblasts are all nucleated reds over 20 microns in diameter. There is more tendency in them to show varoius nuclear changes.

2a. Leucocytes.

1b. Normal:-- The normal number of leucocytes varies quite a good bit under different conditions and at different times of the day. It is usually given at from 7 000 to 10 000 per cumm. The relation of the whites to the reds is important. This should be from about 1 to 5 00 to 1 to 1000. 1c. Lymphocytes:-- All lymphocytes have more nucleus than cytoplasn and are divided somewhat arbitrarily into the small and larg

1d. Small Lymphocytes:-- These are from 5-8 microns in diameter, more frequently the latter. In the adult they constitute from 22-25% of all leucocytes, in children from 50-60%. They hav a comparatively large cantrwlly located single nucleus with an insignificant narrow rim of cytoplasm. With Wright's stain the nucleus is a dark purplish blue with a robin's egg blue cytopasm. There are rarely any cyt plasmic granules. These cells may be very slighylt ameboid but are not phagocytic.

2d. Large Lymphocytes:-- From 8-10 microns in diameter, constitute from 2-4% of the leucocytes, a~~r~~ relatively large round, single centrally paced nucleus, with a distinct rim of cytoplasm. The appearance with Wright's stain is the same as for the small lymphocytes, except that they have more cytoplasm and in this cytoplasm are occ sionally a few dark blue or purple granules, though never marked in numbe. These are somewhat ameboid but not phagocytic.

2c. Transitional Leucocytes:-- These are from 11-1. microns in diameter, constitiute from 1-2% of the leucocytes, have a larg rounded or oval, usually matched centrally palced nucleus, with a relativ gretere rim of cytpplasm. With Wright's stain the nucleus has a finter bl than in the lymphocytes, the cytoplasm a faint blue with some few purple granules. They are actively ameboid and phagocytic.

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3c.Polymorphonuclear neutrophils:-- From 12-20 microns in diameter, in the adult comprise from 60-70% of the leucocytes, have a centrally paced, distinctly lobed or twisted nucleus to represent the various capital letters. It may be elongated or curved. These cells have much cytopasm with fine granules. With Wright's stain we find a dar blue or dark lilac nucleus and the fine cytopasmic granules are of a redd lilac color. These leucocytes are actively ameboid and -are phagocytic.

4c. Eosinophils:-- These are from 8-20 microns in diameter, usually about 12 microns, and comprise from 2- 4% of the normal leucccytes. The nucleus is distinctly lobed or double, there is much cyt plasm containing large shiny granules. With Wright's stain we have a blu or dark lilac nucleus and the larger cytopasmic granules are distinctly red, lying in a light blue cytopasm. Frequently in the slides these eosi ophils can be seen breaking up and discharging their granules. They are a boid and somewhat phagocytic.

2b. Abnormal Leucocytes:--

1c. Mast Cells:-- These are from 8-12 microns in diameter, the nucleus is single, double, or at times lobed. There is a comparativèly narrow rim of cytoplasm in which are large granules. Sometimes these may be encountered in the normal blood. With Wright's stain the nucleus is purplish or dark blue, the cytpplasm is blue and in it are many large dark purple, almost black round granules.

2c. Myelocytes:-- These are always abnormal in the peripheral blood.

1d. Eosinophilic myelocytes:-- These are large in exceptional cases reaching 40-50 microns in diameter, but usually from 15-18 microns. They have a single nucleus, usually excentric, with much cytoplasm and fairly large granules. Wright's stain gives a dark blue or dark lilac nulceus, a faint blue cytoplasm in which are many red, fair large granules. It is differentiated from the ordinary eosinophil by its single nucleus, its usually large size, and somewhat smaller granules.

2d. Erlich's Myelocytes:-- From 15-18 microns, has a centrally placed, single nucleus, with eosinophilic granules. Wrigh stain gives a lighter blue nucleus with red granules and a lighter blue cytoplasm. Ordinarliy this is included under the preceding group of ~~eo~~ eosinophilic myelocytes.

3d. Corneil's Myelocytes:-- From 15-20 microns has a single excentric nucleus, with much cytopasm showing fine granules. Wright's stain gives a lighter blue or lilac nucleus with a fainter blue cytoplasm in which are fine purplish granules. This, perhaps, is more fre quently calle d the neutrophilic myelocyte. These myelocytes normally occur in the marrow of baones, where they are spoken of a s marrow cells.

3a. Blood Platelets or Plaques:-- These are little spherical or ovoid bodies from 1-4 microns, circulating free in the plasma, variousl estimated at from 2 00 000 tp 400 000 per cumm. The origin and significance iis still in dispute, but as yet they have no clinical importance. They disappear on exposure of the blood to air. Wright's stain shows them blue with smooth or irregular margins, containing many small blue or viole granules toward the center. They frequnent ly occur in groups or masses. The greatest importance connected with them is when lying accidently upon a r,b,c, they may be mistaken for the malarial parasites.

II. Variations in the hemoglobin.

Normally there should be nofree Hb in the plasma or staining the tissues, however, in certain disease where there has been extensive hemolysis, as occurs in certain snake venoms, with poisonous toad stools, certain drugs as KClO3, carbolic acid, and after severe burns, and sometimes in the acute infections as pneumonia and malaria. A condition somewhat similar occurs in postmorten decomposition. When the Hb is dissolved in the plasma the condition is called hemoglobanemia; if eliminated in the urine, giving it a dark brown or deepd red color, the condition is called hemoglobinuria. This last is characteristic of certain severe infections of malaria, = "black water fever". In all of these cases an excess of Hb is carried to the liver, transfered into bile pigment, so that we get jaun dice. As a rule, the percentage of Hb varies up and down uniformly with th change in the number of r,b,c, however, in some conditions as chlorosis, the Hb index may be less than one, which means that the individual red cel contain less Hb than usual. On the other hand, we sometimes the Hb index greater than one, as in pernicious anemia when it is 1.7, meaning that even though the r,b,c, are decreased in number, each cell carries more Hb than usual. Various chemical combinations of Hb are possible. Ordinarily the ~~Ø~~ ~~Ø~~ oxygen is loosely combined with the Hb = oxyhemoglobin, but sometimes it is more firmly bound, less easily dissociated = methemoglobin. This methemoglobin is formed with a variety of poisons prominent among which are KClO3, certain of the coaltars as acetanelid and antipyrin, etc. This causes the blood to assume a dark chocolate color and gives a characterisitc spectrum. The carbonic oxide hemoglobin (CO Hb) occurs with inhalation of fire damp or illuminating gas containing CO. It gives the blood a rose or cherry red color. When warmed in a porcelain dish with 10 NaOH the CO blood becomes cloudy, then clear with reddish flakes on the surface, while normal blood becomes brown with a grenish cast. Also upon adding ZnCl solution the CO blood becomes or remains red, while normal bloc will turn black. On adding 4 or 5 volumes of lead acetate the CO blood remains red, while normal blood turns black. This combination of CO with Hb persists in the blood for several days, even though the patient is to recover. It also gives a characteristic appearance with the spectroscope.

III. Variations in the Leucocytes.

1. Degenerations:-- Where leucocytes are present in degenerating tissues they naturally take part in the process, however, in the blood itself certain degenerations may be found. This may occur in some of the acu infections and progressive pernicious anemia. The neutrophilic granules may become acidophilic, the nucleus becomes irregular, swollen or shrunken, staining badly or even disappearing, sometimes with kariolysis or kariorhexis. The leucocytes may also undergo a glycogenic degeneration. This i found in such diseases as diadetis mellitus and in suppurative conditions. When the filn is dried and stained with iodine and gyycerine, th ree degrees of this glycogenic degeneration(idiophilia) may be found. (a) A slight diffuse mahogony color throughout the whole cell. (b). Definite rounded globules in the cytoplasm or even in the nucleus. (c). The whole cell may be filled up with glycogen. Remember that the glycogen is freely soluble in water so that no water must be allowed to come into conteact wi the film.

2. Hypoleucocytosis:-- This is a condition in which there occurs to few leucocytes in the pripheral blood. There may be an absolute hypoleucocytosis or leucopemia, if the number per cumm be too small. Or it may be relative if their proportion to the red cells be too small. The latter is a rare condition except as associated with an absolute hypoleucocytosis. Leucopemia, while strictly speaking means hypoleucocytosis, is sometimes applied to both. The decrease in the normal number of leucocytes may occu in a nuber of conditions; eg, (a). starvation and malnutrition, as in cance of the oesophagus. (b). Short, hot or prolonged cold baths produce a tem porary decrease in the leucocytes. (c). Most of the acute infections whic show no leucocytosis, may at sometime in their course show a hypoleucocytosis. (d). In pernicious anemia the absolute count is sometimes low, indeed this may occur in any severe anemia. (e). In the socalled splenic anemia or in the spleinic form of Hodgkin's disease we not infrequently hav a marked decrease in the leucocytes. In nearly all of these cases it is th polys that suffer most, there being a relative increase in the nuber of lym phocytes = a relative lymphocytosis.

While stictly speaking it does not come under leucopenia, I wish to call attention to certain acute infections, which are not accompanied by a leucocytosis. Indeed, as suggested above, there number may be actually de decreased. These conditions and diseases are the following:-

Typhoid, para-typhoid, most cases of grippe, measles, mumps, malta fever; cystitis, certain forms of tuberculosis, including insipient tuberculosis miliary tuberculosis, tubercular peritonitis, periostitis, ostitis, pleurisy and pericarditis. It is to be remembered in this connection tha any of these diseases may exhibit complications wherein the leucocytes ar increased in number.

3. Leucocytosis.

This means an increase in the leucocytes in the peripheral blood. This may be an absolute increase or a greater number per c.m.m. and it is to this that we usually refer when speaking of a leucocytosis. Or the increase may be relative, where the proportion of whites to the re is greater than normal. Where the number of leucocytes is greatly increased, the boundary being arbitrary, the condition is called hyperleuco cytosis.

1a. Physiological leucocytosis:- Here we include that of the newborn, of digestion, of pregnancy (?), post-partum, after violent exercise, massgge and cold baths.

1b. Leucocytosis of the newborn:- At birth the average number of leucocytes in the babe is from 17, 000 to 34,000. This gradually falls until in the 6th year, when it reaches that of the normal adult. On the first day the polys predominate, 75%, but by the 2nd week their per centage has sofallen, that we have only 36% and 45% of pymphocytes, a condition which continues throughout the first year. Then the per centage of the polys rises until about the 5th year when the usual conditions met in adults prevail.

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2b. Leucocytosis of digestion:

As indicated before starvation decreases the leucocytes, but on the other hand after a mid-day meal, especially if it be rich in proteids, there will be an increase in the leucocytes, reaching its maximum about 3 to 4 hours after the meal. The increase is usually about 1/3 more. Any disease of the gastrointestinal tract may prevent this increase in the leucocytes, especially if it be of the stomach. Meals chiefly of meats give a greater increase than the vegetable diets, however even in a fasting person about mid-day there begins to be some increase in the number leucocytes, a kind of periodic variation.

3b. Leucocytosis of Pregnancy:- While it is usually stated that a pregnanct woman, especially a primipara, shows a leucocytos in the later years this has been decided and probably in uncomplicated ca does not occur.

4b. Post-partum leucocytosis: during labor there is slight increase of the leucocytes especially in primipara and in young women. This continues during the first week after delivery and then fall to normal. However, it is not sufficiently marked to be of diagnostic value.

5b. The effect of violent exercise, cold baths and massgge:- where the exercise is violent and prolonged, as in a long distance race, there is a leucocytosis which approaches the pathological in the number and character of the leucocytes. The increase due to cold baths if not too prolonged, and massage, is probably explained by the cha es in the blood pressure and the changes in the size of the peripheral ve sels.

In all most all of these physiological leucocytoses the per centag of the various leucocytes will be unchanged, or if there is any change, t polys are increased at the expense of the lymphocytes.

2a. Pathological leucocytoses:-

1b. Post-Hemorrhagic:- Almost immediately after a large hemorrhage, say & one hour, there is usually an increase in the leucocyte frequently from 16,000 to 18,000. In a traumatic hemorrhage this may persist for some days. In a hemorrhage from the stomach or lungs, while the leucocytosis occurs, it rapidly falls back to normal. Even in a cerebtal hemorrhage, where the actual loss of blood is small, one may find this leucocytosis. So there must be some other facotr, as yet unexplained, aside from the actual amount of blood lost. In the post-hemorrhagic leucocytosis there is usually a relative and an absolute polynucleosis. In rare cases, though, one may find a lymphocytosis.

2b. Cachexic leucocytosis:-

In a great many cachexic conditions one may find and leucocytosis. If this be due to a malignant tumor the extent and character of the leucocytosis will depend upon a number of

factors, as the position of the growth, its size, rapidity of the grwoth, and the resistance of the individual. Those tumors associated with hemor rhage usually show a high leucocyte count, also if the tumor is rapidly increasing in size, the leucocytoses will be marked, especially if the case have a fiar resistance. As a rule the increase is in the polys, but in cancers it is not rare to find a lymphocytosis.

3b. Terminal or ante-mortem leucocytosis:-

Where the dea is sudden or rapid one does not find this terminal leucocytosis. If the death be slow there is usually a rise in the number of leucocytes, even to 50,000 in the 24 hours preceeding death. This is due either to stasis or to a terminal infection. It is to be remembered that the leucocytes are more cohesive than the r,b,c, so if the stream be slow more of themwill stick in the peripheral vessels and be found in the drop.of blood at the time of puncture. In this terminal increase polynucleosis is the rule, however, cases have been reported in which the number of lymphocytes was high, 90% or so.

4b. Inflammatory leucocytosis:-

This is sometimes spoken of as the leucocytosis of acute infections, a poor term because a number of important acute infection do not show an increase in the leucocytes. The rule is that suppurative and gangreous processes show more leucocytes than affections with seruous exudates (non-suppurative serious inflammations). Cabbott sums this up as the resultant of two forces:- the severity of the infection and the resistance of the individual. (a). Wher rhe infection is mild and the resistance is good there will be a small leucocytosis; (b). infection less mild and the resistance less good = moderate leucocytosis; (c). Infection is severe, and the resistance good = marked leucocytosis; (d). Infection severe, reistance poor = no leucocyto

There are two fairly well defined stages in this case. Early in the infection there is an apparent decrease in the leucocytes, due to a swel ing of the endothelia causing the leucocytes to stick and not come out of the puncture and also to an actual degemeration of the leucocytes. This i seen in the early stages of diphtheria, pneumonia, and sepsis. If the patient's resistance is poor this continuesand is an unfavorablesign. The next stage is an increase of the leycocytes, due to the regeneration effor on the part of the marrow to an increased flow of lymph and to the stimulation of the blood making organs by the bacterial products. It is the actively amoeboid and phagocytic cells which are increased, so we find a greater per centage of polys, even to 95%. This is the reason that Metzen koffer assigns to the polys such a high value in the action of immunity an protection. There is no question that their action is protective and serves to rid the body of bacteria and their products, however,its seriously doubted if this be due to the phagocytic action alone.

5b. Experimental leucocytosis:-

experimentally a leucocytosis may be caused by the exhibition of a great many substances, some if injected, still more if given subcutaneously or intravenously. Extracts of spleen and marrow and thymus gland have been found to produce a leucocytosis. However, in most of these it must be admitted that the leucocytosis produced is very similar to if not identical with, the inflammatory leucocytosis. As a further evidence of this it is usually noted when given subcutaneously, the degree of leucocytosis corresponds in a great measure to the amount of local reaction. It is possible, of course, that some of these substances, might be of practical use, as they increase both the phagocytic and the bacteriacidal power of the blood.

IV. Variations in the Erythrocytes.

1. Polycythenia:-

By this is meant an increase in the number of r,b,c, per cubic c.m. in the peripheral circulation. This may be an actua increase in the total number of r,b,c, or it may be due to a decrease in the amount of plasma, causing a greater concentration, as it were, of the r,b,c,. The latter is by far the most frequent.

Etiology:- Such concentrationmay occur in any disease accompanied by profuse sweating, frequent watery stools, as is diarrhoea, dysentary, or cholera, provided at the same time there is no marked hemorrhage. Also in profuse sweating. Then too a polycythenia may be due to a decrease in the areation of the blood and venous stasis as in endocarditis, emphysema, and asphyxia. A permanent polycythenia occurs in those living in high altitudes. In these larer cases the r,b,c, may reach 8,000,000 although the number is usually between 7 and 8 million. At first there is a polycythenia

and many microcytes are found althoughlater on in a few weeks the cells have their normal appearance. At first there is not a corresponding increase in the Hb but laten on this usually becomes more than 100%, keeping pace with the increased number of r,b,c, The cause of this increase is probably two fold, (a) in the increased altitudes there is much more water lost through the skin and the lungs, leading to a degreee of concentration; (b) nature must in some way compensate for the rarefaction of the atmosphere, that is for the decreased amount of oxygen. If the patient moves to a lower altitude the number of r,b,c, drops to normal, indeed it returns to normal much faster than the increase was made. Then again certain polycythenias seem to have no definite cause.

2. Anemia or olygocythenia:-

Anemia may be defined as a diminution in the corpuscular elements per cubic M.M.in the peripheral circulation. Roughly we divide anemias into two great classes:- (a) Secondary or symptomatic, in which we recognize the cause and (b) Primary or essential, in which no cause as yet has been determined. This then is the distinction between the two classes, but it is probable that as our knowledge pf the etiology increases, the number of primary anemias will diminish.

1a. Secondary anemia:-

1b Etiology:- The causes of secondary anemia are manifold as one would expect. Unsanitary surroundings, poor or insufficient food, over work with slim diet, emotional disturbances whihc affect the apetite, sleep, etc, produce varying amounts of anemia. Painfu affections from their mental and physicial influences upon the nutrition may be accompanied by anemia. Parasites, those in the blood causing a blood destruction, as malaria are frequent. Intestinal parasites, as t uncinaria and the botherocephaluslatus may be accompanied by much anemia In these intestinal parasites the anemia is probably dueto a combination of three conditions:- (a) Their presence may give rise to some indigesti (b) they may actually eat some of the blood; (c) but the most important is that they laborate a toxin, which upon being absorbed is blood destru Infectious diseases are accompanied by a degree of anemia. In acute infections this at first is not so manifest, but usually makes its appearance at the time of the comvalescense, when it may be quite distinct. Certain chronic infections, as syphilis, tbc, may produce much anemia. Chronic inflammations of certain of the organs, as chronic nephritis, cirrhosis of the liver, etc, may show an anemia because of the general disturbance of the nutrition. Cachexic diseases, especially malignant diseases, also may show a very prominent secondary anemia. It is to be remembered that the degree of secondary anemia may be slight or very severe, approaching even, or passing into progressive pernicious anemia.

2b. Blood changes.

1c. Physio-chemical:-

While the anemia may show varying degrees, the blood is lighter in color, more watery, flow easily from the puncture, and clots readily. The sp. gr. of the plasma is normal, but that of the whole blood is reduced, sometimes even to 1050, depending upon the decrease in the number of r,b,c, and the loss of their nitrogenous material. The Hb reduction depends upon the severity of the anemia, in most cases the Hb index is below normal, however, the decrease in the Hb may follow the decrease in the number of r,b,c,. The reaction of the blood is usually unchanged.

2c. Cellular changes:-

As to the number of r,b,c it is possible in the midder cases that there be no decreased at all. Indeed in a few cases the number may be over 5,000,000, yet in these cases each cell contains too little Hb, that it the Hb index is below normal. All gradations between the normal number on down to 1,000;000 may be met The variations in the shpae of the cells will depend upon the severity or degree of the anemia. In the middle,grades there is none, on the other hand the individual red cells may all of them be slightly too small In the severer cases poikilocytes of various shapes andsizes appear, microcytes and megalocytes also. Although the megalocytes do not appear in marked numbers. As the irregular forms begin to appear, one sees that their cytoplasm becomes altered. In its staining reaction the cell, either as a whole or in parts, shows an affinity for basic stains = polychromatophilia. If the anekia be of much severity and the patient's resistance fair, it is not ususual to find erythroblasts. Nearly of these are monoblasts. Megloblasts whoe only in the severe cases, while gigantoblasts are particularly seen in secondary anemias. Microcytes are also rare.

These erythroblasts may be taken as an evidence of rapid blood formatinn.

Leucocytes:-- Whether or not there would be a leucocytosis depends upon the cause of the anemia and this has been sufficiently discussed unde the general head of leucocytosis. As a rule, as the number of r,b,c, decrease the white cells increase both relatively and absolutely. In the severer forms of secondary anemia one may find a few myelocytes, usually Corneil's. An occasional basophil or mast cell may show.

3B. Associated Lesions:-- The characteristic palor of the skin is well known. Degenerative changes, either parenchymatous or fatty, are to be expected in the various viscera, as the kidneys, liver, and myocardium, particularly if the anemia lasts for a considerable time. Degeneration of the capillary endothelia are to be expected and it is to this that we ascribe the edema. An important change is seen in the marrov especially of the long bones. From its usual pale or fatty color it becom pink and lymphoid in character and smears show a marked increase in the number of erythroblasts. Remember that some of these nucleated reds are always present, but in the secondary anemias they increase markedly.

4b. Prognosis:-- This depends upon the cause, its severi and the possibility of its removal. Remember that with every anemia of a severe grade a viscious cycle is liable to be established. The poor quality of the blood causes more work to be thrown upon the important organs, while at the same time the blood has less ability to carry oxygen ans food stuffs. This will explain the degenerations mentioned above. So long as the blood forming organs are provided with sufficient nutrition to enable them to carry on their work and form new red cells to take the place of those lost, that long the patient will hold his own or may recover. When this fails the case becomes progressively worse and he may die with or without the blood assuming the characteristics indistinguishable from those to be described fro progressive pernicious anemia.

2a. Primary or Essential Anemia:--

1b. Chlorosis:-- Some of the synonyms of this condition are; viz, green sickness, febris amatoris, morbus virginus, chloremia, chloranemia;

Definition:-- This is a peculiar disease of girls or young women, manifested especially in a moderate decrese of erythrocytes, accompanied by a marked decrease in the Hb.

Etiology:-- At best we must confess that the cause is not known. It is almost limited to blond females usually under 30 years,of age, developing at puberty or a little after. A few rather typical cases have been recorded in older women under the name of chlorosis tarda. A host of predisposing causes have been recorded; a family tendency to tbc, heredity, the emotions such as grief, fear, anxiety, home sickness, love sickness, auto intoxication, habitual constipation, dyspaesia or faulty intestianl digestion, menstrual distrbances, unhygenic surroundings especially when accompanied by over work and faulty diet (factory gir Some authoritys claim to find the disease more frequent in girls of large families and regard the chlorosis as part of a general condition, one manifestation of which is unusual fertility. Still others regard it as a neurosis. Many of these girls show perverted apetites.

2c. Blood Changes:--

1d. Physio-chemical:-- The blood is easily obtained from a puncture, sometimes spurting out as fron an artery. It is too pale, frequently markedly so. The specific gravity of the whole blood is too low 1035 to 1045, although that of the serum is alone unchanged. The blood clots quickly. The alkalinity may be skightly increased. The most characterisitc change of all, however, is the decrease of the Hb usual to 35 to 45%. This usually is the earliest change, the decrease being out of proportion to the r,b,c,. The Hb index then, is very low, frequently from .5 to .3 . The water of the blood is frequently inc reased =hydremia. But the dried residue may be practically normal. The albumens, P and F are decreased. Changes in the amount of iron are not constant, in most cases, however, it is less.

2d. Cellular Changes:-- In most cases there is comparatively lit tle decrease in the number of the r,b,c,, indeed they may be increased, over 5 000 000. The average, however, of s long series of cases is about 4 000 000. If allowed to go untreated the number of r,b,c, falls to 1 500 000. Do not forget to contrast this comparatively slight de crease of the r,b,c, to the very low percentage of Hb.

Changes in Size and Shape:-- A slight decrease in the average size of the r,b,c, is frequently seen. But their shape remains normal until

the case becomes very servere when we meet with poikilocytosis and polychromatophilia.

Endoglobular changes:-

A very marked feature in the r,b,c of chlorosis is their paleness, both stained and unstained. It is the center that is chiefly affected sometimes only a narrow rim of cytoplasm appearing about the periphery. Nucleated reds are hard to find and always normoblast

Leucocytes:-- In most cases there is a relative and absolute leucopemia, although never very marked. The polys are decreased and the small lymphos increased. Sometimes the eosinophiles are increased in number and insevere cases myelocytes in scant numbers make their appearance.

Blood platelets:-

These are usually much increased and and to these some have ascribed the readily coagulability of the blood.

Associated lesions:-

In definite cases the skin has a somewhat greenish tint, hence its name green-sickness. Hypoplasia of the aorta has been described in a number of cases but it is doubtful whether this has any real connection. There is a marked tendency to thrombosis in the veins, especially the cerebral sini, less frequently in the other veins Evidehce of circulatory weakness is seen in the slight edema about the ankles. A peculiar venous hum is at times heard in the larger veins; the cause is not known. Hypoplasia of the genitals, though not constsnt, is seen in a number of these cases. No change in the blood forming organs is to be seen, but the spleen may be slightly enlarged. In marked cases the anemia may produce a fatty degenertain of the viscera. Distubance of secretion in the stomach is frequently met, usually a hypersecretion. The body as a whole seems to be undernourshied and the muscular power is decreased.

Prognosis:-- If not treated these cases may go on to a fatal issue, however, the most of them especially if they be true chlorosis, are rodily amenable to changed hygenic, conditions, diet, and the administration of iron.

Lecture 12/4/'08.

2b. Progressive Pernicious Anemia.

Synonyms:-- Pernicious anemia, idiopathic, Addison's Causeless, Biermer's Disease, and Myelogenic Anemia.

The defintion is somewhat unsatisf actorY, This is a pathological process associated with excessive hemolysisand a decreased hemotogenisis, for which no efficient cause can be discovered. It is characterized by a marked decrease in the r,b,c, and a high Hb index, and a decreases in the leucocytes. Well defined types of this process are so typical as to convince one that he is dealing with a distinct disease entity, entirely different from secondary anemia. Be it remembered, however, that intermediated stages may be found in which it is practicallyimpossible to say whether one be dealing with a real progressive anemia or a bad case of secondary anemia. The description which follows will be of these typical cases.

1c. Etiology:-

Of the real cause we are still in the dark. Some hold that the process is essentially an extensive haemolysis, others that the primary lesion is deficient blood formation, or a decreased haemotogenesis. Many predisposing casues have been suggested, such as syphilis, malaria, child-bearing, repeated small hemorrhages, nervous shock, chronic Gasto-intestinal diseases. However, as Cabbott has well said these stand in relation to progressive anemia as the last straw which broke the camels back.. All these causes mentioned have existed in numberless cases without a progressibe anemia fllowing, so that is to be real cuases they are probably not, but only accidental. As to oal demonstrable causes may be mentioned the di-botherocephalatus and he uncinaria. While in both of these parasites their presence even in onsiderable numbers may be followed only by a secondary anemia, yet certain ases do develop a blood picture and clinical course indistinguishable from he typical idiopathis or cryptogenic and later the expulsion of these arasites lead to the recovery of the patient. These intestinal parasites robably do not act alone by stealing blood, but their greater action is robably due to a haemolytic toxin which they produce.

As to the age of the patient, most occur in adult life,usually not efore 20 years, nor after 60. Statistics show a slight preponderance of males affected,although this is indeed slight.

2b. Blood changes:

1d. Physio-chemical:- The color of the blood as it comes from the puncture varies greatly. As a rule it is pale and watery, but at times even when the r,b,c, are greatly decreased, the whole blood may be bright red, as a result of a high Hb index. The blood is obtained with difficulty. An almost constant feature is its great ~~afffin-~~ ~~iff~~ fluidity. Instead of forming a nice round elevated drop on the finger or ear it spreads out flatly over the sutface and is difficult to handle. The drop may look straly as though the cells were separating from the plas Coagulation is much delated and is incomplete. The specific gravity of th whole blood may be very low because of the loss of albumens, especially fibrinogen of the plasma, but more especially the Hb of the r,b,c,. Indee this specific gravity may be as low as 1025, below that of narmal serum alone. The dried residue of the whole blood is much decreased, while that of the sserum alone not so much so. The Hb is actuslly reduced in amount, but this decrese does not keep pace with that of the r,b,c,, the Hb index being high, above normal, even as high as 1.7 . During the periods o improvement the Hb index may fall to one or below one, and is usually considered a favorable sign. The high Hb index is one of the characteristic feat ures of progressive pernicious anemmia. It is usually said to be due to the great percentage of megalocytes.

asked

2d. Cellular changes:-- As to the number of r,b r,b,c,, most cases of progressive pernicious anemia show between one and two million per cumm. The fall in number to two million is usually quite rapid but below this the rate of fall is much slower. The lowest count on record is 143 000 r,b,c, per cumm. One or more remissions are to be expected, in which the number of the r,b,c, approaches normal, but these remissions are always followed by a relapse in which the number often drops below that which was present before the remission. The number of r,b r,b,c, may remain stationary, about one or two million until death; other cases may show a gradual progressive decrese in the number until the fatal issue.

Changes in the Size:-- In progressive perniciuos anemia the average diameter of the r,b,c, is increased, many megalocytes appear, some even claiming that unless as many as one third of the r,b,c, are megalocytes the diagnosis of progressive pernicious anemai should ne made with reserve. Sometimes gigantocytes are seen. At the same time microcytes and normal sixed erythrocytes are met. It is the usual thing to see many o these cells too deeply stained, that is containing too much Hb.

Changes in the shape:-- Poikilocytosis is the rule, practically all cases showing irregularitjes in the shape of the r,b,c,. Some cases show a marked tendency to assume an oval shape, as though reverting to the blood of some of the socalled lower animals as the frog. Tennis racquet, pear, star, or saucer shaped r,b,c with crenations make their appearance. Ameboid movements, usually slow, are at times seen in the r,b, especially the megalocytes in the fresh preperation. Roulex formation is absent or incomplete or because of the variation in shapes may assume peculiar forms.

Staining reaction of the R.B.C. :-- The deep stain of some of the r,b,c, has been mentioned. At one time these little and tensely stained microcytes, called Eichort's Corpuscles, were thought to be pathognemonic of progressive pernicious anemia. While they may prominent in this disease they are by no means confined to it. Again a distinct polychromasia is seen, either as a spotting, stippling or diffuse staining of the r,b,c,.

Nucleated Reds:-- While by no means characteristis of progressive perhicioius anemia, yet erythroblasts are usually quite a prominent feature. Indeed, if the nucleated reds can not be found avter search on several successive days, the diagnosis of progressive pernicicous anemia should be abandoned. While in the secondary anemias the normoblast is the erythroblast usually found, in progressive perniciuous anemia it is the mega megaloblast which forms the majority of nucleated reds, about 4 to 1. Free nuclei with tagés of eytopasm containing Hb may be met.

Leucocytes:-- A marked decrease in the number of leucos is a constant feature in all severe cases of progressive pernicious anemia, even below 1000 per cu. M.M. During the remissions the number of leucocytes increases along with the increase of the r,b,c, up to and even beyond the normal. This decreased number of leucocytes contrasts very strongly with the secondary anemias, where the leucocyte number is normal or greatly increased, the latter the most usual thing. The polynuculear nutrophiles are ~~xxxxxxxx~~ decreased and the lymphocytes are increased, particularly the ~~xxxxxx~~ small lymphocytes. Prwctically a constant condi-

tion in progressive pernicious anemia is the presence of a small number of myelocytes, usually about 2%. Sometimes we meet with basophiles, and other abornmal leucocytes.

Blood pltelets:- Cabbptt says these are greatly decreased in number.

3b. Associated lesions:-

1c. Central nervous system:- In the brain there is a tendency to extravasation of small amounts of blood. A condition, which, however, may be seen throughout the body. These hemorrhages may be in the brain substance or in the meninges. The little clots may organize in the membranes and remain as little pigmented scars; while in the brain rissue their site is marked by pigment, vacuolation of the cells, edema, and decreased staining sffinity.

Changes in the spinal cord:- In all cases of progressive perinicious anemia where the cord was carefully examined at the autopsy, show lesions of that part. These lesions are usually symmetrical, or almost so, occupying the cervical and dorsal parts of the cord. The gray matter is not involved. The parts most affected being the columns of Goll and Burdach, sometimes the lateral columns in and near the pyramidal tracts are somewhat affected and more rarely the direct cerebellar tract. At times in the cord minute hemorrhages are seen. No alteration in the size or shpae of the cord is caused from the lesions mentioned above. These lesions are to be interpreted as degenerations from a toxemia similar to that which may be met in diabetes or diphtheria. The histological appearance of the lesions varies with its age; those more recent show axis cylinders with granular, swollen myelin sheaths, without change in the interstitial tissue. In the older parts there is a distinct sclerosis, a great increase in the neruoglia, and in the number of nuclei. The axis cylinder and sheaths both disappear producing a honey-comb of the tissue with spaces either empty ot filled with a clear homogenous material. In the connective tissue many corpora amylacea may be seen. The vessel walls are fibrosed and hylaine.

Changes in the bone marrow:-

While the lesions just indicated in the central nervous system are essentially degenerations, the changes in the bone marrow probably represent an effort at repair or regeneration os the blood. Certain rapid cases, with an acute course may show no changes in the marrow, but practically all the chronic cases do. The usual change is the conversion of the fat like marrow in the shafts of the long bones into a red or pymphoid marrow, which grossly is similar to that normally found in the epiphyses. This is a current jelly marrow, named from its color and consistency. Grossly this marrow cannot be told from that frequently found in secondary anemias, but can microscopically. It may be wide spread, involving all the long bones or it may occur in isolated patches. Microscopically this marrow is characteristic. Instead of the normal sized erythrocytes and normoblasts seen in secondary anemia, we now find a great preponderance of the megalocytes and also megaloblasts with large pale nuclei. Many of these are mytotic, while others show karyorexis and karyolysis. The ordinary marrow leucocytes are unchnaged, except that the number of large ones, Giant cells, are increased and these may contain r,b,c.

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Visceral Changes of Progressive Pernicious Anemia:-

Spleen and Lymph Nodes:-- In most cases of pernicious anemia these organs show no change. Sometimes one may find cases in which the spleen is somewhat too large, even to twice the normal size. It is usually soft.

The Heart shows wide spread fatty degeneration but it is most marked in the papillary muscles of the lest ventricle where we may get the yellow mottling of the "tabby cat heart". The blood in the heart may remain fluid for hours after death, an evidence of poor coagulability. What clots are present are very loose and friable. Fatty degeneration of the endothelia of the blood vessels and the capillaries are frequent, explaining the tendency to minute hemorrhages so frequnetly encountered.

The Kidneys and Liver show extensive fatty degeneration and the pancreas also may come in for a considerable share. All these degeneratio in the viscera are too extensive to be looked upon as the result of under-oxygenation alone and are almost surely due to a toxemia.

The deposition of Iron:-- This occurs in the liver, kidneys, splee and the marrow in the order named as to frequency. It is hemosiderin. The deposits in the liver are rather characterisitc of pernicious anemia. The hemosiderin may be so profuse in the liver of pernicious anemia as to give an iron content 23 times the normal. Contrary to the usual situation in pernicious anemia the pigmentary deposits of hemosiderin are in the outer two thirds of the lobules.

Gastro-intestinal Mucosa:-- So marked are the changes here in mar cases that the earlier observers attributed to these changes the cause of progressive pernicious anemia, however, they are not seen in all cases. The changes are usually of an atrophic form, sometimes the walls of ths tc ach and of the intestines may be very smooth, thin and almost transparent. On the other hand the stomach wall may be thickened by a fribous hyper-plasia. Microscopically one may find either a fatty degeneration of the epithelia of the secreting tubules or a complete destruction of the tubul with an increase in the fibrous tissue, at times converting the mucous mem brane in to a thin layer, covered by flat epithelia. Or again, the micro scopical changes may be simply those of an atrophic gastritis.

Hemorrhages:-- As suggested before, most autopsies in progressive pernicious anema will show many small hemorrhages, especially of the brain cord, and serous surfaces. During life these may show beneath the skin or typically in the retina with, however, surprisingly little disturbance in the vision.

The skin is yellow, a peculiar straw color somewhat like Manilla wrapping paper, this color being evenly distributed. The fat is of a lig yellow color. The patient is not markedly emaciated unless he fails to take food. The muscles are bright red. At the autopsy the lungs and stomach are especially pale and the other organs naturally show a decrease amount of blood.

Summary of the above changes:--

Blood Changes:-- (a) red cells between one and two million. (b) leucopemia, (c) High Hb index. (e) Poikilocytosis. (e) Erythroblasts, the megaloblasts greatly predominating. (f) Relative lymphocytosis. (g) A small percentage of myelocytes. (h) Loe specific gravity of the blood (i) Large number of megalocytes.

Visceral Changes:-- (a) Sclerosis of the postrior and lateral columns of the spinal cord. (b) "Megaloblastic degeneration" of the marrow. (c)Extebsive fatty degenerations, especially of the heart. (d) Atrophy of the gastro-intestinal mucosa. (e) Increased deposits of iron containing pigments. (f) Punctate henorrhages. (g) Palor of the organs, discoloration of the fat skin and muscles.

4c. Prognosis:-- All these cases save those due to the intestinal parasites, when properlu treated, go on to fatal termination. The length of time from the first observation to the death of the patient will vary, usually somewhere about 18 months. Indeed, so great is this tendency to death that many authorities refuse to recognize as progressive pernicious anemia any case which gets well, no matter what the cause. Almost all cases have periods of remission where the improvement is marked and the blood picture is almost, if not normal. This may last a few days or weeks, then the case becomes progressively worese, nearly always falling to a lower ebb than when improvement began.

3d. Leukemia.

Synonyms:- Leucocythemia.

Definition:-- While here again an attempt at a logical definition is unsatisfactory, leukemia may be defined as a peculiar disease of the blood and blood forming organs characterised by the presence in the blood and the organs of an enormous number of leucocytes, the cause for which being as yet unknown. The disease is not confined to man alone but has been seen in some of the loer animals as the cat, dog, horse, etc.. We usually recognize two heneral types:-- (a) Myelogenous, (b) Lymphatic, the latter of which may be either acute or chronic.

1c. Myelogenous Leukemia.

Synonyms:- Myeloid Leukemia, myelemia, myelocythemia, Spleno-medullary leukemia, lienal leukemia.

In this variety we have in the blood, in the spleen and organs, and in the nodules in the liver elements corresponding in morphology and relative proportions to the elements of the bone marrow and in the marrow the cells are greatly increased in number.

1d. Etiology:-- Of leukemia in general.

Age and sex:-- The disease is more frequnet in males than in females in the proportion of two to one, and increases in frequency from childhood to about 30 to 40 years of age. It is usually not seen in early childhood, and yet one definite cease is recorded in a still born babe. It is sometimes seen past the 40th year. HEREDITY has not been proven to have a causative relation ship. What is known as a collateral heredity;i,e, as occring in brothers and sister s, has been recorded. Again, certain diseases have preceeded some cases of leukemia, as tuberculosis, syphilis, rickets, malaria both acute and chronic, diphtheria, small pox, and typhoid. The relation of these, however, would seem rather accidental than otherwise. Trauma of the spleen has been recorded in some myelogenous leukemias. Intestinal intoxication has been blamed, but these too seem not sufficient. Certain cases seem to have their origin in progressive pernicious anenmia and in secondary anemias. In this disease, also, an infection has been assigned a casusal role. The acute cases especially seem to run a course very analogous to the gecognized infectious diseases. Then too, one case has been recorded developing in a nurse six weeks after he had nursed a f atal case of leukemia. Many kinds of bacteria have been found in the blood, in the leucocytes and in the viscera, but inoculation experiments thus far have failed. So the case is unproven. Protozoa have been described as occurring in the lymphocytes in certain cases, and names have been assigned to them. Very few observers, accept this theory.

2d. Blood Changes.in myelogenous Leukemia

1e. Physio-chemical:-- As the blood flows from the puncture it may look somewhat opaque, ~~xxxxxxxxxxxxxxx~~ but it is neither puriform nor chocolate color as has been described. Such appearance as these latter were probably due to errors in obtaining the blood. The blood flows slowly and may be somewhat difficult to spread out because of the many leucocytes. Even when the number of r,b,c, are greatly decreased the leucocytes are much increased, the blood still has its red color although it may tto pale. In well established cases the Hb is usually decreased and the Hb index is too low, usually about .6 . With enormous numbers of leucocytes present at times it may be difficult to read the Hb percentage in Dare's or Von Fleischel'z Hemoglobinometer on account of the opacity thus casued. The specific gravity is not so much lowered as one would expect from the decreased amount of Hb , since other albumens may be found in the plasma, however, in most cases the specific gravity of the whole blood is below normal. The alkalinity of the blood is decreased probably by the overporduction of acids. After death the blood may wuickly become acid, distinctly acid in reaction, a rapid postmortem change. In most cases the coagulation is slow but the fibrinogen is almo st normal. At times a deuteroalbumose, closely resembling peptone, is found in the plasma and this delays the coagulation of the blood not with standing the fact that we have the usual amount of fibrinogen. A peculiarity of leukemi blood is the presence at times in the blood drawn during life, either prese present in the circulatin g blood or precipitated out almost instantly after being drawn, of the Charcot-Leyden crystals. These are colorless, refractive, long octahedra, about 50 by 160 microns. They are usually found at post mortem in the blood in the exudates, and especially in the spleen, and as the postmorten changes increase more of them are found. Chemically they represent a union of phohphoric acid with some organci substance. They are not peculiar to leukemia but have been foun in the sputum of asthmatics and in the feces with intestinal parasites. Many other chemical changes have been found but are too complicated to be of practical use.

from the rest of the spleen microscopically. This socalled central artery which may be more than one, is usually somewhat excentrally placed. These masses constitute the malphigian bodies or splenic corpuscles. These arte: ies break up into arterioles, which empty into the splenic spaces = venous sinuses. Whether these sinuses have a complete wall is a disputed question; they are probably so fenestrated that the blood is enabled to come directly into contact with the splenic cells, since at these places they have no walls, save that formed by the lymph cells. There two main varieties of cells which constitute the cellular elements. The first and by far the greater number is the small mononuclear cells with scant cytoplasm indistinguishable from the small lymphocytes of the circulating blood. The seoond is more after the fashion of the large lymphocytes, but usualy has more cytoplasm and frequently contains r,b,c, or fragments thereof or other engulfed material, which proves their marked phagocytic action, to these some authors would restirct the term splenic cells. Sometimes, especially in the young, one may meet with a lagr lobbed nucleus a sort of small Giant cell. Nucleated red cells may be found normally. Running in between all of these cells comes our usual delicate reticulium of fibrous tissue.

Here I would like to give a few of the more frequent P. M. Changes occuring in the spleen:-

If the spleen be engorged with blood at the time of death, it quickly becomes soft and pulpyand it is exceedingly difficult to remove such a spleen without tearing the capsule.

Pseudo-melanosis:- This occurs from the H_2S formed in the stomach and the intestines, acting upon the iron of the blood, and being deposited as the black iron sulphide. This is always superficial and rarely deceives one as to its nature. Evolution of gas by bacteria which inavde the spleen from the intestines, may produce an emphysema of the spleeen. This distinctly a P. M. change. In this connection remember that there is a matked tendency for the intestinal bacteria to invade the spleen rapidly after death and so cultures from the spleeen, if taken at periods longer than a few hours after death, may prove entirely misleading.

2. Anamolies:-

1a. Of the spleen itself:-

Complete absence is quite rare, although apparently compatible with life, however, in most cases where the absence of the spleen has been reported, it is very probable that the organ was represented by several smaller areas of spenic tissue. Accessory spleens, or Splenculi,or Splenunculi are quite freqeunt. They vary from one in number to a dozen or more (40). They present all the features of the spleen proper, as to capsule and pulp and undergo the same pathological changes. They may be situated in the hylum of the spleen, along the splenic vessels, even on the opposite side of the abdomen, in the peritoneal folds, in the omentum, or attached to the wall of the intestine; or on rare occasions imbeded in the spleen itself or in the tail of the pancreas.

Multiple spleens:- These differ from the above in that they are usually of approximately the same size, no one of them being large enough to be considered the spleen proper. They are usually situated where the spleen should be. The normal splenic notch is rarely absent. Sometimes there may be more than one, and not infrequently this notch may be so deep as to almost or completely bifucate the spleen.

2b. Anamolies of position:-

Congenital malposition of the spleen is not very frequent. In certain cases of ~~tan~~- transposition of the organs it may occupy the right side, and any other congenital malposition is accompanied by congenital gastroctosis, enteroctosis or splenoctosis. At times the spleen may be so turned as to project one pole forward, instead of the anterior edge.

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Acquired malpositions, called also splenoptosis, a term including anf misplacement of the spleen, is more frequnet than congenital misplacements and is more often seen in the female. The causes of this condirion are congenital defects in fixation, external compression, as by tight lacing or tight belts, also in bed ridden patients from muscular relaxation of the abdominal walls and wasting. Also after the relaxation of the abdominal walls due to repeated pregnancies or operations upon or through the abdominal wall this misplacement is frequent. Blows or injuries suddenly forcing the costal margins inward, falls from a height where the patient lands on his feet or buttocks, adhesions to other viscera, spinal curvature, tumors and effusions into the pleural cavity may be further sited as causes. The position of the misplaced spleen may vary from one only slightly below normal to as far down as the pelvis. these wandering spleens may have their pedicles twisted and in this way

the blood supply, especially the venous return is obstructed, favoring degeberations and subsequent entrance of bacteria from the intestines. milder grades of obstruction may produce a fibrosis, called the cyanotic induration. These misplaced splees as felt through the abdominal wall h have been mistaken for tumors.

3. Circulatory Disturbances:

1a. Anemia:-- This is always a part of a general anemia and a side from a slight decrease in size and wrinkling of the capsule and a pale color no other gross features are noticable, but microscopically, one will be frequently be able to make out the nuclear changes characterisic of cell death.

2a. Hyperemia:-- This is most frequently seen in the acute infections also as a part of the acute splenitis to be noted later. the organ is a bright red or a dark red color.

3a. Congestion:-- Any obstruction to the venous freturn, as the twisting of the pedicle or a wandering of a misplaced spleen: the pressure of a tumor, as cancer of the pancreas may lead to venous stasis. the fact that the blood empties into tissue spaces affords ample oppartunit for congestion from the slightest cause and the spleen may fill up rapidly and the gain drain just as rapidly so that rapid increase and decrease are not infrequent. Especially is this true after death, since the blood may drain out postmortem or else fill up so that the blood content of the spleen at postmortem is not always a fair criterion of its antimortem condition. any disturbance of the circulation tending to venous stasis anywhere, as chronic valvular or heart disease and emphysema will produce a congestion of the spleen. Hepatic cirrhosis also practicall always means that the spleen will be congested. The spleen is at first large, soft and semifluctuating, dark red, deep blue through the capsule and on section the pulp is soft, very friable, not infrequently quite mushy and drips blood. Micrpscopically we find the sinuses distended with blocd so as to disturb the normal structue and evidences of degeneration of the pulp cells, as judged by the nuclear changes, are encountere Later on the spleen becomes firm, still too large, deep red, pigmented, with a thick capsule, fibrous trabecula increased and the malphigian bodies obscured.

4a. Hemorrhage:-- It is quite difficult to distinguish either grossly or microscopically, between some grades of hemorrhage and excesses of blood either hyperemia or congestion. Some degree of hemorrhage is quite frequent in the acute infections or indeed in any condition where the spleen is stuffed with blood. These hemorrhages may be diffuse or localized.

asked 5a. Rupture:-- This is not at infrequent and for convenience we divide ruptures into the traumatic and spontaneous.

In the traumatic cases the injury may be direct may be direct or transmitted and very frequently it will be impossible to make out any marks of external violence in the neighborhaood of the spleen. The possibility of the rupture of a spleen producing abdominal he morrhage in patients who have suffered from falls from a heaight must be borne in mind. Such a traumatic rupture is rendered more liable when the spleen is engorged with blood or where there are adhesions of the organ to the surrounding viscera. Death in these cases is the usual outcome, resulting from the abdominal he orrhage. In milder degrees a clot may form in the crevice, become organized and healing occurs.

The socalled spontaneous rupture of the spleen sometimes occur in cases withour recognizable trauma where the organ is much distended, as in typhoid and malaria. Aside from these tru ruptures in which the capsule is torn there may occur a subcapsular laceration of the splеenic tissue. The hemorrhage which follows this may localized or diffuse. Sometimes these hemorrhages may result is cyst formation, called "metaclastic", which frequently reach a large size and are filled with a blood stained fluid.

6a. Embolism and Infarction:-- The results of infarction following emboli are very typically shown in the spleen. Here the embolis usually comes from the left side of the heart or the acrta and may be any of the usual emboli. Simple noninfected emboli produce infarcts which may be either hemorrhagic or white or anemic and produce the typical gross and microscopical characteriistics of infarcts. In healing scar tissue forms, extending as a dense pigmented or white mass into the spleen. If the embolis is infected, as in ulcerative endocarditis etc. the infarct first forms and very quickly breaks down into an abscess cavity, becoming then a form of purulent splenitis.

4. Infiltrations and Degenerations.

1a. Mucoid Degeneration of the Trabeculae:-- This, while not very important pathologically, occurs in a number of spleens whos trabeculae have become increased in size from any cause

It cannot be recognixed grossly but the trabeculae have become converted into a homogeneous material which, if stained fresh or fixed in alcohol, takes the red color with thionin. In the ordinary stins this fibrous tiss retains a great deal of the haematoxylin being too blue.

2a. Amyloid Degeneration:-- Two general forms of this are recognized.

(a) The sago spleen in which the malphigian arteries are first affecte and (b) the diffuse form where the capillaries of the pulp are first involved. (a) The sago spleen is increased in size, usually not more than two to four times the normal, however, it is firmer than normal, cuts with increased resistance and the little amyloid areas show as small trans lucent bodies scattered throughout. These mary in size from a pin head to two or three millimeters, looking like little grains os sago in a sago pudding. Microscopically, the amyloid change begins first in the sub endothelia connective tissue of the arteries of the malphigian bodies, then involes the whole vessel, finnaly spreading into and supplanting the malphigian body.

(b) The diffuse from is not so frequent. Here the spleen may be, though not necessarily very much enlarged, from 8 to 10 pounds. The organ is dense with an elastic feel, cuts with increased resistance and the cut secfion has as emitranslucent waxy appearance. The amyloid part stains brown or mahogany red with iodine. Microscopically, in this form the malphigian bodieas frequently escape, the disease beginning in the capsule and the veins then going to the reticulum and trabeculae, perhaps finally involving the pulp. During this time the spleenic cells atrophy or are destroyed by pressure and poor nutrition. This amyloid gives the usual staining, as mahogany brown or red with Lugol's solution, changing to a blue upon the addition of sulphuric acid, hence its name amyloid. A rose red color is produced upon the adition of annalin green, Gentian or methyl violet. The etiology is that of amyloid change anywhere, especially with long continued suppuration, as T.B.C. of the joints of lungs.

3a. Pigmentation:-- External pigment, as with coal dust, brought by the blood to the spleen, can occur but it is not frequent. This is only mild and of little interest. Of more importance is the hemotogenous pigmentation, which occurs during the course of any blood destructive disease or extensive destruction of blood from any cause. It is most marked in chronic malaria, where the spleen becomes very much enlarged, it fibrous tissue increases, and so much pigment deposited as to give the org a slaty color, accounting for the name "slaty induration". The pigment is deposited about the blood vessels and may be seen in the splenic cells and endothelia. In chronic venous stasis and pernicious anemia the pigmen ary deposites are excessive.

4a-- Calcification:-- Lime salts may be deposited in the spl in old caseous areas, healed infarcts and organized thrombi = splenoliths. These are nearly always insignificant in size and effect. A more frequent and important form is the deposition of lime slats in the capsule. These may show as little granules or as plates and sometimes these are so excessive as to almost completely encase the spleen as in a bony box. The impo rtance here is theat traumatism may cause these calcareous plates to injure the organ.

5. Inflammations = Splenitis.

1a. Acute:--

1b. Simple Acute, or acute nonpurulent:-- Etiology:--

Before speaking of the etiology I we or either of us wish to say that the gross or minute ear marks of simple acute inflammations of the spleen are not always clear. Just where an engorgement, either arterial or venous, leaves off and a definite inflammation begins is not always easy to say. In alsmost cases where there is a parasitic toxemia and with certain other poisons of similar nature, as abrin, scin, an acute splenitis within the bounds of our description will be seen. Here we place the toxi of typhoid and malaria. All toxemias do not produce this as it does not accompany intestinal autointoxication, nor uraemia unless there be an accompanying process which would explain it.

Gross appearance:-- the spleen is enlarged, 3 to 4 times its normal perhaps; deep red, capsule tense, usually smobth. Typically the organ cits easily, the pulp is very friable, almost diffulent, like a loose blood clot, bloody and dark red. But most frequently the Malphigian bodies may be seen. The capsule may be stretched so tight that in life that it may give way at the most insignificant trauma, producing a rupture. At the P.M. much care must be exercised in removal to avoid breaking the capsule.

Microscopically:-- One's first impression is that of blood everywhere. The Malphigian arteries are frequently filled with blood and the r,b,c, may be breaking down. The lymphoid cells of the spleen may show a variety of changes, mytotic figures, karyorexis and karyolysis. The endothelial cells are proliferating to some degree, giving rise to mononuclears which are phagocytic. If the bacteria of the disease be circulating in the blood, they are likely to be found in the spleen in great numbers, both in the phagocytes and in the splenic sinuses. Hemorrhages are very frequent, and as a rule the Malphigian bodies are increased in size and their arteri contain an excess of blood. The fibrous trabeculae show wide spaces of edema.

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Prognosis:-- Such spleens as these seem able to recover completely. They can return to normal in a remarkably short time, owning to the rapid draining of the excess of blood. It seems scarcely possible, however, that the cellular elements become normal in such a short time.

2b Acute purulent Splenitis:--

This is also called Spleni abscess and localized suppurative splenitis.

Etiology:-- These splenic abscesses may arise from direct injury; from the extension of a neighboring process, as Gastirc ulcer; they may also be found in typhoid and malaria. Indeed any form of the acute apleni tis may have a suppuration superimposed where the pyogenic cocci enter th circulation. These cocci may enter the blood from a pelvic abscess or an appendcocoeal abscess. As suggested in the discussion of infarction, an infected embolus may quickly produce an abscess. If these abscesses be due to an infected embulus, they are frequently multiple. Those resulting from trauma or extension are usually single.

Morbid anatomy:-- The arears are roughly rounded, varying much in size from miliary to several c.m. across; situated either in the depth of the tissues or near the capsule. The contents are usually of a dirty red cr chocolate color, from the admixture of much blood and they may contain definite masses of splenic tissue. This material is thick and semifluid. There may be so much blood and broken down splenic pulp that it may be di ficult to recognize the material as pus, even microscopically. If the abscess be near the surface or approach the surface, we frequently have an inflammation of the suroussurface of the capsule = perisplenitis which in healing may form adhesions. These abscesses may rupture into th abdominal cavity, producing a localized, diffuse, or general peritonitis; or they may break into the neighboring venis, as the stom ach or the intestines. If they are small they may become encapsulated, inspissated, organized or calcified.

2a. Chronic Splenitis:--

A great number of names have been applied to this condition, as follows:- Chronic diffuse splenitis; Chron splenic tumor; chronic sppenic induration; fibroid spleen; chronic inter-stitial splenitis.

Etiology:- Repeated attacks of acute splenitis, as in malaria; long continued venous stasis, as in cirrhosis of the liver or from tensic or from pressues on the pedicle of a misplaced spleen; in chronic valvula disease or in emphysema, it may be seen. All of these probably act by allowing an accumulation of irritant products in such quantities that the spleen can not handle them.

Gross Appearance:--

For convenience two general forms have been rec nized:- (a) Atrophic and (b) Hypertrophic, but perhaps a better name is hyperplastic.

(a) Atrophic:-- This form is looked upon by many observers as a simple atrophy of the spleen. Here the spleen is darker than normal, dark red or dark blue; the capsule is thick and usually wrinkled; hard, and cuts with increased resistance, and on section shows a great increas of the fibrous tissue, with usually very little bleeding.

(b) In the Hyperplastic form the spleen may be very large, as in th "ague cake" of chronic malaria, where it may sometimes weigh from 1 to 6 pounds. Its is slaty in color if there be much pig ment; but dark red if there is much blood; if neither of these the organ may be too pale. The organ is quite firm, cuts with increased resistance, the tissue is not friable but firm; the total amount of fibrous tissue is seen to be materially increased, altho the fibrous trabeculae are not

close together as in the atrophic form.

Microscopically:- In both forms the most marked feature is the increase in the firbous trabeculae, both in size and in number. The vessels are thick walled; the amount of blood varies: the splenic cells are atrophied; and the Malphigian bodies are decreased in size, frequently insignificant. The endothelia may show and may contain much pigment. This pigment may also befound in and about the trabeculae.

3a Splenomegaly:--

Under this term have been described a number of conditions; non-leukemic in which the enlargement of the splen is a prominent feature. Some have included under it a definite neoplastic change. If one exclude the tumors, either primary or secondary, all the other cases can be fairly well classified under two heads:- (a) (a) splenic anemia; (b) Primary splenomegaly.

(a) Spenic anemia:--

Here we have a progressive enlargement of the spleen, associtated with an anemia of a chloritic type, e.g., a slight devrease in the number of the r,b,c, but a marked fall in the Hb percentage. In these cases the spleen is decidedly enlarged, frequently to as much as 2-4 pounds; too hard and firm, cuts with increased resistance, is dark red in color, and shows an excess of fibrous trabeculae. Microscopically one finds only such changes as a chronic stasis might produce. So it is only the accompaniement of the chlorosis like anemia in the case which keeps this spleen out of the group of chronic hyperplastic splenitis. It is probable, however, that further study of these cases will reveal changes which are characteristic. The etiology of these cases is still obscure.

(b) Primary Splenomegaly:--

Here we have a primary non-leukemic chronic enlargement of the spleen; a secondary enlargment of the liver, an absence of anemia, profuse sweating, a tendency to hemorrhage and a peculiar brownish yellow discoloration of the exposed skin, absence of jaundice and the case extending over a long period of time.

Etiology:-- The cause is not known. It is not a common disease: females seem to be more affected. It usually begins in the teens and at times two or three cases have been found in one family.

Morbid Anatomy:- Typically the spleen is very great ly enlarged, even to 10 pr 11 pounds, of an elongated ovoid shape and not necessarily retai ning its original shape. The surface as a whole is of a reddish brown color with evidences of perispenitis and infarcts more or less healed. On section the organ cuts with increased resistance and reveals a chocolate color with here and there alighter colored areas of grayish red.

Microscopically:-- One finds dense braod bands of fibrous tissue, an excess of blood with a decrease, at least relatively, of the normal pulp cells. Here and there through the organ are to be met the distincti microscopical features: large masses of cells arranged irregularly in alveolar like spaces. These are large cells with much slightly granular or straked and sometimes vacuolated cytoplasm, three to four times the size of a r,b,c, or larger, with distinctly rounded nuclei which are abou the size of a r,b,c. The nuclei may be situated either centrally or at times toward the periphery. These cells are proliferating endothelia and are probably pocated in the distended venous capillaries of the sple Sometimes these cells may have fthree to four centrally docated nuclei; but this does not increase the size of the cell so that we have no typical giant cell. Frequently in the spleen there is much deposition of blood pigment, usually the iron containing hemosiderin. The liver in these cases is usually very large, perhaps weighing 8-10 lbs, the enlargment coming after that of the spleen. It frequently shows old or recent areas of perihepatitis, often causing adhesions to the adjacent v cera. .The organ is dark red, firm, cuts with increased resistance, and cut surface is dark red with many braod bands of fibrous tissue ramifyi through it.

Microscopically, the features are the enormous interlobular fibrous tissue formations consisting of loose areolar conective tissue with many capillaries and some pigment. Also the same endothelial colls described in the spleen are present in this interlobular connective tiss and sometimes these cells are seen within the liver lobule. The liver cells are usually not much affected, either by pressure or otherwise, a feature which willl frequently enable one to distinguish such a liver from ordinary hepatic chirrosis = cirrhosis.

Lymphnodes Nodes:-- Most of the deeper nodes, the mesenteric, bronchial, and retroperitoneal are somewhat too large, not markedly so, however; They are soft and show minute hemorrhages.

Microscopically:-- The trabeculae in these nodes, while not increase anamount, show great deposites of iron containing pigment. For the most part the follicles have disappeared and the germinal areas are obscured. The whole field is almost entirely occupied by proliferating endothelial cells, identical with those in the spleen, but without any particular change.

The marrow of the long bones is dark red, firm and minutely shows a proliferation of the endothelia, although here there is als o much variation ih the size of the cells. They are sometimes collected in large masses which usually appear th have a definite relation to the litt fibrous trbeculae.

Prognosis:--They usually last a long time, perhaps many years, even without interfering with ones daily work. Leath occurs from exhaustion or some intercurrent infection.

6. Spleen in Leukemia and Hodgkin's Disease:--

The association of enlargements of the spleen in these diseases have been given under the discussion of these diesases above.

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7. Slenectomy:--Cases are on record where the spleen has been removed for various causes and the patients have recovered completely, thus proving that this organ is not absolutely necessary. If the diseases affecting the spleen have come on so gradually that the other lymphatic structures of the body have had time to prepare to take up the work of the spleen there may be little disturbance following its removal. If, however, it has become necessary to do an early operation, as in splenic rupture, the follwing symptons usually come on: Anemia, a great decrese of the strength and weight, rapid pulse, a daily elevation of the temperature from 101 tp 103, thirst, drowsiness, perhaps pain in the abdomen radiating down the thighs. A secondary anemia may occur following the removal of the spleen. This is usally of a mild degree and frequently lasts for a long time, even a year or more. With it there is usally a polynucleosis, replaced after some months by a moderate lymphocytosis. The lymph nodes become hyperplastic and the marrow of the long bones returns to its early lymphoid character. The consensus of opinion is that removal of the spleen in leukemia or in amyloid disease is not followed by sufficiently favorable results to justify the proceedure. Some cases of splenic anemia seem to recover on the removal of the spleen

8. Tumors of the Spleen.

1a. Primary:-- All primary tumors of the spleen are rare.

1b. Of the Benign we may run across fibromata, osteomata, and lympho-angiomata.

2b. Malignant:-- Rare cases of primary sarcoma or endothelioma arising in the spleen are on record. These present the usual gross and minute features of such tumors met elsewhere, except that they are more apt to be distinctly red and the centers may break down into a red pulpy, soft mass. Secondary tumors from these not infrequently occur.

~~2a. [illegible]~~

2b. Sarcoma:and endothelioma can not told apart grossly and even microscopically they frequently require close study of serial sections. A process similar to the lympho-sarcoma which will be described under the lymph nodes, mat start in the spleen.

Certain cysts of the spleen may be met. Some, on the one hand, resulting from encapsulation and softening of infarcts, and on the other hand some are parasitic or hydatid cysts which may reah a large size.

2a. Secondary tumors of the spleen.

1b. Carcinoma:--This is frequently found. Remember that cancers can not arise primarily in the spleen since this is not an epithelial organ. It is true that certain cases have been described but perhaps close study of these will class them as endothelioma. Secondary cancers may reach the spleen by direct extension as from the cardiac end of the stomach or from the tail of the pancreas. This involvement, however, because of the comparative rarity of cancer of the structures named is not frequently met. In this connection it mighy be mentioned that a hypernephromat of the left kidney or thereabouts may extend up to and involve the spleen. That this does not occur more frequently is due to the fact that the hypernephroma usually keeps within a capsule of itsown

But more common are the secondary cancerous deposits brought to the spleen by the blood in general carcinomatosis. These may be of any variety of cancer and vary from ext remely small multiple white nodules to as large as 5-6 cms across.

2b. Sarcoma:-- This is the most frequent secondary tumor of the spleen and it may be brought to this organ by the blood from any part of the body. Melanotic sarcoma early involves the spleen, perhaps nex most frequently to its involvement of the liver.

9. Specific Infections.

1a. Tuberculosis:-- Primaru tbc of the spleen is exceedingly rare, probably not more than 10-15 recorded cases. It is usually represented by a fairly large caseous area well encapsulated. Secondary tbc is rather frequent and may be either acute or chronic. In general miliary tbc the spleen is commonly studded with multitudes of grayish white or grayish yellow miliary tubercles which are apt to show also in the capsule as well as in the pulp. In the chronic form there may be one or a few larg caseous areas, say from .5 to 5 cms in diameter, usually with a fibrous capsule. These may become partly or completely calcified.

2a. Syphilis:-- Syphilitic involvement of the spleen may be either congenital or acquired.

In the acquired form we may have a diffuse hyperplastic fibrosis, increasing the size above normal. Or again in rarer congenitsl cases definite gummata have been found. (This is congenital syphilis)

Acquired syphilis always affects the spleen, but the character of the involvement varies with the stage. In the earlier months there is a hyperplasia and enlargement, but later in the secondary or early tertiary stages a fibrosis commonly appears and later you may find one or two gummata. Definite gummata of the spleen are rare and in size they will var ofrom quite small to 3-4 cms. They are generally rounded, pearly white, perhaps a bit translucent, encapsulated and show very little caseous material, a point which helps to differentiate them from chronic tbc.

II. Lymph Nodes.

1. Anatomical Considerations:-- Lymphatic tissue normally occurs in the body in teo general forms: (a) circumscribed and (b) diffuse.

(a) Circumscribed:--From a pathological stand point the circumscribed forms are perhaps the most important. These may occur as solitary follicles or as agminated follicles (Pyers patches) in the intestines or as definite masses encapsulated to which we apply the term lymph node. These nodes are widely distributed throughout the body and the lymph channels which begin in the tissue spaces drain into them. They are usually arragned in chains. The efferent vessels of the one being the afferent of the next in line. Such groupings of nodes in the different parts of the body are known as regional nodes.

Grossly they vary very much in size, normally they are usually not larger than a pea; of an oviod or almond shape and of a pink color. They are provided with a definite firbous capsule, and sometimes with a few smooth muscle fibers. This capsule sends in trabeculae, which anastomosing forms irregular compartments. The afferent vessles open into the lymph tissue on the convex side of the organ into a subcapsular or peripheral lymph sinus. These sinuses penetrate toward the hylum, allowing an exceedingly immediate contactof the lymph with the cells, collecting at the hylum they are gathered together as an afferent vessel. At the hylum the blood supply enters and leaves.

Microscopically the typical lymph cells comprising the node is indistinguishable from the small lymphocyte of the blood. In the peripheral portion these cells are gathered together inlocalized areas known as follicles. For the most part these are pear shape and have their stems pointing inwards. Between these follicles are the germinal areas whose conters consist of loosely arranged large cells after the type of the large lymphocyte and these are regarded as the mother cells, as they produce the small lymphocytes by division. About these the smaller cells form a closely packed ring. Toward the center of the lymphnode the cells form anastomosing cords surrounding the sinuses and blood spaces.

2. Atrophy of the Lymph nodes:--

This is a frequent physiological process in the aged in which the lymph cells are decreased in number, to be replaced by fibrous and edipose connective tissue., The nodes are firm and pale but if they have been the seat of pigmentation they will be fark or black.

3. Hyperplasia:-- This occurs in a number of conditions, as syphilis, most acutely in certain of the infections and attention has been called to the hyperplasia in Hodgkin's disease. Frequently this hyperplasia, especially in the infections, is closely akind to a definite inflammation and border line cases are frequent.

4. Circulatory disturbances:-- Anemia, hyperaemia, congestion, and hemorrhage occur, but usually in connectionwith some other feature which is the important one.

5. Inflammations and Deggnerations:—

1a Fatty Invasion:-- Frequently in atrophy, adipose connective tissue forms in considerable amounts, first near the hylum and t'er within the node to replace the lymphatic tissue lost. In obse cases it is not unusual to find excessive amounts of fat tissue in the nodes, especially about the hylum.

2a. Amyloid Degeneration:-- In rare instances these tissues alone of the body are affected, but more frequently it accompanies similar changes elsewhere. The walls of the vessels and the trbeculae are involved and this may be of such a slight degree that only proper staining brin it out. If much advanced the nodes are large, firm, gray and semitranslucemt. The large sells undergo pressure atrophy. The etiology of the disease is that of amyloid change anywhere.

3a. Hyalin Degeneration:-- This is quite common in the blood vessel walls and the trabeulae in fibrosed lymph nodes.

4a. Calcification:zz Calcarious infiltration of the lymph nodes occurs most frequently in connection with tbe but it may occur with nay other chronic process. Sometimes in the nodes one finds little granular deposits in nodes otherwise normal where there has been extensive bone destruction.

5a. Pigmentation:-- The lymph nodes appear to be the dumping ground for all sorts of trash that the leucocytes or lymph stream may pick up. Prominet among this are the various pigments. This may be exter pigment as the common black bronchial nodes from coal dust or in the mesenteric nodes where dirt is eaten with the food and the pigment is carri through the mucosa and to the lymph nodes by the leucocytes. Various other fine dust paricles, as bits of steel etc., may comprise this external pigment. These frequently give rise to a chronic fibrosis, making the gland larger, firme, and changing its color to a brown, gray, slaty or blak. Again the pigeent may be internal, usualyy hemtogenous as in th blood destructive diseases or in the nodes draining a region of a hemorrhage. Bile pigments may alsc be found.

6, Inflammation or acute Lymph Adenitis:--

1a. Acute:--

1b. Simple Acute or Non-suppurative:-- Etiology:--

A certain degree of involvement of lymph nodes either generally through o the body or regionally occurs in many of the acute infections , although this may not reach a degree of sufficient severtiy to be dignified by the name lymph adenitis. However, with many of these a real inflammation of nodes does occur, particularly in those onfections in which the bacteria are circulating i n the blood or where they enter the lymph stream.
It must be remembered also that toxins absorbed and transported by the lymph stream may produce an inflammation of the nodes. It is ny no means infrequent for bacteria to ne transported to the node by phagocytes or washed there f ree in the stream. In deed, one prominent use of these collections of lymph cells seems to be the filtering out and destruction of bacteria. The inflammation may have entered through some very small lesion, as where we get the axillary kernels from an infection of a hang nail.

(Use indelible pencil in making corrections in these notes.)

Have
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If
not,
why
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now?

Etiology continued:--Certain general infections, such as bubonic plague, diphtheria, and small pox usually produce an acute lymph adenitis and here, as a rule, the nodes which drain the region of entrance of the causative organism are the first involved and the most severely, but those nodes in the distant parts of the body may also be affected. Bubonic plaguc especially seems to pick out the lymph nodes producing a very marked enlargement of them, hence its name.

Morbid Anatomy:-- Grossly the nodes are swollen, gray, pink or red in color, and soft. On section, the surface is juicy, smooth, and reddish gray. Microscopically, the vessels are full of blood and small hemorrhages are common. The endothelia of the sinuses show proliferation and theso sinuses are packed with varuying numbers of endothelia cells, leucocytes and r,b,c,. The lymphoid cells may show mytosis but more frequently there occurs a swelling of the cytoplasm with a nuclear fragmentation, indicating that they are undergoing disintergration . The nuclear fragments and bacteria may be found free or within the phagocytes, some of which are quite large = macrophags. If the process be of a much more severe nature necorsis occurs and fibrin may show in the poorly staining areas. A certain degree of extension to the surrounding tissue (perilymphadenitis) may occur, although the capsule tends to limit the process to the nodes. Recovery is the rule, although if much necrosis has occurred the dead tissue is replaced by fibrous tissue or the necrosed part may become encapsulated.

2b. Acute Suppurative Adenitis:--

Etiology:--Here the invading organism is some form of the pyogenic bacteria. This process frequently occurs in nodes whose afferent vessels are draining an area which is the site of an infected wound, either large or small. It may be found in the inguinal nodes in gonorrhea; in the chancroidal infections; much more rarely in syphilis. It may occur in a submaxillary lymph node or even in the cervical lymph nodes in diphtheria or scarlet fever. Indeed, any simple adenitis may later have the pyogenic organisms added to it and so become suppurative.

Morbod Anatomy:-- Typically, the node is very large, gray, or reddish gray, sift and fluctuates. The capsule may break and discharge the contents into the adiacent tissues or even on the surface, as in the gonorrheal bubo.

Microscopically:-- The little fibrous septa are broken down. Most of the lymphoid cells are gone and the field is occupied by pus, the polys predominating. Instead of rupturing a perilymph adenitis may reinfo the capsule and serve to wall up the pus, at least for a time, and sometim permanently, the pus becoming inspisated by the removal of the fluid. It may even be calcified. In healing the node or the area occupied by the pus is filled up with fibrous tissue. Sometimes the microorganisms may be permitted to enter the efferent vessels to be carried to another node, setting up a like process, or into the lymph stream and from there to the blood stream, giving rise to a pyemia.

2a. Chronic Lymphadenitis:--

Etiology:-- This usually occurs from the acute attacks or it may b due to the continued addition of irritant products of a lesser severity, either foreign material as pigment, or~~of~~ ~~a~~ ~~low~~ ~~grade~~ bacteria of a low grade virulence, or the diluted product of bacterial activity.

Morbid Anatomy:-- All or nearly all of the nodes of a certain region become enlarged, firm, white, perhps pigmented and dense. Section of these reveals the fibrous septa running in from the hila or from the capsules.

Microscopically:-- One sees a great increase in the fibrous tissue and as a rule the lymphoid cells are too few in number, having disappeared as the result of degeneration or from thr pressure atrophy.

As to the results:-- These nodes can not return to normal and their work of filtering bacteria and bacterial products out of the lymph is seriously interfered with, so that this important defence against the invasion by organismes is last to the body.

7. Specific Infections.

1a. Tuberculosis:= Tubercular Adenitis.

In discussing this it is convenient to divide the process in to the primary and srcondary forms, meaning by the secondary those cases of tbs infection of the nodes which can be reasonably placed to some other tbc lesion which antidated the involvement of the nodes.

(a). Secondary form of tbc adenitis:-- Etiology:--

Here, as just suggested, one can find a tbs process in the region

drained by the nodes, as caseous bronchial nodes in chronic pulmonary tbc, or the mesenteric caseous nodes into tbc of the intestines. The tubercle bacilli unquestionably come throuh the lymph stream, perhaps some are carried by the leucocytes.

Crossly:-- The nodes are large, firm, yellow perhaps pigmented from some external pigment, and on section various sized areas of caseation are made out.

Microscopically:-- One may find the various stages of the tuberculos process, from the miliary tubercles to the form where the entire node is caseous and surrounded by a fibrous capsule, just under which may be a zone of nuclear fragments. Where the process is advanced the chronic primary peritonitis occurs causing the nodes to be firmly adherent to one another or to the adjacent tissue so that they can no longer be shelled out with ease. Calcification is not infrequent. Probably the chief importance of these secondary tbc nodes is that from them the material may break into the draining blood vessels and produce a general miliary tuberculosis. As a rule, one does not find a great number of tubercle bacilli in these nodes, even in the earlier stages.

(b). Primary foem of tubercular lymph adenitis. We may divide this form into two varieties viz, general and regional.

Etiology:-- In these forms we have the involvement of the nodes as the primary process , although it must be borne in mind that the bacteria from those nodes may be carried to other parts, producing secondary tubercular changes.

In the general form, there is a wide spread involvement of the nodes all over the body. This is rare and the infection is probably transmitted through the blood stream, although the original surce of it may not be evident.

In the regional form, we have the tubercular involvement of a chain or mass of nodes in one anatomical region, as the cervical, submaxillary, mediastinal, mesenteric, retroperitoneal, bronchial, axillary and inguial nodes. It is not always possible in these to demonstrate beyond a doubt the prt of entry of the bacteria. In the submaxillary or cervical forms we ahve its most frequent occurrence, here the bacilli enter through the tonsil, a chronic tonsillitis affording an excellent opportunity. They may also come through carious teeth, through the nose or the ear. In the primary tuberculosis of the mesenteric and retroperitoneal nodes (tabes mesenterica) which occurs by far the most frequently in children, the bacilli enter through the intestinal wall, having been previously ingested in the food. This condition is more prevalent in the bottle fed and those reared in unsanitery surroundings. While it has been demonstrated conclusively that the tubercle bacilli can enter through the int estinal wall, in which the most careful search does not reveal either a gross or microscopical lesion, yet it is also true that diorrheal and digestive disturbances increase the liability to such an entrance.

Morbid Anatomy:-- In the general foems one finds the lymph nodes every where enlarged. As a rule, they are firm and in all stages of tubercular involvement. Even here , when the process is well advanced, the bodes are discreet or at best only two or three of them are fused.

Microscopically:-- Most of the nodes show the typical histology of a tubercle, in some however, it may be impossible from an examination of a section to say that the process is tubercular and the proof rests upon staining the bacilli in situ or upon animal inoculation. In these nodes, both those that show the tubercles and caseation and in those that do not, it is not at all unusaul to find an endothelial hyperplasia, hence the name "endothelial catarrh" is applied to it. Here the lymph sinuses are choked up with proliferated endothelia and in them careful search may reveal the tubercle bacilli, though few in number.

Now on coming to the regional form, we see that some of these are of surgical importance. And we find in the advanced cases a typical picture. If the mass is near the skin surface as in the cervical, inguial or axillary regions we find a large nodular immovable mass under the skin. The individual nodes are fused and when dissected out and sectioned the caseation is seen to have destroyed the dividing capsules or left only remnants of them and in this way causing the nodes to be fused into a large knotty mass, and the periadenitis produces fusion to the surrounding tissue. In the typical "tabes mesenterica" all the nodes of the mesentery and the retroperitoneal nodes are greatly increased in size, up to 3-5 cms in diameter, forming a prmonient irregular mass which may be felt through the abdominal wall and mistaken for a sarcoma. This, as suggested , frequently occurs in children and when well advanced the child shows a suggestive picture, with a prominent protruding "pot belly", sway back, inanition,

and nearly always digestive or diarrhoeal disturbances are present. Here the individual nodes may not be fused but in nearly all cases one will find some of them to be so. Section shows many of the nodes completely occupied by caseous, granular, mushy, yellow or grey material; sometimes it is gritty or stony from the calcerous deposites.

Microscopically the same changes mentioned before will be found. A point to be noticed is that in the more advanced nodes very few baccili are seen, but in the younger forms they are found upon careful search. It is especially to be stressed that especially in the mesenteric and retroperitoneal nodes the tubercle baccili may be present without producing the typical gross or microscopical picture, a fact which can be proven by innoculations into gyinea pigs. All of this occuring without the tubercular involvement of the intestines. This is important in view of the claim of many of the present day observers that many cases of pulmonary tuberculosis have their origin in bacilli coming from the abdominal nodes. Another importance is that sooner or later any of these nodes may break into a blood vessel or a large lymphatic and produce a general miliary tuberculosis. In various cases certain pressure symptoms may be important and at times suppuration supervenes by the added infection of the pyococci.

2a. Syphilitic Lymphadenitis:-- The regional nodes draining initial canter become enlarged, tense, red, hyperplastic, due to the multiplication of the lymphadenoid cells and a blocking of the lymph sinuses by the lymphocytes. This usually disappears in a few weeks with probabl a little excess of fibrous tissue, but often with complete recovery. In the tertiary stage a chronic lymph adenitis may arise, causing the nodes to be permanently enlarged and firm. Gummata may be seen.

3a. Leprosy;-- Very frequently in leprosy the lymph nod es are enlarged and micrpscopic sections will show lepra cells in which may be demonstrated lepra bacilli.

VIII. Hodgkin's Disease.

The enlargement of the lymph nodes in this disease and the significances of such enlargement has been previously discussed.

IX. Lymphatism.

Synonyms:-- Status Lymphaticus, Constitio Lymphatica, and Thymic Asthma.

This condition is most often found in children, but sometimes in adults, where much of the lymph tissue, especially in the deeper parts, is hyperplastic; the thymus is persistent , and sudden death from apparently insufficient cause is frecuent. Nothing is known of the etiology.

Morbid Anatomy:-- As indicated above, many of the lymphoid structures of the body arre enlarged, the thymus persists after its usual time for disappearance, and the patient may show, though not necessarily, deficient mentality and other disturbances of the body. As a rule the superficial nodes of the body are not much enlarged, the enlargement usually affecting the bronchial, mediastinal, and abdominal nodes, and often Pyer's patches. In most cases the bone marrow is red and hyperplas There is no characterisitc microscopic picture.

Results:--The striking feature of these cases is the frequent termination in sudden death from causes which are apparently insignificant; as the administration for a minor operation, the administration of an immunizing dose of diphtheritic antitoxin; or some sudden shock as the body striking the water in bathing. Little is known about the real cau for these sudden deaths. Some say it is due to pressure on the trachea, or on the great veins, or to abscrption and action of toxins.

X. Tumors of the Lymph Nodes.

1a. Benign.

1b. Fibroma, chondroma, and myxoma have been found in the lymph nodes, but they are rare and present nothing different from their appearance elsewhere.

2b. Lymphadenoma:-The boundary line between lymphatic hyperplasia, lymphadenoma, and Hodgkin's disease, lymphosarcoma, and the nodes of lymphatic leukemia is not at all times clear. And the diagnosis willl often depend upon the attending changes elsewhere and the clinical fratures, rather than upon the gross or even the minute appearence of the tumor. In the socalled lymph-adenoma we have the picture of a lymphatic hyperplasia, often involving the nodes in different parts of the body, but showing no tendency to metastesis.

Crossly:-- the nodes are from 1-3 cms in diameter, fairly firm non adherent, of a grayish white color, and on section a whitish fluid

may exude.

Microscopically:--One sees little else than lymphoid cells enclosed in their usual reticulum. At times even the normal arrangement of the follicles germinal areas and lymphoid cords is preserved.

Asked 2a. Malignant.

1b. Endotheliomata:-- Formerly all such endotheliomata were included either in cancer or sarcoma, especially the latter. However, further study of recent years has enabled us to differentiate them. These endothelial tumors may start in a lymph node anywhere, but seemingly have a special preference for the abdominal nodes. From this primary location they may spread to and invlove any of the neighboring nodes, or get into the lymph or blood stream and give rise to wide spread metastesis, some of which may outgrow the parent tumorL. The size of these primary endotheliomata of the lymph nodes varies considerably, from 2 cm to as much as the doubled fist. They are often soft and red, thus grossly like a sarcoma. Or they may be fairly firm and white, approaching the cancer in appearance.

Microscopically:-- They are seen to be made of large cells wit distinct large hyperchromatic nuclei, a varying amount of cytoplasm not enough to justify the suspicion that we are dealing with epithelial cells, and again they are sfany and rounded as though sarcoma cells. However, careful study of thin sections reveals the fact that many of these endothelial cells have a definite intimate relation to the adjacent fibrous tissue, since the cytoplasmic processes may be seen extending to, fusing with and losing themselves in the fibrous tissue. The character of the blood vessels will vary from thin almost walless blood spaces to those having fairly definite walls. As suggested before, metastesis takes place through the lymph stream, the blood, or through both. These endotheliomata show a preference for the earlier years, i.e. before 35 years ag

2b. Lympho-sarcoma:--Here we have a tumor rising primarily in the lymph nodes, perhaps some of the superficial nodes as the axillary nodes. It is a tumor presenting unusual diagnostic difficulties. As a rule, the mass is large, soft, red, juicy, attempting to invade the adjacent tissue, not keeping to its capsule, and spreading through the blood stream. At times a numb:r of nodes seem to be simultaneously involved.

Microscopically:-- The picture is usually of a mass of round cells somewhat larger than lymph cells, with hyperchromatic nuclei, and may atypical mitoses. Present in between the cells is the delicate reticulum, which is better shown when a frozen section is brushed with a camels hair brush. At times thin bundles of fibrous tissue run through the section, uniting in such a way as to give it an alveolated appearance.

3b. Sarcoma:-- Primary sarcoma of the lymph nodes may be of any type. The small round cell variety is probably the commonest and evidently has its origin as a rule in the lymphoid cells. The spindle cell variety probably arises from the fibrous trabeculae.

Grossly:-- The tumor presents much the same appe arance as that given for the lympho-sarcoma; i.e.large, soft, juicy, pink or red, often showing hemorrhage. It penetrates the capsule of the node and invades the adjacent tissue. It also gives rise to metastatic deposits through the blood stream.

Microscopically:-- These growths present the usual appearance of sarcomas with a scant intercellular substance (not a reticulum); The blood spaces and occasional little fibrous trabeculae may give it an alveolated appearance. Secondary sarcomas of the lymph nodes are quite rare.

4b. Carcinoma:-- These are always secondary. Indeed, owing to lymphoid spread of cancers, the lymph nodes are almost always the first parts to be occupied by secondary deposits. Here, cells from the parent cancer get into the lymph stream, are carried to the nearest nodes deposited, begin to multiply producing cells and with the same arrangement as that of the parent cancer tumor. One quite remarkable fact is that the amount of fibrous stroma in the secondary deposits is frequently the same as that in the parent tumor, and yet this fibrous stroma is derived from that of the lymph node. The process usually starts in the peripheral sinuses. One must be on the lookout for abnormal or unusual transmissions as for instance, where the metastesis is retrograde, as appears in the lymph nodes whose normal branch is away from the region affected by the cancer. Sometimes one group of nodes is apparently skipped, and the second set involved. It may be that such cases are due to abnormallities in the lymph stream. When a cancer, as of the breast, reaches the skin surface and ulcerated through, the lymph node involvement is often quite rapid becau because of the number and large size of the lymph vessels of the skin.

III. Bone Marrow.

1. Anatomical Considerations:-- In the adult two general types of bone marrow are to be recognized, the red and the yellow. In the child it is all red. In the adult the red marrowis found in the flat bones and near the epiphesys of the long bones. It is, as the name signifies, red in color, somewhat lymphoid in character, and is very closely related to lymphatic tissue.

Microscopically:-- One finds that it is made up of a stroma of delicat, branched, anastomosing cells, enclosing in its meshes a great variety of cells. Some of these are identical with the leukocytes described as myelocytes, both neutrophilic and eosinophilic. The normal lymphocytes are found in varying numbers, but in addition to this, two fairly characteristic kinds of cells are found, the myeloblasts(?) and the hematoblasts. The former are large cells often several times the diameter of a polynuclear leukocyte, either monuclear or multinuclear. These are probably relafed in some way to the formation of leukocytes. The hemotoblasts are really nucleated red cells =erythroblasts, and are found in considerable numbers. A few flat cells will always be found.

The yellow marrow occupys the shafts of the long bones and is made up adipose connective tissue, with here and there a few of the cells named above. The bone marrow is nourished from two sources: viz, (a) vessels penetrate to it directly from the nutrient foramen, and (b) little anastomosing branches come out from the Haversian canals.

2. Circulatory Disturbances:-- Very little is known of the circulatory disturbances of the bone marrow, except that we get a hyperplasia-remiain connection with the inflammations.

3. Inflsmmations and Degenerations:

1a. Fatty Degeneration:-- A gradual replacement of the red marrow with adipose connective tissue is a physiological process of advancing years. At times, with conditions of malnutrition and inanition this occurs more rapidly than its usual wont.

2a. Mucoid Degeneration:-- In certain cases of senile malnutrition and chronic pulmonary t,b,c,, chronic nephritis, etc., a kind of mucoid degeneration may take place in the marrow, causing it to have a mucinous or gelatinous appearance.

3a. Pigmentation:--This condition is closely associated with blood destructive diseases, and here an excess of blood pigment is deposited in the marrow cells. Malaria often gives rise to such melanin.

4. Atrophy:-- This nearly always accompanies the mucoid changes mentioned above. It is found under similar conditions, and here the cellular elements lost is replaced by a serous fluid.

5. Hyperplasia:-- The hyperplasias which accompany the leukemias, secondary anemias, and pernicious anemia have been described. This is also found in a number of acute infections.

6. Influence of acute Infections:-- Here, as just described, there is frequently a hyperplasia. Then, too, we oftrn get a fatty degeneration in the capillaries and blood vessels of the bone marrow, as well as in the cells of the marrow. Along with this there is a certain amount of reversion of the fatty marrow to the lymphoid or red type, especially if one finds the infection accompanied by a leukocytosis. Often the specific causative bacteria may be isolated from the bone marrow, and typhoid bacil have been known to lie dormant here for a long time. Focal necrosis is not unusual.

7. Inflammations, and

8. Specific Infections:-- These will be discussed with diseases of the bones.

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Diseases of the central nervous system, outline of:-

A. Meninges.
  I. The dura mater.
    1. Anatomical considerations.
    2. Circulatory disturbances.
      1a. Hyperemia.
      2a. Congestion.
      3a. Hemorrhage.
      4a Thrombosis.of the sinuses.
    3. Inflammations or pachymeningitis.
      1a. External Pachymenigitis.
        1b. Acute.
        2b. Chronic.

2a. Internal Pachymenigitis.
1b. Acute.
2b. Chronic.
1c. Pachymeningitis Hemorrhagica Interna.
2c. Productive.
4. Infectious granulomata.
1a. T.B.C.
2a. Syphilis.
5. Tumors.
1a. Benign.
2a. Malignant.
1b. Endotheliomata.
2b. Sarcomata.

II. The Pia Arachnoid.
1. Anatomical consdierations.
2. Circulatory disturbances.
1a. Anemia.
2a. Hyperemia.
3a. Congestion.
4a. Hemorrhage.
5a. Edema.
3. Inflammations or Leptomeningitis.
1a. Incidental
1b. Acute.
1c. Etiology.
2c. Morbid anatomy.
1d. Serous.
2d. Fibrinous.
3d. Purulent.
3c. Results.
2b. Chronic.
2a. Epidemic cerebro-spinal meningitis.
1b. Etiology.
2b. Morbid Anatomy.
3b. Results.
3a. Meningismus.
4. Infectious granulomata.
1a. T. B. C.
2a. Syphilis.

5. Tumors.
1a. Benign.
2a. Malignant.
1b. Endotheliomata.
2b. Sarcomata.
6. Hydrocephalus.
1a. Internal.
2a. External.

A. Meningose.
I. Dura Mater.

1. Anatomical considerations:- The dura mater belongs alike to the brain and to the spinal cord and serves a double purpose, acting as the periosteum of the bone on the outside, and as a protection to the brain and to the cord on the inside. It is composed of dense compact bundles of white fibrous and elastic tissue arranged in two general layers an outer and an inner. The direction of the fibers in one being directly crosswise to those of the other. The outer layer is provided with a fair number of blood vessels, while the inner layer has a scant blood supple. The inner layer is covered on the inside by one, sometimes two, layers, of large flat cells, separating this inner layer of the dura mater from the next layer, the arachnoid, in the subdural space. Because of its location the dura is liable to infection (Secondary) from three sources, (a) from the bones, (b) from the pia arachnoid, (c) from the blood sinuses. These latter are the large venous channels which run in between the two layers of the dura, gathering up the blood from the brain, and emptying themselves into the large venous trunks of the neck. These sinuses are provided with no xxixexax walls, except what is afforded them by the dura.

2. Circulatory Disturbances.

1a. Hyperemia:-- Almost the only time that hyperemia can be detected in the dura iis when it accompanies an acute inflammtion of that membrane.

2a. Congestion:-- Any cause which prevents the drainage of the blood from the brain or head may produce a venous excess in the dura. Among these may be mentioned thrombosis of the sinuses, which may produce a more or less localized congestion; or a marked tricuspid regurgitation; orpressure on a venous trunk by tumors, aneurysms or enlarged l lymph nodes.

3a. Hemorrhage:-- This may occur upon the dura i,e, between it and the bone = extradural: under the dura i,e, in thc dural space = subdural: or in the dura itself = interdural.

(a) Extra dural hemorrhage:-- These hemorrhages occring between th dura and the bone are practically always due to injury or disease of the skull bones. The hemorrhage may be of large size, dissecting up and separating the dura from the cranium and producing serious pressure on the brain, or even sctening and laceration. In injury, the location of the hemorrhage is not always under the site of the trauma but it may be upon the opposite side. The blood in these hemorrhages may come from, and frequently does, the torn vessels of the bones or the vessels of the dura itself may be broken. As a rule, the blood will be found partially coagulated since a definite space of time practically always intervenes between the time of the injury and the death of the patient. The reason of this is that the blood escapes slowly as a rule, a little at a time, and therefore the pressure symptons do not come on immediately. Sometimes with the smaller hemorrhages there may be an absorption of the fluid part and a partial or even complete organization. When this occurs the dura will become adherent to the inner surface of the bone. In the newborn, or even at times during the intrauterine ilfe of the child, an extradural hemorrhage may take place and this may occur even where the labor has not been a difficult one. If the child does hot die at once , the hemorrhage may persist and produce an infantile cerebral palsy. When the hemorrhage has occurred during the intrauterine period it may result in a condition which will be described later as microgyria. Hemorrhages outside of the dura in the spinal column are not frequent and here they are usually are traumatic or due to disease of the bone.

(b). Subdural Hemorrhage:-- Here again, injury is the causative factor in most cases and the injured vessel may belong either to the dur a or to the pia or arachnoid. However, in some inflammations of the membranes small hemorrhagic extravisations may occur into the subdural space. In the larger hemorrhages pressure symptons will occur and death is the u usual outcome.

(c). Interdural Hemorrhages:-- Hemorrhages occurring within the dura, i,e, confined to the substance of the dur a, are quite rare, are usually small and not important unless they accompany one of the other forms just mentioned.

4a. Thrombosis of the Sinuses:-- Thrombosis of the venous sinuses of the dura follows the rules of thrombosis in veins anywhere. They may be either simple (not infected), or purulent (infected).

(a) Noninfected Thrombi of the Sinuses:-- This occurs by preferer in the two extremes of life, the very old or the very young, especially where there is extreme wasting or marasmus from any cause : eg, in the young, the severe diorrheal disturbances or inanition from any one of a multitude of causes, may under lie the formation of a thrombus; in the old, the condition is most frequently found in cancerous or tubercular cachexias. These marasmic thrombi form by preference in the longitudinal sinus. They are firm, nonfriable, yellow or yellowish red, and frequently adherent to the sinus wall. If this clot only patially fills the sinus, there may be no appreciable effect, however, if it completely fill the lumen you may get a dural congestion or cerebral soft ening.

(b). Purulent Thrombi:-- These may occur at any age and may due to injury, but more frequently are secondary to a suppurative process some where else and of these the most frequent cause is suppurative otis media, especially where this has involved the petorus portion of the temporal bone. In such condition the purulent thrombus is most likely to involve the lateral sinus. The clot is dark red or a dirty red, pulpy, not firm, perhaps having some definite pus mixed with it and it is frequently accompanied by a purulent leptomeningitis or cerebritis. The softened nature of these purulent thrombi renders dislodging of parts

of them easy and these may be carried to distant parts, frequently to the lungs and producing metastatic abscesses.

3. Inflammations of Pachymeningitis.

This may be either external or internal, either of which may be acut or chronic.

1a. External Pachymeningitis:-

1b. Acute Pachymeningitis Externa:

An inflammation of the external part of the dura is neraly always due to injury or disease o the bone and it is almost always suppurative. At time an erysipelas of the scalp may spread through and produce it.

Grossly:- the dura is swollen, edematous, pink or red, shows many little petechia, and in most cases it is covered over with more or less pus. As a rule the area involved is not very extensive and because of the density of the dura the purulent exudate is usually not large. However, in certain cases considerable amounts of pus may accumulate between the bone and the dura, and stipping up the later. At times the pus may penetrate to the inner side of the dura, producing an internal inflammation, or even into the brain. A purulent thrombosis of the sini may result. If the amount of the exudate be not large it may remain localized and undergo organization. When this occurs the dura becomes exceddingly adherent to the skull at that part.

2b. Chronic External Pachymeningitis:-

This is nearly always due to syphilis, although in some cases trauma may produce the chronic thickening. The dura is thickened, sometimes much so, and rendered very adherent to the calvarium, and there may be little spicules of bone growing into it. The dura is rarely thickenoguh to produce the clinical symptoms so far as we know.

2a. Internal Pachymeningitis:

1b. Acute internal Pachymeningitis:-

This too is nearly always suppurative and is secondary to a like process in the external layer or accompanies a purulent lepto-meningitis. It may be found in pyemic, puerpual fever, and rearc cases in the exan exanthamata and erysipelas. Cases have been reported in chronic parenchymatous nephritis.

The inner surface of the dura in these cases is swollen, covered over with alayer of fibrin and pus, these collections being either localized or diffuse.

2b. Chronic Internal Pacy-meningitis:-

1c. Pachy-meningitis Hemorrhagica Interna:--

Here we have a chronic process usually found most frequently in the region supplied by the middle meningeal artery and characterized essentially by the formation of a delicate connective tissue mambrane on the internal surface of the dura. Many hew, thin walled blood vessels are formed and from these blood easily escapes to form hemorrhages.

As to the etiology:-- whether this be a distinct inflammation or not is questionable, but it probably is. It is found in those suffering from chronic brain lesions; in chronic alcoholics, and the more marked froms are seen in idiots, epileptics, chronic dements, etc.. A few cases have been seen in children.

Morbid Anatomy:-- The membrane formed is at first a very delicate pelicle, usually fibrinous with here and ther little red areas of hemorrha or this membrane may be stained a red or rusty brown with blood pigment.

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Microscopically, even at this stage one finds many little thin walled capillaries growing out from the vessls of the dura. In between these vessels lying in a homogencus fibrin will be found large fusiform rounded or stellate cells with branching processes. These may contain red blood cells or blood pigment. At this time this membrane may be stripped away easily, being adherent only at the site of the vessels. Later this membrane becomes denser and thicked in its outer part while the inner part presents the same appearance as that just described. Now more hemorrhage occurs from the rupture of these thin walled vessels and considerable masses of blood may collect in the membrane to form the soacalled hematoma of the dura or between the newly formed membrane and the arachnoid in the potential subdural space. This condition occurs most often on the conves surface of the brain on one or both sides and from its size, especially with larger hemorrhages, may produce much pressure. At times serum collects in the meshes of the membrane and may form cysts of considerable size. In rare cases this newly formed membrane may become

infected with pyogenic organisms and suppurate. A similar condition may affect the spinal dura either with or without involvement of the brain dura. In the ~~spinal~~ dura of the spine it is sometimes associated with a distinct external pacymeningitis. In all pints of description it is just like the above. The spinal fluid is increased, perhaps slightly turbid or bloody, and the process may be localized or diffuse.

Results:-- Pressure upon the brain or upon the cord, as the case may be, may produce decided symptons. The milder localized areas produce no recognizable symptons and are run across accidentally at the autopsy. Sometimes where the pressure is considerable the bone may become atrophic. As successive hemorrhages occur one finds that these cases will exhibit periods of pressure symptons alternating with periods of comparative freedom when the hemorrhages are being absorbed. Following such an internal pachymeningitis a chronic inflammation on the pia may be induced.

2c. Chronic Productive Internal Pachymeningitis.

In this chronic productive form just as in the chronic external form, syphilis frequently plays an important causative role and there results a distinct thickening of the internal layer of the dura. This may be and usually is, localized. But at times it occupies extensive areas and may be so pronounced as to produce pressure symptons. Usually, however, it is found at the autopsy, unsuspected during life. A peculiar chronic condition in the spinal dura of the ~~spinal~~ cervical region has been called hypertrophic cervical pachymeningitis, a chronic productive inflammation of the intenal dura. This becomes very greatly thickened with fobrous tissue, even from 5 to 10 times the normal and the cord and spinal nerve roots are much pressed upon. The etiology of this condition is not known. Syphilis, exposure, and overexertion have been blamed.

4. Infectious granuloma.

1a. Tuberculosis of the dura is found only in connection with a similar process elsewhere in the brain, cord or membranes, usually the pia. Sometimes it may be produced from tbc of the bones of the skull and vertebra by direct extendion.

2a. Syphilis:-- This , as has been suggested, is frequently the cause of pachymeningitis. Aside from this, syphilis may produce local thickenings of the dura, first made up of lymphoid and plasma cells with an excess of fibrous tissue and later these may go on to definite gummata with caseation or they may become calcified.

5. Tumors.

1a. Benign:-- Circumscribed fibromata occur, but are rare. The chondroma has been found. The socalled osteoma of the dura occur most frequently in the falx cerebri or in the tentorium but these usually are only osteophytes and not real tumors.

The psammma ~~psammma~~ also occurs rather frequentlyn growing from the inner side of the dura about the base of the brain. Grossly, they ar. grayish white or graying red masses from very minute up to .8 cm, frequently with a pedicle and on section with a knife little gritty concretions (brain sand) will be found. Microscopically these psamommata look like little spindle cell sarcomatas, having in them little colorless masses, sometimes concentric, about which are flattened hyaline cells. These tumors rarely produce symptons but they may be so located as to press upon the third and fifth nerves.

As to the benign tumors of the spinal dura, we mention here certai tumors which arise in between the external layer of the dura and the spinal column or those which gorn in throuh the intervertebral spaces. These are most frequently myoma and myxoma and not infrequently produce definite localized pressure symptons. From the inner side of the dura we may have the fibroma and the myxoma. All of these tumors are more prevalent in the lumbar region and aside from pressing on the cord or nerves they may obstuct the lymph drainage.

2a. Malignant Tumors of both the Cerebral and Spinal Dura.

1b. The first and most important tumor of the dura either of the brain or the cord, is the endothelioma. This most frequnetl produces a wide spread growth , which at first lokks like a greatly thickened dura. It usually growa from the inner side where pressure on the brain or cord is important, but it may also graow outward toward the bone, producing much destruction of it. On section, it has a white or slightly red color, is fairly firm and is usually provided with relatively few blood vessels. Metastesis is rare. Microscopically, it presents the usual picture of endotheliomata.

2b. Probably the most important tumor of the dura is the sarcoma. This is usau lly of the spindle cell variety although the

round cell type may be found. It occurs in two general forms, (a) a diffuse one, like that just described for endothelioma, and (b) a circumscribed one more or less round, growing out from the inner side of the dura and producing definite pressure symptons on the brain or cord. These, too, may grow outward, eroding the bone, as the skull, when it may present under the scalp much like the glioma to be described later.

II. The pia-arachnoid.

1. Anatomical Considerations:-- In reality one should consider the pia-arachnoid as one membrane, amade up of two layers; The visceral, which is more frequently called the pia mater, and the parietal, usually called the arachnoid. The visceral pia is closely applied to the brain and cord, following in all the fissures and sulci and also sending little projections into the nerve substance which forms the outer wall or perivascular lymph spaces.

Histologically, this pia mater consists of large branching cells with some definite loosely arranged spindle shaped connective tissue cells. It is richly supplied with blood vessels. The puter parietal pia, or arachnoid, is a delicate veil like membrane covering over the visceral pia, not extending into the fissures but bridging over them. These two layers are connected together by delicate fibrous tissue extensions or partial partitions. The parietal pia mater has comparatively few blood vessels, these being relatively large. Prolongations from these membranes extend into all the ventricles. In this way we have between the two layers enormous lymph spaces, the interpial or sunarachnoid space in which is contained the cerebro-spinal fliud. Two large lymph cisterns are situated between the cerebellum and the medulla oblongata at the base of the brain and into these the subarachnoid spaces of the cord are directly continuous. In this way the cerebro-spinal fluid of the brain and cord are normally freely interchangable, easily draining from one to the other. Beginning in the lateral ventricles, this fluid enters the third ventricle through the foramen of Monroe; from the posterios aspect of the third ventricle it drains into the fourth ventricle through the aqueduct of Sylvius; from the fourth ventricle and here the central canal of the spinal cord empties, the fluid drains into the large lymph cisterns mentioned through the centrally paced foramen Majende and two lateral aperatures, sometimes called Luschka's forama. From the subarachnoid or interpial lymph space this lymph may drain away throuh the perivascular spaces surrounding the vessels and nerves extending through the foramena at the base of the skull, emptying into the jugular lymphatics. Another important drainage of this interpial space is into the large venous sinuses of the dura by means of the pacchionian bodies, which are in reality extensions of the pia-arachnoid up to and emptying into the venous sinuses.

2. Circulatory Disturbances:

1a. Anemia of the Pia:-- This is seen in general anemia, sometimes in rapidly fatal massive hemorrhages in other parts of the body, also at times in excessive cranial pressure where it is likely to be more or less localized and to some degree where the lumina of the supplying vessels are narrowed by disease or by pressure.

2a. Hyperemia:-- As to the etiology of hyperemia of the pia -- it is frequently seen after death from acute alcoholism, in some epilepsies, certain of the acute infection as acute rheumatism and typhoid, after many alkaloidal poisons, acute mania, in cases dying in delerium from any cause and frequently markedly so in those dying from sun or heat stroke, also in acute inflammations.

Grossly:-- All the little vessels of the pia are full of blood, showing as little tortuous streaks and little homorrhages a re frequent, while the meshes of the pia may contain an excess of fluid, frequently blood streaked. This hyperemia not infrequently extends into the cortex of the brain.

3a. Congestion:-- Venous excess of blood in the pia may be simply post mortem, a hydrostatic settling of the blood to the dependent parts. However, as a pathological condition, it may be met in failure of compensation of the heart, tricuspid disease , diseases of the lungs, asphyxia, but most severely in thrombosis of the sinuses. Here the veins stand out as prominent dark red lines add there is not the same tendency to little hemorrhages . It is not by any means easy at the autposy to determine just how much of the blood one finds has been present before d death. As a rule, we remove the brain and cord first at the autopsy, since if we do not, cutting of the large vessels of the neck or chest will probably allow much of the blood to be drained away.

(Please pay up)

4a. Hemorrhages of the Pia:-

This may be due to injury to the bones; to contusions even without fractures; certain infections as anthrax; severe inflammations; small hemorrhages may result from severe hyperemia and ~~xxxx~~larger ones from minute aneurisms of the pial vessels. In the latter case the hemorrhages are slow in forming but are frequently massive and may follow along the pia dissecting it up. Small ones under the pia, if not over important centers, may be partially absorbed and cause the pia to be too adherent: others may produce death from pressure on important parts.

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5a. Edema of the Pia:-

Edema of the brain and cord, so-called, may occur in congestion, in pressure on the vessels, it is frequent in chronic alcoholics(a point ~~xxx~~ which will be stressed in the discussion of wet brain), in chronic heart disease and in chronic nephritis; a certain degree of it occurs in the early stages of acute infections. This fluid may collect in such large amounts in the interpial spaces as to be a form of external hydrocephalus. In ordinary degrees of edema the pia has a swollen, translucent, at times gelatinous appearance; and on the removal of this parietal pia more fluid than usual escapes.

3. Inflammations of the Pia or Leptomeningitis.

This is what we usually mean when we speak of a meningitis and it is here that we find the most important inflammatory conditions of the cranial and spinal cavities. By far the greater number of inflammatory conditions of the pia are incidental, in that they occur secondary to ~~x~~ coexistant with diseased processes in other parts of the body and these may be spoken of as incidental in contrast with that form which is spoken of as epidemic cerebro-spinal meningitis.

1a. The incidental leptomeningitis:-- This may be either acute or chronic.

asked

1b. Acute Incidental Leptomeningitis:--

1c. Etiology:-- With regard to the etiology of acute inflammations of the pia a great number of factors enter into an etiological relationship. It may follow trauma with infection of many of the pyogenic microorganisms as staphlococci and strptococci, pneumococci etc; It is found secondary in pyemia, purulent thrombosis of the sinuses, at times accompanying diseases of the middle ear, nose, and orbit either with or without involvement of the sinuses: it may follow disease of the bone surrounding the cavities; it occurs in certain acute diseases as rheumatism , rarely gonorrhea, and sunstroke: at times in other acute infections as influenza, typhoid etc.. The causes above mentioned do not wl always produce the same anatomical picture, as for example infection with one of the pus organisms may in one case produce one form of acute leptomeningitis and in anoter case produce another form. We recognize, generally speaking, three acute forms; serous, fibrinous, and purulent, according to the character of the exudate. Some authors also include a fourth or cellular form in which the changes are only microscopical, involving only the cells of the pia, producing a proliferation of the fixed connective tissue cells there, especially of the visceral layer and of this form the greater number of cases recover.

2c. Morbid Anatomy:--

1d. Of the Acute Serous Leptomeningitis:--

Here we have a meningitis usually rapidly fatal which may occur in children, especially in the early stages of the acute infections as in typhoid, measles, scarlet fever, and in rarer cases this may occur in adu sometimes also after sunstroke. It is possible that the exciting cause i any one of the above indicated organisms and that the case has died befor the exudate has become purulent. After death, even though the clinical symptons have been meningeal very little change may be seen grossly. The pial vessels will be injected, the pia edematous, perhaps slightly turbid or gelatenous, there is an excess of serous fluid in the meshes and in the interpial space, sometimes also in the ventricles. This exuda is usually not large and it may be only slightly turbid. Leucocytes in increased numbers show in the fliud and in the perivascular lymph spaces. Along with this there may be more or less acute degeneration shown in the gray matter of the cerebral cortex. The ventricles may or may not be inv ved in a manner similar to the corticle pia. Sometimes one meets this

serous meningitis, occuring localized, a cindition sometimes called localized subarachnoid effusion or subarachnoid cysts. The exudate here is porbably limited by the strands of fibrous tissuerunning between the two layers of the pia. Such a condition is nearly always traumatic in origin, producing pressure symptoms, which soon pass off, rarely produ ing death.

2d. Acute Fribrinous meningitis:-

Here we have an early stage, which later would have merged into the purulent for had the patient not died so soon. Now we find the parietal pia slightly turbid, pushed further away from the cerebral cortex by an exudate, the pial vessels dilated with blood, and little hemorrhages are seen. On the visceral pia one sees little flakes or strands of fibrin and these may be mixed with an excess of fairly clear or slightly turbid cerebrospinal fluid . This process not infrequently involves the pia of both the brain and the cord and accompanying it one finds acute degenerationsin the orga

3d. Acute purulent Leptomeningitis:-

This is the most frequent form of meningitis and in deed almost all forms of inflammation of the pia tend to become suppurative. Here we draw a theore ical line of distinction between this purulent and the epidemic forms, but one must always bear in mind that the morhid changes, that the anat- omical picture and indeed the clinical symptoms are similar in either cas This organisms producing this purulent form may any one of a number: in- deed all the pyogenics have been proven guilty and sometimes such organ- isms as the B. Typhosus, Influenza bacillus, or even the B. Coli are the ons isolated from the purulent exudate. It is sometimes said that these different microorganisms produce exudates whoe physical characteristics differ somewaht but this is ture only in a general way. The inflammatio seems to begin in the parietal pia. As the skull cap is removed the diploeic vessels are injected, the venous sinuses and vessels of the dura are stuffed with blood and at times there is a distinct pachymeningitis. One then comes to the visceral pia which has lost its glistening appear- ance, although it may be so transparent as to permit the exudate to be seen through it. The vessels of the visceral pia and the adjacent cor- tical tissue are hyperemic. The exudate is found lying in the interpial spaces and consists of a yellow or dirty white or greenish white material at times thin from much serum, at others thick and tenaceous. At ~~times~~ first and usually this exudate lies in the sulci, but if there be much of the tops of the convolutions will be hidden by it and as one traces the vessels little yellowish lines of pus will be seen accompanying them. In certain cases the process may extend into the ventricles, producing an epindymitis and involving the choroid plexuses, it may however, be con- fined to the vertex or again to the base of the brain. In the latter ca there are also large collections of pus in the two lymph cisterns loca- ted there and if the process spreads to the spinal pia the cord may be su pended in a mass of purulent exudate. In middle ear trouble the proces first involves the pia along the petrous portion of the temporal bone, but it may spread from here to the base of the brain. Almost always in these cases there is an involvement of the gray matter of the cortex, the changes being degenerative, hemorrhagic, and small abscess formations

Microscopically, one finds the vessels of the pia stuffed with blood, with many leucocytes escaping and filling the perivascular lymph spaces. Here too, one finds degeneration and desquammation of the endos thelia. In the cerebral cortex degenerations, necroses, hemorrhages and small abscesses will be found. When the causative organism is the pneu- mococcus the exudate is thought to be characteristic; the pus is a cre am yellow, very rarely greenish or tinged with blood, of a viscid slightly t naceous consistence.

3c. Results:-- (Of Lepto meningitis).

In the serous form, death is not unusual early but recovery is possible and it may leave very little evidence of the former inflammation

In the fibrinous form, if the case recovers, as it may in favorab conditions, adhesions will form between the two layers of the pia, thus obliterating a part of the subarachnoid spcae and sometimes the visceral pia may be too adherent to the brain substance.

Where the condition is purulent, and of any considerable extent, the patient surely dies, fatal issue occurring from degenerative involve- ment of important centers.

2b. Chronic Incidental Leptomeningitis.

2b. Chronic Incidental Leptomeningitis.

1c. Chronic Productives:-- This is nearly always secondary to some disease either of the brain or dura; sometimes found accompanying chronic nephritis; in paretic dementia and to some degree, about chronic tubercular foci and tumors, perhaps also syphilis may produc it. The pia is thick, white and milky, sometimes yellowish, especially along the sulci, and these thickened patches may be irregularly distribute Previous acute infedtions, as typhoid etc. may be followed by this conditi The two layers of the pia may become adherent in places and the visceral pia by abnormal adhesions to the cortical substance.

Microscopically, the pia shows a profuse infiltration of lymphocytes and a proliferation of connective tissue cells and this condition accompanies the vessels into the cerebral cortex. Along with this there is an extra formation of fibrous tissue, perhaps some pigmentation, or even defintie deposits of lime salts. This chronic inflammation occurs mo frequently over the convex portions of the frontal lobes, then at the base of the brain is the next most frequent site.

2c. Chronic Serous Leptomeningitis:-- This is the chronic alcoholic, or wet brain, and is found in chronic alcoholics, especially those cases compicated by chronic nephritis or valvular heart disease. In these cases when the dura is stripped off and the parietal pia is exposed it is seen to be bulging with an excess of fluid beneath it The arachnoid shows some slight opacity, especially along the sulci or along the vessels and frequently the visceral pia and the adjacent brain are odematous. When the visceral pia is opened the fluid pours out in great excess. This fluid is practically always clear although in certain cases it may be slightly turbid. In all these cases there are coexisting changes in the cortex as edema and degeneration and there perhaps serve to explain certain of the mental phenonema of the chronic alcoholics When serous excess of fluid has persisted for some time the convolusions are flattened and the cortec atrophied, a condition which will be rendered all the more prominent if the ventricles contain as excess of fluid as the frequently do.

2a. Epidemic Cerebro- Spinal Meningitis:-

1b. Etiology:- These cases seem to arise in very well defined epidemics in which the distribution of the cases is extremely irregular. It is due to a specific organism, the diplococcus entracellularis meningitidis(?), which in morphlolgt resembles the gonococcus and occurs within the pus cells in the cerebrospinal fluid or exudate. It is a paired, Biscuit shaped mircoorganism and is decolorized by Cramss method however they grow readily at 37 deg. C. on agar, thus differentiating it from the gonococci. The exact mode of entry to the body in unknown but more recent observers say that the penetrate the cranial cavity from the nasal mucosa. The microorganism has been isolated from the nasal mucous in a developed case, and from healthy individuals who have been exposed to infection. Some hold that the infection is a bacteremia, whose chief localized lesions are in the meninges, while other organs of the body also show changes. While all ages are affected the disease is prone to occur in children and those in the teens.

2b. Morbid Anatomy:-- In certain fulminating cases dying within 24 hours of the onset of the symptons the post mortem reveals very little. The pia is redened and microscopically a few lymphocytes are seen along the vessels and in the brain tissue microscopical hemorrhages = capillary hemorrhages, may be observed. In the later stges the more typical cases show a distinct purulent or fibrino-purulent exu date and this exudate is more markef about the base of the brain and along the posterior portions of the cord, perhaps due to the peoumbent position of the patient, however, all parts of the pia may be involved. On the cortex the thick yellow pus tends to collect about the fissure of Rolando. In the brain and cord the vessels are injected and the substance not infrequently softened, edematous, and with small hemorrhages. The cranial nerv ans spinal nerve rrots are swollen and red and in case of the latter it may extend along the sheath for some distance.

Microscopically:-- Examination of the cerrebro-spinal fluid reveals large swollen endothelia, many pus cells containing the diplococci, some r,b,c, which are perhaps accidental and perhaps other bacteria, a mixed infection. The microscopical examination of the pia shows it is swollen, edematous, with a great number of polys, swollen connective tissue cells and fibrin. The blood vessels may show thrombosis and about some of them may be a moderate number of lymphocyte s. Wherever found the polys contai the diplococci. In the brain and cord the vessels are hyperemic, endothelia swollen, frequently with mytotic nuclei, tissue infiltrated with pol

the neuroglia cells proliferated; the ganglion cells degenerating and many new fibers show degeneration.

Briefly summariezed the other lessions shwon in the other parts of the body may be cloydy swelling or fatty degeneration of the heart, liver kidneys and perhaps multiple little abscesses in the organs; purulent synovitis of the joints; endocarditis, pleurisy, pneumonia, petechial hemorrhages of the skin, this latter condition gives rise to the name spotted fever. All of these lesions indicate that we are delaing with a bacteremia which works its special damages on the menibges.

3b. Results:- In well markedcases, death in from 24 hours to 3 weeks of the onset of the symptoms. Certain chronic cases, however, may recover, but these leave the meninges thickened from the formation of the fibrous tissues in which lymphocytes, plasma cells and usually abundant. In these chronic cases thickenings about the cranial nervers or the spinal nerves may produce certain disturbances of the function of these nerves.

3a. Meningismus:- this term, which is really a subterfuge, has been apllied to conditions in which the clinical symptoms indicate a meningitis but where the autopsy fails to reveal any change sufficiently marked to explain the symptoms. At times various organisms may be obtained from the spinal fluid by puncture in these cases, or at the autopsy: yet no lesions be discovered. So the condition is probably fundamentally toxic. Such a condition as this has been in typhoid, erysipelas, pneumonia and in the fullminating cases of epidemic serebro-spinal meningitis.

4. Infectious granulomata:-

1a. Tuberculosis of the Pia:- This is almost always secondary to t,b,c, elsewhere in the body, and occuring most frequently in the youngg. The site of preference is the base of the brain, where it is sometimes called basal meningitis. Tuberculosis of the Spinal Pia is very much less frequent than that of the brain, although when it does occur involvment of the cord is more frequent than involvement of the brain.

Morbid Anatomy:- For the sake of convenience in description, we will consider t,b,c, of the pia under two heads:- (a) milliary and the (b) solitary tubercles. These also present somewhat different clinical pictures.

(a) The Miliary form:- This usually a part of ageneral miliary tuberculosis, where the cerebral symptoms predominate. It is best seen when the brain is inverted and the base examined. Typically the pia, especially along the lines of the blood vessels, shows numerous little greyish or white tubercles, varying in size from microscopic to a pin-head. An important to look for these, if they be few in number, is in the Sylvian Fissure, where the prolongations of the Pia have followed in the Sylvian arteries, and sometimes they may be found here when absent elsewhere. Along with these tubercles there usually occurs an exudate, either serous, fibrinous, purulent, or at times hemorrhagic. Certain cases of a more acute nature, present this exudate as the predominating feature and it requires close inspection to discover the tubercles. At other times there is only a small amount of exudate, while many tubercles are present, constituting the so-called dry form of meningitis. With this involvement of the surface pia, there may occur also an involvement of the ventricles, especially the appendema and the choroid plexuses and frequently here there is a distension of the ventricles with fluid = a form of acute hydrocephalus. In these cases the convolusions are likely to be flattened on their convex surfaces, and in all cases the pial vessels are injected, little petechial hemorrhages are not infrequent, and the cortical substance is frequently edematous, prehaps degenerating.

Microscopically:- The little tubercles present the usual histology, but the bacilli are few in number. Many of the pial vessels show an acute endarteritis, the subendothelial layer containing numbers of lymphocytes, and multiplying connective tissue epitheloids. Sometimes the perivascular lymph spaces are seen crowdedwith lymphocytes and proliferating endothelis.

(b) In the Solitary Form:- Unless the area be of large size or affect especially some of the more specialized areas, as the sensory or motor, the process will not be recognized until the autopsy. In such cases we have one or two rather large masses, varying in size, from the end of one's finger to that of a hen egg. This may lie upon the brain surface, so pressing on it as to produce a depressionfrom, from which it may easily removed.

Or again the tuberculous mischief may extend into the brain substanc

and here it will be impossible to say whether it was originally pial or cortical in origin.

Microscopically we find the center distinctly caseous and about it the usualy picture of tuberculosis.

Results:- In the miliary form the clinical symptoms depend rather upon the amount and the character of the accompanying exudate; in the solitary form the symptoms depend upon the location with reference to the specialized areas.

2a. Syphilis of the Pia:- This occurs late in the secondary stages or at any time in the tertiary stage of syphilis. The pia seems especially susceptible to syphilis. Here the changes occur most frequently and most typically at the base of the brain, especially in the middle fossa. Gummatous memingitis may extend over the entire base of the brain but it is more frequently confined to the interpeduncular space. On the convexity, it is usually the frontal or parietal lobes which are involved. Here it will be circumscribed or diffuse and has a tendency to involve the cortical substance as well = meningeo-encephalitis. Often, too, there is a syphilitic meningitis.

Grossly:- The pia looses its normal appearance, it is too closely adherent to the brain, nerves and blood vessels. It is greyish white or slate colored, thickened, tough, and frequently shows nodules. If there extensive degeneration in the nodules, they have a diry yellow appearance with the center soft, almost diffluent, and in most of these cases whethe distinctly gummatous or not, there will be found an excess of fluid in th sulci.

Microscopically the greater part of the thickened pia will show an infiltration with lymphocytes, connective tissues epitheloids, plasma cellsand newly forming vessels, the latter showing early degenerative changes. Early caseation may be seen in the nodules, but few giant cells. The blood vessels in the thickened piaand in the neighborhoodshow an early obliterative endarteritis.

Results:- The gummatous changes present symptoms more like tumors, as pressure symptoms and interference with the nerve function.

5. Tumors of the Pia.

1a. Benign:- Rare cases of such benign tumors as myoma, fibroma, chrondroma, osteoma,and teratoma are recorded. Also rare example of dermoid cysts. 1b.

2a. Malignant:- The endothelioma and the perithelioma are the most important. These arise from the endothelia, usually of the perivascular pymph spaces, whether on the external surface of the brain or about the choroid plexuses in the ventricles. As a rule they are not large and merge graduallyinto the surrounding tissue. They may penetrate into the brain substance alon the pia.

2b. Sarcoma may occur as a redish white growth,as a rule more circumsrcibed than the endotheliomabut in nearly all cases it will require a microscopical examination to show the true character.

3b. Primary cancer may occur from the eppendema, as this is epithelial, or from the cells covering the choroid plexuses.

Secondary Malignant tumors:- These occur sometimes in the pia. All tumors of the pia, whether benign or malignant, are rare and they produce pressure symptoms which serve to locate them.

6. Kyrdocephalus:- This is a pathological excess of cerebrospinal fluid. It may be either congenital or acquired, either of which may be ither internal or external.

(a). Internal form:- Here the increase of fluid collects in the ventricles, either the lateral, distending them, or all of the ventricles. If any of the ventricles escape it likely to be the Fourth ventricle; although there is one form which is confined to this 4th ventricle,producing harmful pressure on the cerebellum and the medulla. The congenital form is usually internal and may be produced from introuterine injury, or disease,or be due to mal-development of the brain. In the congeital form, as a rule, the child is born with a head somewhat too large, but this develops and rapidly increases in size and on examination one finds that the ventricles, usually the lateral, are enormously distended, pressing out the cortical substance against the cranial cavities, flattening the convolusions and destroying the typography of the brain. At times these hydcephalic children may have heads of norm l size, due to a premature ossification of the sutures and here the final issue from the internal press-

ure usually comes on more rapidly.

The acquired internal form is usually not of such an extensive nature. It may be due to an inflammation of any sort of the appendema: sometimes delveloping acutely, producing an acute hydrocephalus: sometimes chronic. Internal hydrocephalus in the adult aside from that due to inflammation is almost always produced by a subtentorial tumor. This presses up, obliterating or almost obliterating the veins of Galen, and pressing on the outlets of the ventricles and closing them up. Sometimes one hemisphere shows the pressure more marked than the other, either in the in the acquired or conge ital form. This is due to a more or less complete closure of the formen of Monroe. The amount of fluid in the ventricles varys from 50 c.c. to as much a several liters.

The External form of Hydrocephalus:-

This is almost alwaysacquired, due to inflammtion of the pia, either acute of chronic or to extreme congestion and it may lead to serious pressure at times. The fluid here, usually lies within the sulci but in marked cases it may also cover over the convolusions.

The term is now over; we have done our part; so do yours.

Etiology:

It is far less frequent since good hygiene and sanitation have been in vogue. It occurs epidemically and sporadically. It is due to overcrwodin~ and unsanitation in jails and armies. It is especially prevalent in the hot climates, and it used to cause many deaths in our public institutions. It occurs usual ly in adults, but sometimes in children, especially with the summer diarrhoea of. The particular bacillus agglutinates with serum of acute cases of dysentery and also with the serum of immuned animals. The bacillus has not been isolated from the body, but is occurs especially in the stools and mucous.

Varieties: Catarrhal and diphtheric.

Pathology. It is an acute trouble. The mucous membrane of the large bowel is swollen, there is hyperemia, elev tion of the folds, spots of hemorrhages superficial necrosis (patchy, or general or uniform). There is ~~xxxxxx~~ usually no ulceration but if any at all it is slight.

In the solitary follicles there is hyperplasia, necrosis, sometimes ulceration. The bowel may be very thick; the mucous membrane greenish black or green. The surface may look necrotic or gangrenous The serous surface is injected.

Sometimes also the Ileum is involved with hemorrahges, necrosis, and injection. The follicles are sometimes swollen, with slight necrosis and superficial erosions.

Symptoms. The incubation period is from 24 to 48 hours. Prodromes are anorhexia, slight pain and discomfort, and diarrhoea for a day or two. Pain in the belly wall, diarrhoea and fever. The stools vary in number from 3 to 6 or more per day, at first they are mucous in cha racter but later becomes bloody, with straining and tenesmus. The stools amy reach 100 per day with a constant desire and a burning sensation about the rectum.

The temperature varies from 100-4, with a rapid feeble pulse.

The tongue at first is whit later it is yellow and glazed. There is great thirst, and considerable tenderness over the abdomen. The stools consist of mucous, pus, blood, round or oval epithelia and bacilli.

Delerium may occur with a high temperature, with much pus and blood and death then soon follows.

In from 5 to 10 the blood decreases, the stools less frequent, pain less intense, stools becomes dark brown or greenish.

In many cases emaciation is progressive and rapid from the diarrhoea. During convalescence there is tendency tovadd frequency of stools and scibolus masses with a discharge of gas and rapidity of the discharge of stools especially after meals, hot ~~xxx~~ fluids in particular and after exercise.

Di agnosis. This is usually easy and is made on the character of the di arrhoea, mucous, blood, accomapnied by tenesmus. You may isolate the bacillus or use the agglutination test, in a solution of 1 to 1,000 or 1,5000

Prognosis. Usually good and moderate cases get well in 6 days to 2 weeks; severe cases take 3 -4 weeks. In the young, old, and feeble the prognosis is bad. Delerium and coma make a bad outlook.

Complications. Peritonitis either by direct extension or by perforation. Arthritis, plourisy, thrombosis, pylephlebitis, pyemia, peri- and endo-carditis, nephritis, and an edema which is not due to the nephritis or endocarditis but to the anemia. Sometimes paralysi paraplegia, neuritis and abscesses. Sometimes malaria complicates this disease. Rarely intestinal stricture occurs. Dyspepsia may follow the disease for some time.

Treatment: As the disease is self-limited and water borne, an inspection of the water supply and care of the patient are indicate If there is constipation give castor oil(1oz) or salines as MgSO4 (oz) and in this way you may convert a dysentery into a diarrhoea.

If there is pain follow the salines with opium (10-20m) or paregoric, or you may combine these with the purgative. If there is pain and you merely want an astringent influence then give aromatic sulphuric acid. Ipecac has been used extensively by the West India physicians. It is given in large doses and on an empty stomach. Before administering the ipecac give a dose of morphine, Dover's powders or laudanum, then put thepatient to bed and conpel him to lie flat on his back and the tendency to vomit is resisted by chipped ice, mus-

2. Congenital Lymphangiectasis.

This may be wide spread or localized. The diffuse form shows in the infant as aswelling of the superficial connective tissue somewhat like elephantiasis. And the tissue appears to be very edematous. The localized congenital forms are seen in the congenital "macroglossus' = large tongue. This dilitation may not be present at birth but may develop later.

&xxxxx IV. Thoracic Duct.

The processes here are very similar to other lymph vessels, but its size makes it specially important.

1. Obstruction of theThoracic Duct:-- It may be due to the pressure of tumors, aneurysms, and inflammations from without, or arise from thrombosis or inflammations from within. Frecuentlu the collateral circulation ie so good that no serious results follow, especially if the obstruction be slow in forming. However some of the vessels may rupture causing chylothorax, chyloascites, or even chyluria.

2. Dilitation of the Thoracic Duct:-- It may be due to many of the causes just mentioned, or may come about from heart failure, with a stuffing of the great veins with blood. Sometimes the back pressure of the blood in the vena cava may fill the upper part of the duct with blood.

3. Inflammations:-- These are usually secondary and result from the direct extension of a pleurisy, some abdominal inflammation, etc.

Lecture 11. 11/13/'07.

4. Tuberculosis of the Thoracic Duct.

Miliary tuberculosis has been seen in the thoracic duct in general miliary tbc. A more chronic process may ensue especially when there is some long standing tbc in the abdomen. This may lead to obstruction of the duct.

5. Tumors of the thoracic duct:-- These are rarely primary although sarcomas and fibromas have been recorded.

V. Tumors of the Lymphatics.

Of The primary tumors of the lymphatics, by far the most important is that of the endotheliona. Here the endothelia begins to multiply and invades the surrounding tissue. These sometimes may have a typical alveolated appearance. The part of the lymphatics in the spread of cancer is well known. These cancer cells usually lodge in the lymphati and begin to develop and later invade. The direction of the spread from the cancer is usually in the directin of the lymphatic flow. But the tumor may extend backward and give rise to retrograde metastesis.

VI. Parasites of the lymphatics.

The adult of the filaria sanguinis hominis or the filaria bancrofti is found in the lymph channel where the embryos may occur in great numbers. The adults may block up the channel with the attendant results described under obstructions.

Diseases of the Respiratory Tract, outline of:--

I. The Nasal Cavities,
- 1. Anatomical Considerations.
- 2. Congenital Malformations.
- 3. Circulatory Disturbances.
  - 1a. Hyperemia.
  - 2a. Congestion.
  - 3a. Epistaxis.
  - 4a. Edema.
- 4. Inflammation or Rhinitis.
  - 1a. Acute catarrhal Rhinitis.
  - 2a. Pseudo Membranous Rhinitis.
  - 3a. Chronic Catarrhal Rhinitis.
- 5. Tuberculosis.
- 6. Syphilis.
- 7. Tumors.
- 8. Parasites and Foreign Bodies.

II. The Pharynx.
- 1. Pharangitis.
- 2. Adenoids.

III. The Larynx.
- 1. Anatomical Considerations.
- 2. Congenital Malformations.
- 3. Circulatory Disturbances.
  - 1a. Anemia.
  - 2a. Hyperemia.
  - 3a. Congestion.

4a. Hemorrhage.
5a. Edema.
1b. Of the Glottis.
2b. Of the Larynx Proper.
4. Inflammations or Laryngitis.
1a. Acute Congenital Laryngitis.
2a. Pseudo Membranous Laryngitis.
3a. Chronic Congenital Laryngitis.
4a. Perichondritis.
5. Infectious Granulomata.
1a. Tuberculosis.
2a. Syphilis.
3a. Lepra and Glanders.
6, Tumors.
7. Parasites and Foreign Bodies.

IV. The Trachea.
1. Congenital Defects.
2. Acquired Malformations.
3. Inflammations.
4. Tuberculosis.
5. Syphilis.

V. The Bronchi.
1. Anatomical Considerations.
2. Congenital Defects.
3. Circulatory Disturbances.
1a. Anemia.
2a. Hyperemia.
3a. Congestion.
4a. Hemorrhage.
4. Inflammation or Bronchitis.
1a. Acute Catarrhal Bronchitis.
2a. Fibrinous Bronchitis.
3a. Chronic Catarrhal Bronchitis.
5. Stenosis.
6. Bronchiectasis.
7. Infectious Granulomata.
1a. Tuberculosis.
2a. Syphilis.
8. Tumors.
9. Parasites.
10. Foreign Bodies.

VI. The Lungs.
1. Anatomical Considerations.
2. Congenital Malformations.
3. Circulatory Disturbances.
1a. Anemia.
2a. Hyperemia.
3a. Congestion.
1b. Stasis.
2b. Hypostatic.
4a. Edema.
5a. Hemorrhage.
6a. Embolism and Infarction.
4. Emphysema.
1a. Interstitial.
2a. Vesicular.
1b. Acute.
1c. Compensatory.
2b. Chronic.
1c. Associated Conditions.
3b. Senile Emphysema.
5. Atelectasis.
1a. Congenital.
2a. Acquired.
6, Gangrene of the Lung.
7. Inflammations or Pneumonia.
1a. Lobar Pneumonia.
1b. Definition.
2b. Etiology.

John A. Schilling.

Description of Specimens in the

Sophomore Laboratory of Pathology, 1906 - 1907.

1. Hyperemia of Lung. ----------H.E.---------Low.
The blood vessels are full of red blood cells. This is best seen in the arteries and capillaries in the alveolar walls. So far there is no destruction of blood with deposit of pigment. Some alveolar walls are broken down.

2. Hyperemia of Kidney.----------H.E.--------- High.
Blood vessels, especially the arteries and capillaries, are filled with red blood cells.It is chiefly in the cortex where the capillaries of the glomerules are distended. In this section the excess of blood has involved the vessels of the medulla. There is very little hemorrhage.

3. Hyperemia of Heart Muscle.----H.E.---------Low.
Vessels near the pericardium are stuffed with blood. Some red cells in between the muscles fibers (diapedesis). The larger vessels by the greater elasticity of their walls have collapsed and have driven the blood out, so are nearly empty.

4. Hyperemia of Stomach.---------H.E.---------High.
The mucosa shows many small round cells and the gland tubules are compressed. The capillaries of the mucosa are markedly distended with blood as are the vessels of the submucosa The acid cells show well in places.

5. Hyperemia of Lymph Node.------H.E.--------High.
Very marked distension of vessels, especially of the capillaries. The endothelial lining shows well.

6. Congestion of Spleen.---------H.E.--------Low.
Capsule thickened. Arteries of Malpighian bodies almost empty. Malpighian bodies less prominent. Veins, capillaries, and blood spaces filled with blood cells which have compressed the splenic cells in many places, causing them to lose their staining properties. The blood has not stained well owing to improper fixation.

7. Congestion and Hemorrhage of Spleen.---H.E.----High.
Differs from the preceding in having the Malpighian bodies more distinct, the blood stains better In certain places are masses of blood with very few splenic cells and the rbc. are broken down to form a rather homogeneous mass. Very marked excess of blood. The entire spleen weighed 900 grams.

8a. Portal Congestion of Liver.--------H.E.------Low.
Portal vessels are filled with blood or are widely distended. Arteries comparatively empty. Capillaries throughout the lobule are stuffed with rbc. Hepatic epithelia near the central veins contain much yellow granular pigment. Vessel walls, especially of the arteries, are thickened with fibrous tissue.

8b. Hepatic Congestion of Liver.--------H.E.------Low.
The cemtral veins are filled with blood, which also shows in the capillaries of the central zone. Portal vessels and hepatic arteries do not show much excess of blood.

9. Congestion of Kidney.----------H.E.-------Low.
Veins and capillaries, especially of the medulla, filled with blood. Arteries contain very little. Tubular walls thickened with fibrous tissue.

10. Anemia of Lung.----------H.E.------High.
Interalveolar capillaries empty. Blood only in the larger vessels and these are not very full. Some alveolar walls broken. (Case of surgical shock).

11. Anemia of Liver.----------H.E.-------High.
Very little or no blood in any of the vessels. Liver cells vacuolated or granular, filled with many small round open spaces. Some large fat globules. Cytoplasm does not stain red except in a few of the epithelia.

12. Thrombus or Clot in Heart.---------H.E.-----Low.
Section of interior of heart wall. Muscle fibers normal or nearly so. Some hyperemia. Clot has shrunken away from the wall. The periphery of the clot next to the wall has much granular fibrin with few rbc. and a very few wbc. Central part of the clot shows very little fibrin, many rbc., and fwe wbc. Clot recent.

13a. Recent Thrombus in Artery.--------H.E.------Low.
Artery wall normal. The thrombus divided into semblance of alveoli by bands of fibrillar fibrin which vary in size and distribution, enclosing rbc and wbc. These latter are more numerous in the central part of the thrombus. Little or no tendency to organization.

14. Thrombosed Umbilical Vessels.------V.C.------High.
All three vessels show the clotting. Next the intima is a layer in which fibrin and many leucocytes are seen, the small lymphocytes predominating altho large lymphos and polys are seen. Central part consists of rbc, with an occasional leuco. Here the fibrin seen with difficulty.

15. Early Organization of Thrimbus.---------H.E.------High.
In the central part of the thrombus, the rbc and fibrin are distinct. Around the margins of the thrombus is a broad zone of lymphos, mostly small but a few have elongated to have long oval or spindle nuclei. Intermingled with these are rbc & fibrin.

16. Anemic Infarct of Spleen.--------H.E.------Low.
The infarcted area is irregularly semicircular, with base toward the capsule. Line of demarcation is zone of blood. The infart has less blood, fewer splenic cells, and a looser arrangement than the rest of the tissue.

17. Red Infarct of Lung.-------H.E.---------Low.
The infarcted area shows the alveolar walls thickened with with round cells, spaces stuffed with rbc, alveolar arrangement fairly kept. It is marked off from the rest of the lung by a broad zone of lymphos and polys. Lung immediately adjacent is the seat of hemorrhage, with many rbc and much fibrin. As one gets farther away from the infarct the alveoli are less filled.

18. Hemorrhage into the Rectus Muscle.------H.E.------Low.
Long broad muscle fibers with nuclei and striae gone, cytoplasm homogeneous or vacuolated. In many places separated by an invasion of leucos. The blood, quite recent, lies outside the vessels and is divided into irregular spaces by lines of fibrillar fibrin which show well.

19. Hemorrhage into Lung.----------H.E.---------High.
Alveolar arrangement fairly preserved. Spaces filled with many rbc, packed tightly. In some of the looser ones the fibrin may be seen. In some places an excess of leucos present.

20. Hemorrhage into Liver.----------H.E.--------High.
The areas of hemorrhage are usually near the central veins. The rbc have replaced the liver cells, at times are fused into homogeneous masses or may be distinct. The liver cells contain considerable blood pigment which may be obscured by the eosin.

21. Small Hemorrhages in Spleen. ---------H.E.------High.
Some excess of blood in the splenic spaces. A few places where the blood has gathered in masses and here the splenic tissue is torn away. Some of these are near the arteries of the Malpighian bodies. Note also the number of polys, small monos, large monos, the swollen endothelia, the cells with mitotic figures and that the splenic cells have their nuclei large and palr.

22. Hemorrhage about Adrenal.----------H.E.----------Low.
Very little change in adrenal. The surrounding areolar tissue is seat of hemorrhage showing many rbc, a few wbc, with a very little fibrin.

23. Edema of Lung (Unboiled)------H.E.--------High.
Hyperemia. Some hemorrhage by diapedesis. One part shows many polynuclears in the alveoli. Some alveoli are filled with rather homogeneous or very finely granular uniform material. The alveolar walls are swollen and the individual epithelia are swollen.

24. Edema of Lung (Boiled).------------V.G.---------High.
Coagulated albumins show best in the alveoli as larger granules. Some blood in alveloi. Hyperemia.

25a. Normal Uterus.--------------V.G.-------high.
This section given for sake of comparison with the next. It is the smaller. Both long and cross section of muscle fibers seen Considerable fibrous tissue.

25b. Pregnant Uterus (Hypertrophy). --------V.G.---------High.
Here the fibers are longer, broader, more loosely arranged, and show irregular nodules or swellings along them. Considerable fibrous tissue. Blood vessels more numerous.

26. Corn.----------V.G.----------Low.
Shows a marked thickening or hypertrophy of the horny layer In some places in this layer bacteria have been caught and may show as blue stained round or rod shapes. The reti pegs are very prominent.

27. Hypertrophy of Right Ventricle.-----Unstained----V.G.---High.
Many of the individual muscle fibers are distinctly larger than normal and their striae show distinctly. The branching of the fibers is well seen. In the stained section the nuclei are very much larger than normal, the increase being chiefly in the breadth.

28a & b. Brown Atrophy of Heart.---V.G. Low.---Unstained, High.
Some excess if fibrous tissue in between the muscle fibers and muscle bundles. Blood vessel walls thickened. In the unstained section the excess of polar pigment is evident.

28. Senile Atrophy of Kidney.--------V.G.------Low.
Blood vessels thickened with fibrous tissue. Capsules of bowman too thick. Some glomerules are completely fibrosed. Colloid cysts evident. In one part the intertubular fibrous tissue has so increased as to compress and often replace the tubules.

30. Not given.

31. Extracellular External Pigment of Lung.--C and P.A.---Low.
Nuclei should stain red, blood yellow. The external pigment, coal dust, shows as intense black more or less fragmented masses, chiefly about smaller vessels. This has been carried and deposited there by phagicytes.

32. Intracellular Internal Pigment of Lung.--C. and P.A.--High.
Interalveolar capillarise distended. Many alveoli filled with a few lymphos and many polys. Among these may be seen large flat epithelia with small round almost black pigment granules. These are the socalled cardiac cells and result from congestion.

33. Hematoidin in Lymph Node.-----Hematoxylin.----High.
Ignore the homogeneous or finely granular masses as well as the collections or cells slightly larger than lymphocytes. Scattered in the tissue are small collections of pigment granules, chiefly extracellular, yellow in color, but where the masses are thick they may be yellowish brown. This failed to give the iron reaction of Prussian blue with potassium ferrocyanide and 1 % HCl.

34. Excess of Polar Pigment in Heart.---Hematox.----High.
No contrast stain has been used. The suriae show well. Nuclei are nearly round, do not stain very well. At each pole of the nucleus extending in an elongated triangle (coneshaped in its entirty) is a mass of yellow granular pigment. This is markedly in excess of normal. An excess of fibrous tissue between the fibers. Blood vessel walls are thickened.

35. Melanotic Spindle Celled Sarcoma.----H.--------High.
A secondary or metastatic tumor in a lymph node, tho very little of the adenoid tissue left. The predominent cell is spindle shaped, its nucleus showing as rather an elongated blunt spindle. Throughout the section are large and small masses of a brown or yellowish brown pigment. Even the finer granules of this have a brown color. The larger masses are extracellular but much of the finer pigment is inside the cells.

36. Intracellular Pigment of Liver. -----H.------High.
One edge shows the same melanotic sarcoma as No.35 surrounded by a fibrous capsule. In the liver tissue there is a marked excess if fibrous tissue about the portal areas (perilobular cirrhosis). The capillaries are filled with rbc especially in the hepatic vein area. Also in this zone many liver cells are seen filled with a fine yellow or brownish yellow pigment.

37. Jaundiced Liver.----------H.----------High.
The liver cell nuclei show distinctly and the outlines of the cells are well kept. All thro the section may be seen a green pigment both in rather large extra-cellular masses and as fine intracellular granules of the same color. In many of the intercellular spaces (bie capillaries) is seen a canary yellow pigment which is the more unaltered bile and this excess of it indicates the cause of the jaundice of the liver.

38. Uratic Infiltration of Kidney.------H.------High.
Section shows an excess of fibrous tissue and of blood. In some of the tubules especially of the medulla are seen masses of a greenish brown material almost filling the tubules. This is a deposit of urates. Some of the epithelia show biliary pigmentation.

39. Liver of Pernicious Malaria.------Carmine------High.
This section shows three elements: 1.Practically unaltered bile of a canary or orange yellow color in the bile capillaries: 2. A very little greenish bile pigment in the cells: 3.Much dense black granular intracellular pigment in the liver cells and some of it in the rbc in the capillaries. This is malarial pigment probably melanin.

40. Malarial Pigmentation of Spleen.-----Carmine-----High.
Specimen shows nuclei pink, cytoplasm unstained, Malpighian bodies distinct. Both intra- and extracellular pigment of a fine rounded granular nature, dark brown or black. There is much of this and it is chiefly in the capillaries.

41. Brain of Pernicious Malaria.-----Carmine------High.
Fine black granules show especially well in the capillaries. Much of this is in malarial parasites as can be shown by special staining.

42. Fatty Invasion of Heart.----H.E.-------Low.
Muscle fibers mostly in transverse section. All between them are round or irregular open spaces whose boundaries are stained faint blue. These are fat cells and lying between the muscle fibers constitute an invasion. Some excess of fibrous tissue.

43. Fatty Infiltration of Liver.---SoudanIII and H.----Low.
The fat has stained a deep red or orange and is widely distributed, having invaded the wholelobule. However, if any part of the lobule has escaped it is most often the central zone about the hepatice veinule. The fat globules occur in the liver cells having pushed the nucleus to one side/ at times having compressed and flattened it. The number of globules to the cell is usually not more than two or three, more often one when large.

43b. Fatty Infiltration of Liver.-----H.E.-----High.
Same liver as the above but this has been embedded in paraffin so the fat is dissolved out and has left clear spaces. Otherwise the description is the same. The drawing should show the seal or signet ring cells where the nucleus has been pushed to one side and shows like the setting in a signet ring.

44. Cloudy Swelling of Kidney.-------H.E.-------High.
An excess of blood. The nuclei may show. If they do, they are l larger, less dense and the nucleolus comes out well. The chief change, however, is in the cytoplasm which shows many fine granules. The cells are swollen and fused together so that the outlines of the individual cells are lost. The masses of cells are often shrunken and loosened from the tubular walls.

45. Cloudy Swelling of Heart.------H.E.-------High.
Excess of blood in the capillaries. Muscle fibers swollen, striae mostly gone, cytoplasm granular. Nuclei gone or large with chromatin granules. Some fibers show a tendency to longitudinal fission or splitting. Some excess of polar pigment.

46. Cloudy Swelling of the Liver.------H.E.-------High.
The liver cells are swollen, their outlines are indistinct, they are fused together. The cytoplasm is granular. The nuclei, where they show at all, are larger with fine chromatin granules, may be devoid of cytoplasm (free nuclei). Excess of blood in capillaries.

47. Fatty Degeneration of Liver.----Osmic acid.------High.
The fat shows as small round black globules, many of them to the cell. The liver cells are larger, the individual outlines gone, nuclei indistinct. Much hyperemia.

48. Fatty Degeneration of Kidney.-----Osmic acid.------High.
The cytoplasm of the cells has been converted into small fat globules which show very little tendency to fuse together. These are stained black by the osmic acid. The outline of the cell is gone. Many nuclei have disappeared. The fat globules show especially well about the tubule walls.

49. Fatty Degeneration of Heart Muscle.---Osmic acid--High.
The fat globules are the numerous small round black globules, distinctly in the fibers. The individual fibers are swollen, the striations and nuclei gone or indistinct. An excess of blood.

50. Zenker's Hyaline Degeneration of Rectus.-----H.E.---Low.
Same process as No.18, in which the longitudinal section of the muscle fibers are best seen. The fibers showing the hyaline degeneration are large, stained a homogeneous red. Some fibers have gone further and are broken down and vacuolated. Few nuclei remain. Fibers are widely separated by an infiltration of polys and small lymphos. There is much hemorrhage in places with fibrillar and granular fibrin.

51. Beginning Hyaline Degeneration of Aorta.---V.G.---Low.
The media shows a great excess of fibrous tissue. The imtima is much thickened with fibrous tissue, in one place showing a distinct elevation. The endothelial lining shows as a yellow or brownish yellow line. The subendothelial tissue especially in the thickest part is beginning to become hyaline, i.e. it no longer shows definite fibers, is fusing together, is somewhat paler red or pink and is becoming more homogeneous.

52. Mucus from Nose.---Unstained and acetic acid.----High.
This shows many granular cells; large granular squamous cells, small round cells or these may be drawn out into a spindle. After the acetic acid, the mucin is seen precipitated as definite fibrillae or sheets. The cells have cleared so that in most cases the nuclei are distinct. Many shining cocci and rodded bacteria especially on the squamous cells.

53. Mucus from the nose.-----Aqueous Thionine-----High.
The thionine has been added without previous fixation of the smear. The mucin is red. Nuclei blue, cytoplasm light blue, and the bacteria are blue.

54. Early Mucoid Degeneration of Spleen.---V.G.----Low.
The process which affects the fibrous trabeculae does not show well. It is best seen as the faint blue or violet shade imparted to the ends of the fibrous tissue fibrils which extend into open spaces.

55. Mucoid Degeneration of Mucosa of Ileum.---H.E.----High.
The mucosa shows a marked number of small lymphos. The epithelia of the acini have many goblet cells in which are large round open spaces at times showing a very faint blue. Some nuclei do not stain.

56. Mucoid Degeneration in Endothelioma.----Thionine.---High.
This has affected the fibrous trabeculae of the tumor. These give an alveolated arrangement . The tumor cells are large, some what polyhedral in shape and usually separated from each other by a small space in which run strands of fibrous tissue. The fibrous tissue has taken the pink or red stain of mucoid material and shows even in the delicate strands that run between the cells.

57. Not Given.

58. Colloid Material in Thyroid Gland.---V.G.----Low.
Given to show colloid material. Nuclei do not stain well. The colloid material in this section is typically yellow or orange. In some acini it has broken down to become granular. Otherwise it is homogeneous. The acini vary much in size.

59. Colloid Degeneration in Kidney.-----V.G.------Low.
An excess if fibrous tissue. A number of glomerules have been converted into fibrous tissue. The most prominent feature of the section is the great number of tubules that are distended by colloid material which varies in color from a deep yellow to an orange red. This is homogeneous .

60. Amyloid Degeneration of Kidney.----Anilin Gentian Violet--Low.
Method of staining amyloid ysed in these sections is as follows: 1.Sectioned in paraffin and fixed to slide with Meyer's albumin, and dried in oven. 2.Paraffin dissolved in two changes of xylol. 3.Two changes of alcohol to rid of xylol. 4.Water to remove alcohol. 5.Fresh anilin Gentian Violet 2-3 minutes. 6.Wash in tap water. 7.Decolorize and differentiate in 1% HCl (best under low power of microscope). 8.Wash well in water, dry with filter paper and mount in gum-glycerine.
This section shows rather advanced amyloid change. The glomerules are almost solid with a red or rose-colored fairly homogeneous material. Rest of kidney is blue. The walls of the intertubular spaces vessels are frequently converted into amyloid material, showing both in long and cross section. Epithelia granular and broken down. Many nuclei unstained. Tubules at times distended.

61. Amyloid Degeneration of Liver.--Anilin Gentian Violet---Low.
Staining reaction as before. Amyloid material shows typically in the middle zone in lobule. Also in walls of the hepatic artery and the surrounding fibrous tissue. Perhaps also in portal vein and bile duct. The peripheral zone is fatty infiltrated. Central zone has its capillaries somewhat distended.

62. Amyloid Degeneration of Spleen.--Anilin Gentian Violet--Low.
Amyloid material widespread, is divided into lobule-like masses by cross lines or fissures. Too far advanced to decide the starting point. Affected blood vessels may be seen. Some splenic cells left. Some good fibrous trabeculae.

63. Corpora Amylacea in Hypertrophied Prostate.---H.E.----Low.
These bodies supposed to resemble starch granules do not show well. At times they may be seen in the acini, but not of a very typical shape.

64. Coagulation Necrosis of Lung.----H.E.----High.
This is the stage of gray hepatization in lober pneumonia. The alveoli are filled with a granular and fibrillar fibrin which stains quite red; many polynuclears; some mononuclears; a very fwe desquamated epithelia. In thses cells may be pyknotic nuclei, i.e. a condensation of the nucleus with deep staining, or karyirhexis whrer the nucleus has broken up and shows chromatin granules or threads. Some ghosts of cells. Some diapedesis of rbc. Alveolar walls not clear.

65. Coagulation Necrosis of Ileum (Typhoid).--H.E.----Low.
Muscular coat not very much changed except for some small lymphocytes. Submucosa very much infiltrated with lymphocytes and polys. The gland tubules in the ulcer part are entirely gone having been replaced with altered fibrin, coagulated albumens, polys and small lymphos. Considerable karyorhexis, some pyknosis. Endothelia of blood vessels swollen and prominent.

66. Caseous Material/---Unstained------High.
Granular material; some compound granule cells, i.e. large cells filled with small fat globules; some polys which clear up with acetic acid; some small lymphos; large flat epithelia; bacteria; some molds. The exact composition will vary depending on the source and the number of cells.

67. Caseous Necrosis of Spleen.------H.E.--------High.
The capsule is thickened and somewhat degenerated. Thro the section are red areas of granular material in which are cells with pyknitic nuclei, some chromatin granules and threads, and about the edges are collections of cells very like if not identical with the splenic cells. About the edges and thro some of the areas are ameboid nuclei of phagocytes, probably large lymphocytes.

68. Necrosis of Bone.
No microscopic sections shown but gross specimens from the museum were exhibited.

69. Gangrene of Leg.---------H.E.-----Low.
Horny layer of skin takes blue stain, nuclei do not show well. Excess of fibrous tissue under epithelial layer. Fibrous tissue swollen, nuclei not staining. Much congestion. Infiltration of leucocytes chiefly polys. Tissue thro out does not stain well except the leucos.

70. Fibrin.--------------V.G.------High.
The greater part of section is fibrin which shows as granular, fibrillar, and radiating masses. Some distinct red blood cells. Especially along the margin may be seen lymphocytes, polynuclears and thro the section are large flat endothelial cells.

71. Pus.------H.E.---------High.
The greater number of the cells are polynuclear neutrophiles; but small lymphos, large lymphos, and eosinophiles are present. The large lymphos in this specimen are probably more numerous than the small ones. Some micrococci and a few rodded bacteria may be seen altho this is not a good bacterial stain.

72. Abscess of Liver.---------H.E.-------Low.
The inner surface of abscess shows granular fibrin and cellular debris, a few polys. Further in, the cellular elements are more numerous, mostly polys. Then a layer of dense fibrous tissue with many rbc, some in vessels. Then a zone of small lymphos. Still further in the liver tissue has undergone a coagulation necrosis with fatty degeneration. The liver cells are large filled with many vacuoles (fat globules). Much granular debris between the cords of liver cells. Periportal areas are much infiltrated with small lymphos.

73. Wound in Abdominal Wall.------V.G.------Low.
This is healing by surgical first intention. The surface shows startified squamous epithelium which in one place has invaginated for a greater or less distance into the cut. Just at the junction on the surface is a homogeneous yellow material (dried serum). Beneath the skin comes a thick layer of adult fibrous tissue and still deeper is adipose tissue. Numbers of blood vessels filled with blood show in the fibrous tissue. Running down thro the section from the invaginated epithelium is a narrow yellow zone chiefly shadows of rbc with fibrillar fibrin. This extends into the interstices of fibrous tissue on either side. In this zone are found a very few polys, a fwes few small lymphos, and fibroblasts in all stages of elongation into adult fibrous tissue fibrils. The youngest form is oval with fairly large oval lightly staining nucleus. Later this becomes spindle, the nucleus elongating and the last seen of the nucleus is a single blue thread in a long spindle?

74. Purulent Infiltartion of Kidney.--------H.E.-----High.
Other names for this process are; acute suppurative interstitial nephritis, acute diffuse nephritis. It shows hyperemia and marked cloudy swelling. All thro the section are polynuclear neutrophiles infiltrating the intertubular spaces. There are a few small lymphos and some rbc out by diapedesis.

75. Amebic Abscess of Liver.-----H.E.---------High.
On one end is a mass of granular material devoid of definite structure containing a few lymphos and many groups of blue stained bacteria. Next to this comes a zone of more condensed tissue perhaps somewhat fibrous but infiltrated with many small lymphos. Beyond this the liver tissue is seat of hyperemia. The liver cells are cloudy swollen, some large nuclei pale, cytoplasm granular. Many cells gone, some free nuclei. In betwwen the cells are many small lymphos with a few polys. In the zone of newly forminf fibrous tissue are many fibroblasts well shown.

76a. Granulation Tissue. ----------H.E.---------High.
This is from a simus in the arm. It shows many epithelioid (embryonic connective tissue cells) which are fairly large, a distinct amount of cytoplasm, uniform medium staining nucleus, half again as large as a lymphocyte and not so deeply stained. These may have cytoplasmic processes from their corners to form a kind of a stellate cell. There is a fair number of small lymphos and some polys. Some karyorhexis as shown by nuclear fragments. A very important feature is the new capillary formation. The endothelia of these are large swollen, showing a faintly staining large oval nucleus with distinct chromatin granules and at times a good nucleolus. In some vessels the endothelia have multiplied and form a solid bud on one side of the wall. Other examples where they have formed longer more distinct solid cylinders with perhaps a few rbc penetrating thro the center. Complete anastomosis with a similar outshoot from other vessels may be seen thus completing the formation.

76b. Granulation Tissue.--------H.E.--------High.
Differs from the preceeding in having more granular and fibrillar intercellular substance; this, in some places, occupying almost the entire field. Also the capillary vessels while still large do not show such large endothelia. Again there are some distinct fibroblasts (spindle cells).

77. Catarrhal Exudate in Lung.---------H.E.---------Low.
Hyperemia of larger vessels. Alveolar walls thickened with fibrous tissue. In alveoli is granular and fibrillar fibrin, many polys, a few lymphos and large flat desquamated epithelia with round or oval faint nucleus and granular cytoplasm. Also some rbc by diapedesis.

78a. Acute Orchitis.---------H.E.---------High.
Most of section os testis. Glandular epithelia is swollen and in places the cytoplasm is eroded. Some nuclei are large and show karyorhexis, others show mitosis. In the lumina is much mucous exudate. Vessels are full of blood. Very little cellular infiltration of stroma.

78b. Purulent Hydrocele.--------H.E.--------High.
Tunica albuginea thickened with young fibrous tissue. Hyperemia. On one side is a great mass of leucocytes with much fibrillar and pale-plate like fibrin. The leucos are chiefly polys with some lymphos.

79. Serous Exudate in Acute Catarrhal Appendicitis.----H.E.----Low.
Mucosa shows many goblet cells and in the lumen of the appendix is a mucous exudate. The submucosa has an excess of connective tissue epithelioids with some small lymphos. A number of these in the circular muscular coat and a few in the longituninal coat. The subserous tissue is much infiltrated with small and large lymphos, epithelioids and a fair number of fibroblasts. Then comes a narrow zone of dense red blood with some polys. Then a broader zone of dense fibrin with a fair number of polys. This appendix was found in a pocket of pus at the operation.

80. Wall of Pyonephrosis.--------H.E.-------High.
Given to show fibroblasts in all stages of elongation. Present in the tissue also are many small lymphos, some large lymphos, a number of connective tissue epithelioids. Many blood vessels are filled with blood and a few renal cells the seat of a fatty degeneration.

81. Chronic Productive Arteritis.-------V.G.---------Low.
Much addition of red stained fibrous tissue to the muscular coat. The intima is much thickened especially the subendothelial layer by a loosely arranged fibrous tissue. In this may be seen elongating fibroblasts. The vasa vasorum are filled with blood.

82. Chronic Endarteritis.------V.G.--------Low.
Section of splenoc artery and has some pancreas attached. Chief lesion is in the intima. This is greatly thickened by red stained fibrous tissue. In two places, just internal to the internal elastic membrane, the fibrous tissue has degenerated to form a structureless material staining yellow and showing open spaces in it (an atheromatous abscess). Thro the intime are many ameboid mononuclear phagocytes either large lymphos or c.t. epithelioids. These show various elongated shapes but differ from elongating fibroblasts by having round ends and are not definitely spindle shaped. The cytoplasm of these cells does not stain well

83a. Eosinophiles in Subacute Appendicitis.---H.E.---High and Low.
Mucoid degeneration of glandular apithelia. Small lymphos in excess thro the submucosa, to a less extent in muscular coat and many in the subserous and serous coats. A fwe polys also. Many eosinophiles showing large granules in the cytoplasm and deep red. Their nuclei are typically lobed or polymorphous but may be a single round one. The general shape of the cell is irregular.

83b. Chronic Appendicitis.---Polychrome Blue.-----High.
Given to show plasma, pseudo-plasma and mast cells.The plasma cell may be of two sizes, small or large, the large being about the size of a poly or larger. They have a small round or oval eccentric nucleus, then a clear space and the cytoplasm stains a blue but not so blue as the nucleus with polychrome blue. The pseudo-plasma cells are the size of a poly or larger, have a small round or oval eccentric blue staining nucleus with a red granular cytoplasm. The mast cell is larger than either of these, and its cytoplasm is made up of large blue granules which may obscure the nucleus. They are irregular in shape.

84. Acute Catarrhal Appendicitis.-----V.G.------Low.
Mucosa has great excess of goblet cells. In submucosa marked infiltration of round cells, both large and small lymphos. In outer part of submucosa is almost continuous zone of solitary follicles. The next zone is dense adult fibrous tissue, pr bably the result of a previous attack. Hyperemia of vessels in serous coat.

85. Chronic Interstitial Nephritis.------V.C.------Low.
Capsule thick, fibrous. Vessels are thick walled with fibrous tissue especially the arterial vessels. Capsule of Bowman too thick. Interstitial conrective tissue greatly increased. Some glomerules entirely fibrosed. Some cross sections of tubules show renal casts. A few tubules are dilated to begin to form renal cysts.

86. Chronic Biliary Cirrhosis of Liver.------V.C.------Low.
There is a marked excess of well formed red stained fibrous tissue in the perilobular region, clearly subdividing the lobules. This fibrous tissue extends into the lobule at times separating the individual cells. The vessel walls are thickened. A marked increase in the bile ducts, some poorly formed and showing only as rounded or longer collections of oval nuclei. The liver cells show pronounced fatty infiltration.

87. Chronic Biliary Cirrhosis of Liver.-----V.C.----Not drawn.
Much the same condition as in No.86. The distribution of the fibrous tissue is wider, more penetration into the lobule. Not so many newly formed bile ducts.

88. Miliary Tubercles of Kidney.-----H.E.-----High.
The kidney as a whole is the seat of a hypremia and cloudy swelling. Here and there are small rounded areas where on first examination the kidney substance seems to have been replaced by a mass of round cells. On closer inspection may be seen giant cells which are large irregular shaped cells with cytoplasmic processes extending out between the other cells and having many oval nuclei arranged either as masses near the center (younger forms- or about the periphery. About these giant cells is an irregular zone of epithelioid or endothelioid cells and then one of small lymphocytes. This is the typical arrangement of a young or miliary tubercle. In some of these areas is some granular necrotic material.

89. Miliary Tubercles of Liver.------H.E.------Low.
Here the tubercles are younger, the giant cells are more distinct and more numerous. The tubercles are mostly near the central veins but may be found anywhere in the lobule. Some hyperemia.

90. Miliry and Conglomerate Tubercles of Lung.---H.E.----Low.
The most prominent feature is the solid areas. The centers of these masses are granular or somewhat homogeneous red staining with perhaps a few blue chromatin granules. Outside this may be found a few giant cells, the endothelioids and lymphos. The lung adjacent to these areas is the seat of a catarrhal exudate in its alveoli. Considerable hyperemia.

91. Tuberculosis of Spleen (Miliary)------H.E.-----Low.
The miliary tubercles can be told from the rest of the spleen which is very much congested by their being rounded, of looser arrangement, and the giant cells. The same description before given holds for these.

92. Tuberculosis of Lung.------H.E.-----Low.
Here are both old and new tubercles. The old have considerable caseous material in their centers and show much chromatin dust as an evidence of karyorhexis. The newer tubercles are as usual about the periphery of the older ones. The giant cells show well.

93. Tubercular Ulcer of Ileum.-----H.E.----Low.

The part of mucosa remaining has considerable round cell infiltration in mucosa with goblet cells in excess. Some desquamation of epithelium. A distinct break in mucosa represents the ulcer. Its surface is made of small lymphos, some few polys with a few remnants of original tissue. Below this, occupying the place of the submucosa, muscular and subserous coats, are several well formed tubercular areas with much granular caseous material in the centers with some chromatin dust. The giant cells & epithelioids are outside of this. All along the serous side are caseous areas and these are covered with a layer of endothelia.

94. Advanced Tuberculosis of Lymph Node.---H.E.-----Low.

The section goes entirely thro the node. Capsule thick. All the node has been converted into caseous material around the margins of which has gathered a distinct zone of blue stained chromatin dust which has been washed out by the lymph stream. An occasional giant cell may show in the fibrous capsule.

95. Tubercular Epididymitis.-----H.E.-----Low.

No tissue of epididymis left. All converted into a granular red staining caseous material, at times arranged in rounded areas or masses with much chromatin dust. Few if any giant cells.

96. Chancre.------Polychrome Blue-----

Does not show well. A break in the squamous epithelia shows the ulcerated part of the chancre. Beneath this the tissue is crowded with round cells which are small and large lymphos, plasma, pseudoplasma and mast cells. All the endothelia are swollen and many of the smaller vessel are occluded. The epithelium adjacent to this is edematous, the cells are swoller and the interpapillary extensions are elongated and sharper. T There is also some hyperkeratosis.

97. Gumma of Lung.-----H.E.----Low.

The gumma is separated from the lung by a thick fibrous capsule and there is little catarrhal exudate in the adjacebt alveoli. The gumma is made up of granular material with chromatin remnants but is of looser arrangement and has more fibrous tissue remnants than a tubercular area. No giant cells are seen in this section.

98. Gumma of Liver.-----V.G.---- -Low.

A marked dense fibrous capsule separates the gumma from the liver tissue. Gumma shows granular yellow stained material with some fibrous remnarts. Considerable zone of small lymphos inside the capsule next the gummatous material. Liver shows fibrosis, especially periportally.

99. Syphilitic Hepatic Cirrhosis.------V.G.------Low.

Marked fatty infiltration. Excess of fibrous tissue in the perilobular areas and especially about the bile ducts. This may extend into the lobule.

100. Actinomycotic Granulation Tissue.-----H.E.-----

This granulation tissue does not differ from that previously studied. In some sections the areas of the ray fungus may show.

TUMOR COURSE, SOPHOMORE PATHOLOGY, 1906-1907.

1. Fibro-myoma Uteri.----------H.E.------High.
The section shows both fibrous tissue and smooth muscle cells, the latter lying in groups or masses and surrounded by bands of the fibrous tissue. The vessels are few, the walls are not properly formed in that they lack the proper amount of muscle in them.

2. Intracanalicular Fibroma of Breast.---V.C.-----Low.
Masses if fibrous tissue pushing into channels lined with low columnar or cuboidal epithelia. Tissue poorly supplied with blood vessels. Masses in canals either connected with the wall or free in the cavity, some contain ducts, others capillaries. Tendency to mucoid degeneration in places.

3. Intracanalicular Fibroma of Breast.-----H.E.-----Low.
Differs from the preceding only in that the masses of fibrous tissue are packed tighter in the canals.

4. Myo-fibroma Uteri.----------, --V.C.----Low.
Fibrous tissue is adult with long spindle nuclei, and may be a bit swollen and edematous. Muscle cells a few and show karyolysis and edema of nuclei. May be some long tubular glands lined with tall columnar epithelium (remnants of uterine glands. Vessel walls are thick with fibrous tissue.

5. Myo-fibroma Yteri.---------V.C.---------High.
Bands of fibrous tissue. Some muscle cells but fewer. Vessels in good number but walls abnormally developed. Areas of mucoid degeneration in which the fibers show transverse and longitudinal splitting, and many nuclei are naked. Numerous pseudoplasma cells along the lymph channels and in the degenerated parts.

6. Myxoma of Nose.---------H.E.---------High.
Much infiltration with leucocytes, bothlymphocytes and polynuclear Many blood vessels with distinct but poorly formed walls and prominent endothelia. The chief element is the mucoid connective tissue in which are many typical stellate cells with the mucoid intercellular substance.

7. Cavernous Angioma of Liver.---------H.E.---------Low.
One edge shows liver tissue. Next to this part are many large blood spaces filled with rbc and some leucocytes. These spaces are lined with endothelia, some of whicha are swollen, and their walls are fibrous. The blood in the spaces is much distorted in shape and the spaces vary much in size.

8. "Adenoid" of Tonsil.----------V.C.-------Low.
Lymphoid tissue with many germinal areas. Fibrous stroma in occasional thick bands which show differences in staining power. Vessels few and small, capillary hemorrhages in deeper parts, but not an important feature. Covered with stratified squamous epithelium with some crypts. Chief element is the hyperplasia of lymph tissue.

9. Adeno-fibroma of Breast.-------H.E.-------Low.
Basis of section is adult fibrous tissue, in places degenerating, i.e. stain poorly and fibrillae not made out. Gland tubules of compound racemose type lined with low cuboidal epithelia, proliferating and desquamating, at times filling the tubules. Gland walls incomplete. Blood vessels few, walls thick, endothelia swollen. Some fat cells. Chief elements are fibrous tissue and immature glands.

10. Acuminate Condyloma.----------V.G.-------Low.
Masses of epithelia, all squamous, arranged in many layers about slender fibrous bands. Epithelia along stroma well defined, show prick les, nuclei dividing, fragmented or edematous. That at greater distance shows tendency to fuse into a mass without prickles, nuclei karyolytic. Stroma well supplied with large capillaries and veins, consists of fi-broblasts and some lymphocytes. Chief element is the flat epithelia on branching stalks of fibrous tissue.

11. Papillary Adenoma of Cervix Uteri.---Eosin & Polychrome Blue---High.
Gland lumina lined with tall columnar epithelia. Cells loose from the walls in groups or rings. Nuclei swollen with chromatin in dots. Excess of mucus in lumina. Stroma of fibroblasts loosely packed and in-filtrated with round cells in places. This stroma shows a tendency to bulge into the gland lumina. Hemorrhage and clot on the edges but not in the lumina. A few vessels but are normal in structure.

12. Granulation Tissue.---------V.G.--------High.
Very similar to that given in former course.

13. Round Cell Sarcoma.--------V.G.--------Low.
This approaches the large round cell type. Cells about 2 or 3 times the size of polynuclear leucocytes. They show pleomorphism, i.e. varying shapes and sizes. Some nuclei fill the cell, others have a wide cytoplasm. The nuclei show hyperchromatosis, many are vesicular and fragmented due to inflammation. Cytoplasm in many places fused and in-distinct. Fibrillary intercellular substance, irregular, without cells along it, and scant in proportion to the number of cells. Vessels are imperfect channels, if they do have walls they are sarcomatous. Much hemorrhage and many pus cells.

14. Small Round Cell Sarcoma.---------H.E.-------High.
Tissue composed of round cells. Nuclei densely stained or vesicu-lar. Cytoplasm lacking about many nuclei. Intercellular substance is granular, scant, stains badly. Areas of degeneration in cells. Remains of previous vessels, chiefly arterial, with walls invaded by the tumor cells. Tumor's own vessels are atypical. Many hemorrhages.

15. Giant Cell Sarcoma of Tibia.--------V.G.-------Low.
Tissue wholly atypical and contains spindle, round and giant cells. Spindle cells not prolonged into fibers, nuclei hyperchromatic; least numerous element. Round cells mostly "large", have a narrow rim of cy-toplasm, often imcomplete, nuclei dense; numerous. Giant cells in all stages, of myeloid type, irregular in outline, nuclei dense and may be 100 or more to the cell. Intercellular substance in places granular, in others fibrillar. Vessels may be merely channels or with a few fibrilla about them but most of them are lined with endothelia.

16. Epulis.----------------V.G.----------Low.
One part of free surface covered by stratified squamous epithelia. This is very little modified, altho it shows an excess of prickle cells and the interpapillary processes are sharp pointed and branching. The rest of free surface is covered with a dark staining fibrin beneath which are many polys, many new capillaries and granulation tissue. As one goes deeper, the polys get fewer and the granulation tissue is bein replaced by spindle cells with a fair number of giant cells. The spin-dle cells have large hyperchromatic nuclei and while some of them run out into fibrillae, most do not. Giant cells are myeloid with many nu-clei and often seem to be shrunken & lie in open spaces. Intercellular substance mostly fibrillar but some granular. Some vessels with thick walls, some only spaces. Some adult fibrous tissue thro section.

17. Spindle Cell Sarcoma.----------V.C.--------High.

Tissue composed of two main types of cells, spindle cells and those less typical. The spindles are packed closely, so the tissue is too richly cellular. Nuclei are long ovals, in many the chromatin is granular. The cells do not run out into fibrillae. The less typical cells approach the round type. Vessels are scanty and without proper structure. Degenerated clots in some. Fibrillae dense in places, but not connected with the cells, scanty in proportion to cells.

18. Myxo-chondro-fibro-sarcoma, (Epulis)-----V.C.-------Low.

Free surface covered with granulation tissue and at one side a little squamous epithelium. The sarcoma part shows spindle cells with large hyperchromatic nuclei with comparatively little cytoplasm, the cells not forming fibrillae. Some granular intercellular substance and the blood channels are lined with hyperplastic endothelia. Some fairly good red stained fibrous tissue. Some fibro-cartilage in the depth. Also some mucoid connective tissue especially deep down on the edge and this shows a few stellate cells. The entire tissue has too many blood vessels and considerable hemorrhage.

19. Large Round Cell Sarcoma.-------H.F.------High.

Tissue richly cellular, with a minimum of stroma. Traces of a capsule on one edge and of fat outside this. A few persisting blood vessels with fairly good walls, when cut across their endothelia show hyperplastic. Bulk of tumor of round cells, many very large, their nuclei may be single or lobed or multiple, the latter making a small giant cell. Among these large cells are some small round and some spindle cells. A few lymphocytes thro the tissue.

20. Small Spindle Cell Sarcoma.---------V.C.------Low.

Tissue is very rich in cells which are mostly spindles. The nuclei are blunt, hyperchromatic, with large chromatin granules. Many cells run in parallel bands. Some areas of round cells which are probably the spindles cut across. Not many blood vessels but those present are merely endothelial channels.

21. Myxo-sarcoma.----------H.F.--------High.

Three elements present, fibrous tissue, round cells, and mucoid material. The stroma contains stellate and triangular cells and altered fibroblasts with delicate processes. Also a few vessels. Stroma in irregular alveoli. Cells chiefly degenerated and lie along the walls af the alveoli. In some a nucleus may still be found, others are formless and fused into irregular pink bodies. The mucoid material fills the balance of the alveoli and stroma spaces, in the former it has apparently liquefied and been removed in great part.

22. Melanotic Spindle Cell Sarcome.-------H.E.-----High.

Tumor tissue consists of spindle cells, many vessels, very little stroma. Large per cent of dark brown amorphous pigment, a little in the cytoplasm of the cells as light yellowish brown granules. The most of it is extracellular in masses. Necrotic areas may be seen. The intercellular substance is granular or finely fibrillar. Some hemorrhage.

23. Chondro-sarcoma.----------V.C.------High.

Tumor consists of fibrous tissue along the edge, areas of altered cartilage, and atypical spindle and round cells. The cartilage cells may have a single or double nucleus, large hyperchromatic, capsule well preserved. Cartilage basement substance is hyaline in some places approaching the fibrous type. The more sarcomatous part is made up of short spindle cells, large round cells, and a few giant cells, and has atypical blood spaces. Fibrillary and granular intercellular substance. Occasional small deposits of lime salts which stain a violet or blue.

24. Large Round Cell Sarcoma of Ovary.-----H.E.------High.
Large masses of deeply stained round cells. Divided by trabeculae. Cells of large round cell type, with hyperchromatic nuclei, cytoplasm relatively scanty. Among these are leucocytes in small numbers, lymphos large hyalines, polys. Intercellular substance granular, amorphous. Trabeculae show much degeneration, resembling coagulation necrosis. A few fibroblasts, especially about the vessels. Some trabeculae made of clot with much fragmentation of nuclei present. Vascular supply very poor, walls degenerated and very imperfect.

25. Fibro-lipoma.--------Orcein & Polychrome Blue.------Low.
Spheroid tumor covered by skin surface except at the point of attach ment. Each section represents half the tumor. Central portion is fat tissue with early mucoid change. Fibrous bands scattered thro this and denser just under the skin. Papillae of skin irregular in size and distribution. Vascular supply best in the denser part. The cells present are on the edge normal epithelium, but not all the layers of true skin found; under the epithelium, fibroblasts, rbc, lymphos, polys, pseudoplasmas, some plasmas, large monos, and connective tissue epithelioids; in the middle part fat cells, stellate, and some of the others.

26. Fibro-myxo-chondro-sarco-carcinoma.------V.C.------Low.
This is usually known as a mixed tumor of the parotid. The bulk of the section is dense fibrous tissue and mucoid connective tissue. In one corner are a number of connective tissue cells with an intercellular substance of a delicate fibrillar nature. The nuclei are large oval or elongated and the cells are rounded or spindle. Blood spaces are seen. In another portion may be seen groungs or cords of epithelia with distinct nucleus and nucleolus, with no intercellular substance nor any definite relation to a basement membrane. Some cartilage cells are seen.

27. Flat Cell Carcinoma below Knee.-----H.E.------Low.
One portion of edge shows some fairly normal surface epithelium. Deep down in the tissue lying in lymph spaces may be seen masses of flat epithelia with large hyperchromatic nuclei many of which show irregular mitotic figures. These cells are closely applied to each other without any intercellular substance. The part next the surrounding fibrous stroma have somewhat a columnar shape. In the central parts of many of these cell masses the cells are breaking down to form "pearly bodies" or whorls. These are red stained concentric ringed masses. In some of the lymph spaces the endothelial lining is still preserved.

28. Flat Cell Carcinoma of Penis.--------V.C.--------High.
The elements present are skin, subcutis, muscle , good vessels; tumor with flat epithelia derived from the reti pegs. Columns of flat cells invading the deeper parts thro the lymph spaces, this forms lobules or alveoli, or cell nests, which are the tumor in a stroma composed of normal elements. The cells of the tumor are large with large vesicular nuclei, with irregular chromatin masses, no prickles on edge, wide rim of cytoplasm, cells often polyhedral from pressure. No intercellular substance

29. Flat Cell Carcinoma of Skin.-------H.E.-------Low.
Some surface epithelia still good and with a normal relation to a basement membrane. Other masses and groups of atypical flat epithelia have invaded the lymph spaces. Not much tendency to form whorls.

30. Flat Cell Carcinoma of Cervix Uteri.-------H.E.------Low.
Irregular columns of atypical flat cells invading the lymph spaces. The cells along the walls are perpendicular to stroma and darker than te the others. Many dense whorls in the more slowly growing part. Stroma is of a dense fibrous tissue. Hemorrhages from the vessels of stroma.

31 a. Flat Cell Carcinoma of Clitoris.------V.C.------Low.
Many branching masses of flat epithelia, invading the lymph spaces. Some tendency to form whorls. Fibrous stroma in places densely infiltrated with leucos, chiefly small lymphos, to give it an appearance almost like a lymph node. Stroma of adult fibrous tissue with good blood vessels. Large nerve trunks some of which are fibrosed.

31 b. Flat Cell Carcinoma in Inguinal Node.----V.C.---Not drawn.
This is a metastasis from the preceeding. It differs from it only in that it is in a node.

32. Papillary Flat Cell Carcinoma of Ear.----V.C.-----Low.
Stroma consists of s tree of slender fibrous branches, well supplied with vessels which have hyperplastic endothelia. Many infiltrating lymphos. The paremchyma is made of flat atypical epithelia, with no prickles, cytoplasm fused in places, too many nuclei in places. The superficial epithelia is keratinized, much infolded, making a kind of whorl by desquamation when confined. The next layer in places has fine pigment granules. Deeper layers more atypical and show a tendency to invade the stroma. Note the large dense nucleoli.

33. Carcinoma in Ileum. V.C.-------Low.
This is a metastasis from a carcinoma of the pancreas. The tumor proper consists of columns of epithelia with large nuclei and comparatively little cytoplasm, following the lymph spaces and simulating pancreatic tubules. It is chiefly in the submucosa but a little is in the muscular coat and others are breaking the muscularis mucosa to invade the mucosa. Some degeneration of these cells. Good fibrous stroma. Fair vascular supply. Mucosa much infiltrated with lymphos, epithelia show mucoid change or desquamation.

34. Adeno-carcinoma or Adenoma Malignum of Rectum.---H.E.----High.
The fibrous and muscular tissue are invaded by carcinoma as tubules, the youngest solid, the older ones showing an irregular lumen. The chief points are gland lumina deep in the tissue where their presence is abnormal; epithelia resemble tall columnar and are not very anaplastic; severallayers of epithelia on some tubules; their nuclei are very hyperchromatic; they are polymorphous; are temporary, desquamating rapidly and breaking down into formless granular material with free nuclei.

35. Myxo-carcinoma of Rectum.--------H.E.-------High.
There is a fibrous framework some of which has the bluish stain of mucin (mucoid degeneration). This incloses groups of epithelia with large hyperchromatic nuclei mostly eccentric, a distinct cytoplasm in many filled with mucin. No intercellular substance, tho some of the mucin and granular debris may look like it. The vessels have distinct walls. There is a little definite mucoid connective tissue. Many small lymphos and polys have infiltrated the tissue. Some of the polys are eosinophiles.

36. Encephaloid Carcinoma of Prostate.-------H.E.------High.
No prostatic tissue left. Many small lymphos and polys. The fibrous stroma is very scant, the epithelial masses are broad and long. The individual cells are large, have much cytoplasm, hyperchromatic nuclei, many of which show irregular mitoses. Two or more nuclei may be in a single cell. No intercellular substance. The vessels run in the fibrous stroma and have immature walls.

37. Carcinoma of Tonsil.-------V.C.------Low.
Much fibrous tissue on one side? No lymphoid tissue left. The stroma of the tumor proper of adult fibroms tissue. Parenchyma of epithelia in groups or masses, have large nuclei, hyperchromatic with distinct nucleoli, comparatively little cytoplasm. No intercellular substance between the cells and the cells not closely applied to the limiting fibrous tissue.

38. Carcinoma of Pancreas.----------H.E.--------Low.
Tumor parenchyma made up of long columns of closely packed epithelia. Considerable cytoplasm, large hyperchromatic nuclei, irregular mitoses, cells loose from the fibrous tissue. Fibrous stroma in distinct bands with some mucoid degeneration.

39. Papillary Cystic Adeno-carcinoma of Ovary.-----V.G.------Low.
Dense fibrous stroma and capsule with many vessels with hemorrhage from some. Trabeculae of the stroma grow as branching papillae into the cavities. Lumina of various sizes, lined with low columnar epithelia with dense nuclei a varying amount of cytoplasm, one or more layers. These epithelia multiply locally and later the fibrous tissue grows into them. Many lumina have amorphous degenerated material. No basement membrane. Invasion of stroma, while it takes places at some points, is not marked.

40. Carcinoma of Breast.-------H.E.------Low.
Gland acini of various sizes and shapes, some lined by a single layer of columnar epithelia, others entirely filled by the rapidly multiplying cells. Thro out the fibrous stroma little masses of epithelia are seen. In many tubules, granular material represents an attempt at secretion. The fibrous stroma is infiltrated with small lymphos in places. The blood vessels have good walls. Some fat cells in places.

41. Fibro-carcinoma of Breast.-------V.G.-------High.
This is of the typo called "scirrhus cancer". The tumor is made up of dense degeberated fibrous tissue with very narrow spaces in it. There are a few vessels with thick walls. A dense infiltration of round cells in places. Proportion of stroma to cells is excessive. The epithelia lie in small groups in the spaces, in some are degenerated by pressure. Nuclei are dense, cytoplasm small.

42. Carcinoma of Breast.-------H.E.-------Low.
Rather large broad bands of fibrous tissue run thro the section and from these other smaller bands extend out between masses of epithelia. These latter vary much in size, the cells are large, have large hyperchromatic nuclei which often show many forms of irregular mitoses. The epithelia are closely applied to each other but not to the limiting fibrous stroma. There is no intercellular substance. Blood vessels in fair number but with good walls.

43 a. Medullary Carcinoma of Breast.------H.E.------Low.
The fibrous stroma is relatively very scanty, present many fibroblasts, has distinct vessels. The parenchyma consists of braid zones of large round or polyhedral cells, with hyperchromatic nuclei, at times vesicular, may show irregular mitoses. No intercellular substance. Many areas of red stained homogeneous material with many polys. The fibrous stroma also contains many polys.

43 b. Carcinoma of Axillary Node.----H.E.-----High.
Component parenchyma cells are similar to those in the preceding from which this has come by metastasis. The tumor cells have replaced almost all of the lymphoid elementsaltho the capsule of the node remains.

44. Early Endothelioma of Inguinal Node.----V.G.-----High.
Three chief elements; lymphocytes in masses, normal; leucocytes and rbc, inflammatory; large endothelia, the tumor. These endothelia occupy and fill the lymph channels, and are often disposed in bands about the germinal areas. They have large vesicular nuclei with dots of chromatin, much cytoplasm, closely attached to wall. No increase of stroma.

45. Fibro-endothelioma of Breast.- ------V.C.-------High.
Great deal of fibrous stroma some of which has undergone mucoid degeneration with the presence of stellate cells. This stroma incloses masses of cells with deeply stained nuclei, some elongated, some round, and all the masses show an intimate relation to the fibrous stroma, many being joined to it by little cytoplasmic processes which run out and lose themselves in the surrounding tissue. There is no definite intercellular substance and the vascular supply is scant.

46. Perithelioma.----------V.C.---------High.
Bulk of section is degenerated fibrous tissue and some blood clot, with remains of blood vessels. There are some masses of large irregular shaped cells with large hyperchromatic nuclei, some showing irregular mitoses. A little tendency to form a scant intercellular substance. Some of these masses can be seen surrounding the vessels and taking their origin from the perithelium. The cytoplasmic processes joining some of the cells to the surrounding tissue can be distinctly made out.

47. Hypernephroma. ----------V.C.--------Low.
The characteristic cell is large with much cytoplasm and a small nucleus in its center. These cells are joined directly to each other without an intercellular substance. Some blood spaces are seen.

48. Cyst of Broad Ligament.---------V.C.--------Low.
Large round open space lined with low cloumnar or cuboidal epithelium. This lies in a loose areolar connective tissue. It has arisen from some fetal remains in the broad ligament.

49. Polycystic Ovary.----------V.C.--------Low.
The section shows many cysts of various sizes all lined with cloumnar epithelium. These cells have a distinct small dense nucleus near the basement membrane. Many are goblet cells. The stroma shows many fibroblasts. The contents of the cysts are; degenerated desquamated cells, some leucos, granular and fibrillar substance, and in a few, some homogeneous material like colloid material.

50. Teratoma of Ovary.----------V.C.--------Not drawn.
Tissue does not stain well. Tissues present are: fibrous, muscular, epithelia in groups, representing glands, clot and leucocytes. The arrangement is wholly atypical.