

SO-CALLED HYPERTROPHIC TUBERCULOSIS OF THE INTESTINE.

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UNTIL within the last few years the fact was but little recognized that tuberculous lesions of the intestine occasionally give rise to more or less complete obliteration of the lumen of the gut, and even now references to this condition are but rarely met with, especially in American medical literature. To Hofmeister¹ belongs the credit of first directing general attention to the subject in a very thorough and complete article that appeared in 1896. This author succeeded in collecting the clinical histories of ninety-one instances of this disease, eighty-three of which had been operated upon. Those who are interested in the early bibliography of the affection are referred to Hofmeister's admirable paper. Since this time instances of the disease have been recorded by Lennander,² Claude,³ White,⁴ Pantolini,⁵ Besacon et Lapointe,⁶ Boschgrevink,⁷ Mayo,⁸ Strehl,⁹ Moniere,¹⁰ Hartmann,¹¹ and Gross.¹² To this list I desire to add the history of the following case. For the clinical record of this instance of the disease my thanks are due to Dr. D. E. Hughes, Chief Resident Physician of the Philadelphia Hospital, but, owing to the fact that the patient was in the insane ward, there is little in the history that bears directly upon the lesions in the intestine, which in connection with the generalized tuberculosis was the cause of death.

M. K., aged thirty-nine years, white, female, a native of Pennsylvania, was admitted to the Philadelphia Hospital on June 16, 1897, with the clinical diagnosis of imbecility and epilepsy.

Father died of Bright's disease and mother of heart disease.

For seven years the patient has been now and then in the outwards of the Philadelphia Hospital for epileptic fits and vertigo, and about two months before the present admission had erysipelas in the Medical Ward. The patient's habits have always been good. On admission she was thin and somewhat anæmic, but there was no evidence of organic disease, with the exception that the urine showed a specific gravity of 1014, contained amorphous urates and uric acid and considerable quantities of albumen; there is no record of casts.

A note made February 20, 1898, states that the patient's feet are œdematous and that the eyelids are puffy, and that there is beginning evidence of ascites.

March 3, 1898, ascites increased, but œdema of eyelids and feet lessened in amount. The patient is steadily failing.

April 26, 1898, ascites markedly decreased; œdema of feet and legs almost disappeared. She is brighter and cheerful. Urine 1010; alkaline. On microscopic examination there are found pus-cells and granular and hyaline tube-casts. Albumen is present.

June 20, 1898, ascites has disappeared. Liver greatly enlarged; its lower borders reach to umbilicus. Urine contains one-sixth the bulk of albumen. She sits up part of each day.

November 10, 1898, health fair with the exception of frequent bilious attacks. Mentally is irritable.

February 11, 1899, ascites has again appeared. Abdomen much distended. Urine contains quantities of albumen and casts.

February 27, 1899, failing steadily. Ascites much lessened.

March 9, 1899. Died to-day at 6.10 P.M.

Post-mortem held at 4.15 P.M., March 10, 1899.

Pathological Diagnosis.—*Nephritis and amyloid infiltration of the kidneys. Cirrhosis and amyloid infiltration of the liver. Tuberculosis of peritoneum. Atrophy of pancreas. Hypertrophic tuberculosis of small intestine, and amyloid infiltration of mucosa.*

Body of a much emaciated female. There is a slight œdema of feet. Abdomen distended. Post-mortem rigidity slight. The skin of the entire body has a slightly jaundiced appearance. The abdominal wall contains practically no fat.

On opening the abdominal cavity there are found 4050 cubic centimetres of an opaque, yellowish fluid of a specific gravity of

1020. The transverse colon is pulled downward and to the left, owing to an adhesion between the omentum and the small intestine at the mouth of the pelvis on the corresponding side. In the middle line the liver is twelve centimetres below the end of the sternum; in the right mammary line the organ is one centimetre below costal margin. Above, the liver extends to between the fifth and sixth ribs. Scattered through the entire peritoneum there are small, hard, almost transparent nodules, which vary in size from those which are barely discernible to others that are three millimetres in diameter.

Left pleura contains thirty cubic centimetres of blood-stained fluid, but the membrane is normal. Right pleural cavity contains the same amount of fluid, and its coat resembles that of the other cavity. Pericardium contains a small amount of blood-stained fluid. The membrane is normal. Heart is in normal situation. The heart is quite small. The heart muscle appears normal, but the subpericardial fat here and there shows mucoid changes. Left side is contracted, but the right is flabby. The aortic and pulmonary valves are normal. The left auriculoventricular opening admits three fingers, and the left three. The edges of the mitral valves are slightly thickened, but all of the other valves are normal. The endocardium of the left ventricle is somewhat thickened.

In the apex of the left lung there are a few recent tubercles. The lung is otherwise normal. The right lung is normal.

The spleen is bound to the surrounding tissues by old adhesions. It is somewhat enlarged, weighing 270 grammes; the organ measures sixteen centimetres in length. The capsule is here and there opaque and thickened. The organ is slightly lobulated. The substance appears normal.

Both suprarenals are normal.

The left kidney is smaller than normal, and appears more rounded than usual. The substance is resistant to the knife. The capsule is so adherent that it is impossible to strip it off. On section there is found a cyst two centimetres in diameter in the substance of the organ. It is almost impossible to discern the points at which the cortical and medullary areas meet. The substance is extremely tough. The connective tissues between the pyramids show mucoid change. With the exception that there are no cysts in it, the right kidney resembles its fellow.

Ureters and bladder are normal. Rectum is normal. Uterus is normal. The ovaries are white, fibrous, and atrophied.

Duodenum is normal. Its peritoneal coating contains numerous small tubercles. Pancreas is normal; weighs only forty grammes. On section it is found to be very tough; its fibrous tissue is evidently much increased. The surface of the liver shows numerous superficial scars. At all points the peritoneum contains small, transparent nodules, that vary in size from those that can barely be seen to others that have a diameter of three centimetres. The liver is decreased in size. Its surface presents the irregularities that are always observed in advanced cirrhosis,—the depressions being, however, in most cases, even deeper and wider than are usual in this disease. On section the substance is found very tough. All through the organ numerous large, thick bands of fibrous tissue are observed.

While the peritoneal coating of the entire intestinal tract shows the small nodules which were referred to in speaking of the peritoneum in general, the mucous coat appears entirely normal except in the ileum. In this part of the tract there are found ten points at which the gut is constricted (Fig. 1); just above each of these constrictions the intestine presents saccular dilatations. One of these constrictions, situated just above the ileocæcal valve, is so extreme that water could scarcely be forced through the small opening that still existed at the point; the gut ruptured just above the constriction while this was being done. In the serous coat covering these areas there are more of the nodules just mentioned than are found in other situations, and, in addition, a considerable deposit of fibrous tissue has occurred between them, giving the appearance of old scar tissue. At these points the thickened peritoneal coating of adjacent parts of the intestine have frequently adhered, the consequent kink in the intestine aiding considerably in decreasing the lumen of the gut where this occurs. On opening the gut the walls are found much thicker and tougher than normal; at the thickest portions the wall measures eight millimetres. These areas entirely encircle the inner wall of the intestine, and extend in a longitudinal direction from .5 to 8 centimetres. On the mucous surface these areas are raised above the neighboring healthy parts, and their edges are uniform and distinctly marked off from the healthy tissues.

Anterior to the ears the skull is very thick, being seventeen

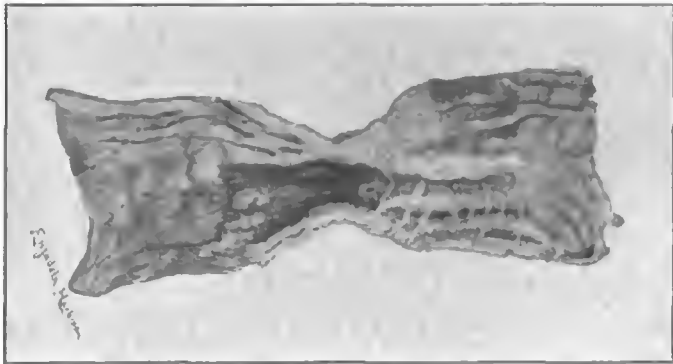


FIG. 1.—Section of ileum showing constriction.

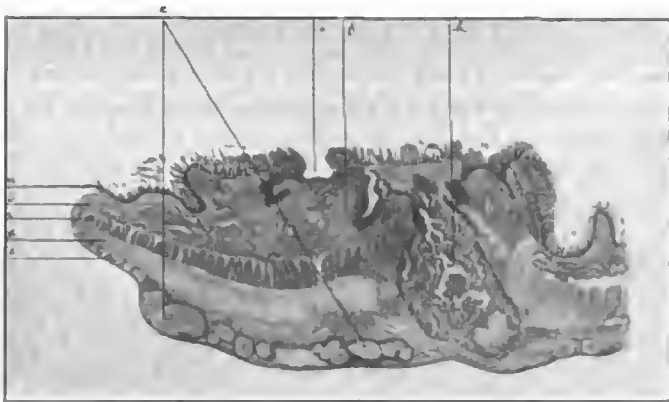


FIG. 2.—Section of the intestine under a very low power. Specimen fixed in Heidenhain's solution of mercury bichloride and stained with hæmatestin and eosin. *a*, mucosa; *b*, submucosa; *c*, circular muscular coat; *d*, longitudinal muscular coat; *e*, subserous coat, within which there are many tubercles (*g*); *h*, large tubercle; *f*, thickened submucosa; *i*, small superficial ulcer.

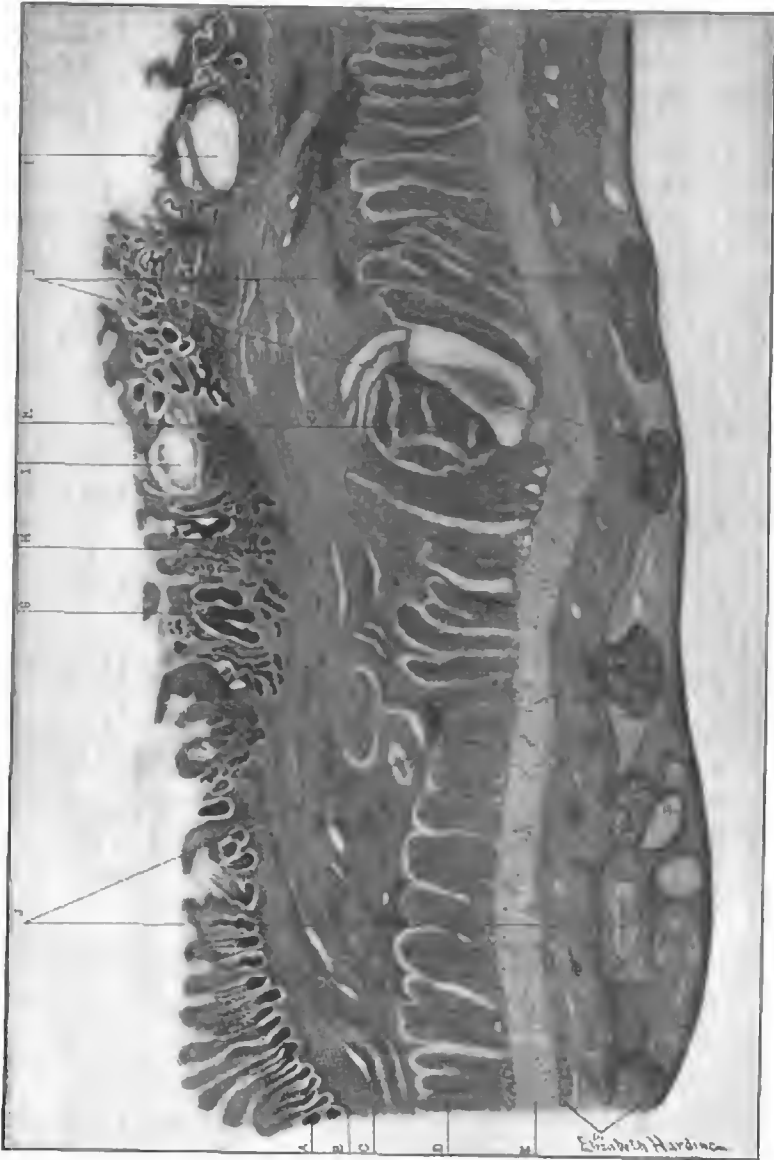


FIG. 3.—Section of the intestine at the edge of a constriction. Specimen fixed in Heidenhain's solution of mercury bichloride, and stained with carbol-toluidin blue and eosin. Beck, $\frac{1}{4}$ inch; oc., $\frac{1}{4}$ inch. *a*, muscularis mucosae; *b*, muscularis mucosae; *c*, thickened submucosa; *d*, circular muscular layer; *e*, longitudinal muscular layer; *f*, greatly thickened subserous coat, with numerous tubercles (*j*); *g*, hypertrophic crypts; *h*, dwarfed crypts; *i*, cysts; *k*, a large tubercle in circular muscular coat.

millimetres in thickness; posteriorly it is only five millimetres thick. The meninges are normal. There is perhaps more fluid in the subarachnoid spaces than is usual. The brain is very small, weighing only 950 grammes.

Microscopic Examination.—Pieces of tissue from all of the diseased areas in the intestine and sections from the kidney, liver, spleen, lungs, pancreas, diaphragm, and broad ligaments were fixed in Heidenhain's solution of mercury bichloride, and afterwards embedded in paraffin. Sections were stained with hæmatoxylin alone and with eosin, carmalum alone and with picric acid, carbol-toluidin blue with eosin, and carbol-toluidin blue followed by Unna's glycerin-ether mixture, acid orcein, and by the methods of Sanfelice, Van Giesen, and Weigert.

Intestine.—On microscopic examination the mucosa of the diseased areas is found to have undergone very marked and quite peculiar changes, although in no instance does this coat present a lesion which in any way resembles a well-marked and characteristic tubercle. At a short distance from the diseased areas the mucosa presents no alteration worthy of mention, except that the connective tissues and blood-vessels that go to make up the mass of the villi show marked amyloid change; in many of the villi the entire tissues have undergone this alteration. The tissues between the crypts also exhibit the change, but not to such an extent as in the villi. As the diseased areas are approached, the semilymphoid tissue that lies between the crypts of Lieberkuhn is seen to be increased in amount. This increase is due almost entirely to hypertrophy of the pre-existing collagenous tissue of the part; in addition there are, as should, of course, be expected, quite a number of fibroblasts, a few plasma cells, about the usual number of lymphoid cells, and here and there a small amount of amyloid infiltration. In this region there is no discernible change in the general character of the crypts of Lieberkuhn, or in the epithelial cells lining them.

Over the region of the greatest change the entire mucosa is elevated by the increase of tissue beneath. In these areas the crypts show most marked alterations, there being none present which can be regarded as entirely normal. The crypts are in some regions greatly decreased in number, while in others they are decidedly increased; these areas often alternate with each other, but in different sections one or the other not infrequently greatly predominates.

When they are fewer than usual, they are generally considerably wider and often longer than normal, and there is a comparatively wide opening in the centre, which is empty. From basement membrane to basement membrane they usually measure from 90 microns to 110 microns in diameter; the normal is from about 55 microns to 75 microns in diameter. The cells lining these glands are evidently in active proliferation, as there can be generally seen two or three rather indistinct layers piled one upon the other; the nuclei of all of these cells stain in a normal way; but it is notable that the protoplasm does not retain its affinity for basic dyes as in the healthy cells; this undoubtedly means that these cells are not engaged in the manufacture of the mucous secretion to which they normally give rise. These cells are frequently detached from their basement membrane. In exceptional instances the glands appear almost normal in every particular, but are never entirely so.

Belonging to this group of widened glands there are frequently present what appears to be cystic dilatations of these structures, but, very curiously, in no instance has a communication from a cyst to the free surface of the gut been discovered. They are oval in form, and their long axes are parallel to the mucous surface. These cysts vary greatly in size, some being but little larger than the dilated crypts above mentioned, while others are much larger; the largest are 210 microns wide by 500 microns long. They appear to be for the most part empty, or, at most, to have contained a fluid with but little solid matter; however, in some of them there is found a granular débris which is beyond doubt the remains of degenerated epithelial cells. The crypts are lined by epithelial cells which in every way resemble those in the dilated crypts before referred to, with the exception that they do not appear to be in such a state of rapid proliferation, and are more frequently detached from their basement membranes. Between these enlarged crypts and between them and the cysts there is, as a rule, a very considerable increase in the amount of collagenous tissue, and, in addition, there are many fibroblasts and quite a number of lymphoid and plasma cells. In some places a slight degree of amyloid infiltration is found. In many instances there is so much collagenous tissue and so many cells between the enlarged crypts that there are wide intervals between them. In these instances there is generally no epithelial covering of the

surface of the intervening tissue,—the collagenous tissue forming the free surface of the intestine at these points. The cysts are not infrequently covered over by a very thin layer of fibrous tissue, on the free surface of which there are no epithelial cells. The blood-vessels of this collagenous tissue are very small and few in number, and in no instance appear dilated. It is, however, notable that the walls of those vessels which are present show considerable collagenous thickening.

In those areas above referred to in which the number of crypts are increased, the mucosa is considerably thicker than normal. This thickening is the result of an increase in the crypts, which, though smaller than normal, have often proliferated to an enormous degree, and have branched and grown in every direction. In the majority of instances they have not penetrated beneath their basement membrane; but in a few sections glandular structures belonging to this group were actually found in the submucosa just beneath the muscularis; the explanation of this must be that there is in the near vicinity a small ulceration extending down beneath the muscular coat of the mucosa, and that the glands have grown down the edges of this ulcer into the tissues beneath. The crypts vary in diameter from 35 microns to 45 microns. These measurements are also from basement membrane to basement membrane. In the centres of the glands there are lumina which are in most instances entirely empty, but in some cases they contain masses of more or less degenerate epithelial cells. All of the crypts are, or have been, lined by glandular epithelium. In most instances the cells are attached to the basement membranes in a perfectly regular manner, but in others they are detached and lie in the lumina of the crypts to which they belong. The cells do not show in these smaller crypts that tendency to proliferate which was observed in those lining the larger ones, there being no more than a single layer of cells observed at any point within them. The cells themselves vary considerably in form; in the majority of instances they are distinctly columnar, but in not a few of the crypts they are so short that they are almost, and in many cases are, entirely cubical. The nuclei, as in the normal cells, are situated near their attached ends and stain in the usual way. As in the cells lining the enlarged crypts, the protoplasm of these cells do not here take the basic dye, as a rule, but, occasionally, exceptions to this rule are seen; and in these

instances all of the cells lining a crypt show a perfectly typical basophilic reaction. There is very little tissue between the crypts last described, they lying in most instances almost in direct contact with each other; but they are, of course, always separated by more or less collagenous tissue, with which there may be occasionally seen an elastic fibril. Within the tissue there are a few lymphoid cells and, very rarely, a plasma or connective-tissue cell. There are very few blood-vessels in the tissue, but here and there a small vessel may be seen, the walls of which show more or less thickening, as a result of the deposit of newly formed collagenous tissue.

The muscularis mucosæ cannot be detected beneath the mucosa in those situations where it is greatly altered, be the alteration what it may; the coat seems entirely replaced by newly-formed collagenous tissue, which is so irregularly deposited that the lower surface of the crypts presents a very irregular outline.

The mucosa is in some situations partially or entirely ulcerated away; these ulcers are in all cases so small that they can only be detected by means of the microscope. They seem to be the result of several more or less separate and distinct processes. Perhaps the most frequent form is that which is due to caseation and destruction of the underlying tissue from the tuberculous process. When this happens, the tubercle begins in one of the lymph nodes which lie within and under the mucosa, or in the submucosa, and, gradually extending, the blood supply is in a greater or less degree cut off from the superficial tissue, which also in the course of time becomes tuberculous, and they ultimately entirely give way; from this there results an ulcer opening upon the free surface of the gut. As would be expected from the method of their formation, these ulcers have always undermined edges, and often extend down to the circular muscular coat or even deeper. The overhanging edges are also in a great degree due to the muscularis mucosa, which here, as in other ulcerative intestinal affections, retards the necrotic process through its inherent power of resisting diseased producing causes. As a rule, the crypts that are in the vicinity of these ulcers show marked degenerative changes; the epithelial cells lining them are not attached to their basement membranes in a normal way, and the cells themselves are swollen, irregular in form, and show a tendency throughout the nucleus and protoplasm to stain with acid

dyes. However, in some instances they are almost normal. Occasionally these cells have grown down the edges of the ulcers into the submucosa; they then form a stratified layer, usually on one side only of the ulcer, and the cells, while showing pronounced degenerative changes, are often in a better state of preservation than those of the neighboring crypts. The entire floor of the ulcer is never covered by these cells; as they grow downward into the submucosa they become more and more degenerate, until finally they terminate in a layer of granular detritus, which evidently represents them in a state of complete degeneration. As has already been mentioned, they may nevertheless, in some cases, form crypt-like bodies in the submucosa.

The walls of these ulcers, when not covered by epithelium, are made up first of a layer of granular débris and semidegenerate cells, and, deeper into the tissues, by a layer of collagenous tissue, that contains numerous lymphoid cells, many plasma cells, quite a number of fibroblasts, and a few polymorphonuclear leucocytes and mast-cells. The tissue is almost without blood-vessels. In the layer of granular débris a few bacteria are found, but by no means so many as would have been expected. The muscularis mucosa which forms the roofs of these ulcers show, especially at the points where it is ulcerated through, decided alterations; the coat is swollen, the muscular fibres do not fully show their longitudinal striation, their nuclei do not stain well, and between the fibres there are great numbers of lymphoid cells.

The other varieties of ulcers are the results of necrosis of the diseased mucosa, whether this be of the one kind or the other which has already been described. Ulcers are also sometimes seen which appear to be the result of rupture of the cysts or of ulceration from without into them.

In the former instance the resulting ulcer is superficial, the edges are not overhanging, and the floor is made up of a very thin layer of granular débris, beneath which are the lower ends of the crypts and the various tissues that are present in those parts of the diseased mucosa where ulceration has not occurred. In rare instances the ulceration extends down to the point where the muscularis is present in the normal intestine, but, as already mentioned, this coat being generally absent where the mucosa shows pronounced changes, it would not be strictly accurate to

say that the ulcer extends to this coat; but it is noteworthy that the ulcerative process does not generally extend deeper.

Those ulcers that seem to have been caused by rupture of the cysts are quite small, oval in form, and lie within the mucosa; they sometimes extend down to the muscularis, or the tissue that represents it, and usually they present edges that slightly overhang the body of the ulcer.

In the diseased regions the submucosa is considerably thickened. This is the result of an increase in the amount of collagenous tissue and to the presence of great numbers of cells of various kinds between the fibrils of the tissue; in addition, there are found within this hypertrophied tissue small tubercles.

In the region most diseased, the collagenous tissue fibrils do not, as in health, run parallel with the surface of the gut, but pass from the muscular coats towards the mucosa in an oblique direction, and sometimes almost directly transverse to it. Between the bundles of collagenous tissue there are quite a number of elastic fibrils, but there does not appear to be an actual increase in the tissue; the fibrils seem to be more widely separated than in health, owing to the increase of the collagenous tissue between them. Within these tissues there are many swollen connective-tissue cells, and in addition great numbers of lymphoid cells, numerous mast-cells, a few plasma cells, and here and there a polymorphonuclear leucocyte. The blood-vessels of the submucosa are not increased in number. The outer coats of these vessels are in almost all cases more or less thickened, but they do not in any instance exhibit an increase in the number of cells contained within them. Some of the smaller arteries show in a marked manner the changes of endarteritis obliterans. The lymph spaces and channels are dilated, and often contain great numbers of lymphocytes.

The tubercles within the submucosa are in every way typical. Around their edges are collections of lymphoid cells, with many mast-cells and a few plasma cells; next comes a layer of swollen connective tissue and the lymphoid and giant cells, and, finally, a centrally located and cheesy area. In properly stained specimens a few tubercle bacilli were found in and around some of these tubercles.

The fibrous septa that separate the various bundles of muscular tissues are in the diseased regions somewhat thickened, and there are present swollen connective-tissue cells, lymphoid cells,

many mast-cells, and a few plasma cells. The bundles of muscular fibres are often greatly displaced and distorted by tubercles encroaching upon them from both the submucous and subserous coats; in some instances those tubercles actually penetrate within the smaller coats. More rarely a tubercle is seen that evidently had its origin within the muscular coat itself,—that is, in the delicate bundles of fibrous tissue that most probably bind them together. These tubercles make, in the majority of instances, but little progress, as the muscular tissues here exhibit their well-known resistance to disease-producing causes. Some of the tubercles are surrounded by a thin but compact layer of fibrous tissue, and have evidently ceased to grow; the enclosed portions consist of cheesy material with a few nuclei that still possess basophilic properties. The other tubercles resemble those found in the submucosa, with the exception that there are found fewer lymphoid cells around them, and, as a rule, more fibrous tissue. The individual muscular fibres are separated from each other immediately around these tubercles by lymphoid, plasma, and mast cells. In a solitary instance a tubercle extending from the muscular coat into the subserous and submucous coats was found that had become secondarily infected by pyogenic micro-organisms; in the centre of the tubercle, mixed with some cheesy material, there were numerous polymorphonuclear leucocytes, while just external to these were many greatly swollen connective-tissue cells. In specimens stained with toluidin blue and differentiated with glycerin ether there were found numerous cocci in the cheesy material between the polymorphonuclear leucocytes that were stained of a purplish hue; these cocci often occur in pairs, but more often are arranged in such masses as the staphylococci usually present in tissues.

The enlarged connective-tissue cells above mentioned have an oxyphilic protoplasm in which there are many large vacuoles; their nuclei are vesicular and take the basic stain fairly well; they are always situated at one side of the cell, never in the centre. These cells have diameters ranging from 5 microns to 12 microns.

The subserous coat is greatly thickened. This is a result of an increase in the collagenous tissue and of a great increase in the number of cells of the part, and, in addition, this tissue contains a great many small tubercles.

The collagenous tissue is notably increased in the vicinity

of the tubercles, around many of which it forms in ill-defined capsules. The tissue contains a considerable number of elastic fibres, many of which appear to be of new formation.

The general tissue contains large numbers of lymphoid cells, a considerable number of plasma and mast-cells, many swollen connective-tissue cells, and a very few polymorphonuclear leucocytes. The lymphocytes and plasma cells are especially numerous around the tubercles and along the peritoneal border, while the connective-tissue and mast-cells occur in greater number away from the points where the pathologic alterations are most marked.

The blood-vessels are not more numerous than usual; their outer walls are distinctly thickened. The lymphatics are dilated and filled with lymphoid and plasma cells.

The tubercles resemble in every way those found in the submucosa, with the exception that there is around their outer borders more collagenous tissue; these tubercles are evidently quite old, and were in all probability the primary lesions.

The Liver.—The normal liver substance is largely replaced by material that is evidently amyloid, since it gives all the reactions of this substance. This material is not deposited in a regular manner,—it replacing in many situations the liver-cells almost entirely, while in others the substance of the organ is almost normal. It is also observed that not only does the amyloid substance show no tendency to deposit first in the “middle zones” of the liver lobules, but in the beginning the “outer zones” are usually involved before any other parts of the lobules, and from this point the process gradually advances towards the centre. This advance is not a regular one, but the material forms here and there in small, irregular rounded, or oval masses, and, these gradually increasing in size, finally coalesce with neighboring collections of the same kind, the intervening liver substance being apparently destroyed by a process of pressure atrophy. In the beginning these masses seem to form in the walls of the delicate vessels between the liver-cells, but in a short time they are so increased in size that they obstruct the lumina of these vessels, and then the liver-cells surrounding them gradually atrophy and disappear. In every field many liver-cells in all stages of pressure atrophy may be seen. The nuclei of the liver-cells seem in all cases to disappear after the protoplasm of the cells. In many situations bands of newly-formed fibrous tissue are observed. These bands

usually pass off from the larger septa that normally course through the organ; in them many lymphoid cells are encountered mixed with a few plasma cells, and quite a number of fibroblasts. The branches of the hepatic artery show everywhere great hypertrophy of their muscular coats, and their adventitiæ are much thickened as a result of the formation of fibrous tissue.

The bile ducts appear normal.

The Kidneys.—The capsules are much thickened as a result of the formation of fibrous tissue within them. From the capsules irregularly wedge-shaped masses of fibrous tissue pass inward, which contain many lymphoid cells, numerous fibroblasts, quite a number of mast-cells and a very few plasma cells. As these bands pass inward, they break up into smaller ones that penetrate deeply into the substance of the organ. In the cortical region the tubules are almost entirely replaced by this newly formed fibrous tissue: but here and there a tubule persists which is so constricted that it is not more than one-half or one-third as large as the normal, and frequently contains, in addition to the epithelial cells, hyaline tube-casts, or granular débris. A little farther inward the fibrous masses alternate with areas in which the tubules are for the most part enormously dilated; these tubules sometimes measure 50 microns in diameter. The epithelial cells lining these dilated tubules are distinctly flattened.

The capsules of the Malpighian bodies have, in most cases, undergone more or less fibrous thickening. The epithelial cells lining the open spaces within these bodies usually show a certain amount of catarrhal change. The walls of the blood-vessels of the glomerules universally show most marked amyloid change, but the number of nuclei in these bodies does not appear to be in any degree diminished. The middle coats of the walls of all of the vessels of the kidneys are thickened, and, in most cases, show pronounced amyloid change.

The Pancreas.—The changes in the pancreas are limited to small tubercles which here and there begin in the capsule, and occasionally extend downward a short distance into one of the septa which pass in from the capsule. The vessels of the pancreas show some thickening in their middle coats, but in no case was amyloid material demonstrated.

The Diaphragm.—The entire under surface of the diaphragm has ulcerated away, and this aspect of the muscle is lined by a

layer of degenerate cells, which, in most places, exhibits typical cheesy transformation in the more superficial portions. At the margin of the cheesy areas there are many giant cells showing the typical arrangement of nuclei around their peripheries. It is noteworthy that these cells are in almost all cases oval in shape, and that their long axes are perpendicular to the advancing process. Around these giant cells, and still deeper beneath them, the subperitoneal coat is thickened, owing to the formation of fibrous tissue; within this area there are multitudes of lymphoid cells, many fibroblasts, a few plasma cells, and an occasional mast-cell. The smaller blood-vessels are generally somewhat dilated. The muscle of the diaphragm is practically normal, there being only here and there a few lymphoid cells between the fibres.

Specimens from the abdominal wall and from the broad ligaments were also examined, and all showed on the peritoneal surfaces small but perfectly typical tubercles.

Inasmuch as this variety of tuberculosis has been but seldom referred to by American writers, it may not be without interest for me to direct attention to some of the more important features of this affection which I have been able to gather from my study of the literature.

Etiology.—Hypertrophic tuberculosis of the intestine is a disease that occurs in both sexes with about equal frequency; out of ninety-one cases that I have collected forty-seven were females and forty-four males. The disease is most common between twenty and forty years of age, but is occasionally seen in both younger and older people. It is noteworthy that in no instance was the malady observed before seven years of age, indicating that the affection is, as compared with the ordinary form in children, quite rare, or that the diagnosis is but seldom made. In most instances the family and personal histories of those suffering with the disease have not been accurately recorded, but in quite a number of cases there was tuberculosis in some of the other organs of those affected. Eisenhardt found tuberculosis of the intestine 566 times out of 1000 post-mortems made in Munich, and out of this large

number of instances of intestinal tuberculosis the hypertrophic form was observed in only nine cases.

Morbid Anatomy.—The pathologic alterations found in instances of this disease resemble upon the whole those observed in ordinary tuberculosis of the intestinal tract. The peritoneum in the vicinity of the lesions usually contains many minute tubercles, causing the adhesion of neighboring coils of intestine to each other, and not infrequently to the omentum. These tubercles are always most numerous in the subserous coat adjacent to the intestinal lesions. When the gut is opened, its lumen is found more or less constricted,—this condition, in some instances, being scarcely perceptible, while in others complete occlusion is found. The tuberculous area is generally pale in color, and on section is found to be exceedingly tough. The microscopic changes consist essentially in the formation of small tubercles in all of the intestinal coats, with the production of scar tissue around them, and with the development on the mucous surface of many atypic and irregularly formed crypts. Above the lesions the intestine is to a greater or less degree dilated; this expansion is produced by the accumulation of fæces above the strictures, and forms a considerable portion of the tumors which are so commonly found in the living subject. The muscular walls of the gut in these situations sometimes show marked hypertrophy resulting from the constant attempt to drive the fæces through the stenosed intestine. In quite a number of instances the intestinal wall has given way, and fistulous tracts communicating with the external surfaces of the body have formed. In a remarkable case recorded by Gross,¹² the lymph nodes of the submaxillary, cervical, axillary, and inguinal regions were greatly enlarged, and at the post-mortem the mesenteric lymph nodes were likewise found to be enormously swollen, resulting in marked compression of the vena cava and the production of ascites.

Symptomatology.—The irregular character of the clinical manifestations of this affection makes it necessary to describe separately its peculiar features (*a*) during the attacks when the

patient suffers from the symptoms of intestinal obstruction, and (b) the intervals between them.

(a) The symptoms observed during the attacks have been very similar in all instances. Of these colicky pains are the most frequent, occurring to a greater or less degree in all instances. In a considerable number of cases constipation has been observed in the beginning of the attack, this to be quickly followed by diarrhœa; blood has been found a few times in the stools. During the attacks, borborygmi are almost invariably observed, there being often a very loud, gurgling noise that can be heard at a very considerable distance from the patient. At these times the movements of the intestines may be very distinctly felt, and in many cases clearly seen. Vomiting is also a symptom that is quite common, being in extreme instances fæcal in character. The abdomen is commonly swollen, and palpation generally reveals the presence of a tumor which is in the region of the ileocæcal valve in an overwhelming majority of instances. These swellings offer considerable resistance to the hand, are but slightly movable, and are usually quite tender. In all cases where the disease is suspected, the presence of a tumor is of great diagnostic importance, the clinical picture of the affection being incomplete without it. In addition to the symptoms that are more directly referable to the diseased intestine, anorexia, rapidity of the pulse, and irregular elevation of the temperature are quite common. In a number of instances the patients have suffered from pulmonary tuberculosis. As complications, hæmorrhoids have been observed several times, two of the patients had floating kidney, and convulsions have also been noted in one or two instances.

(b) In the intervals between the attacks the patient may be in fairly good health, though in a vast majority of instances they suffer from digestive disturbances sometimes accompanied by vomiting, and pains of a colicky character are frequently complained of. These pains may come on at intervals of months, or may be quite constant, and as the time is approached when a severe attack is beginning they may be

almost continuous. At these periods constipation is the rule, but not infrequently alternates with diarrhoea. Just before a severe attack the abdominal tumor is generally quite pronounced. These symptoms may exist in a mild form for a long period of time without exciting suspicion on the part of the patient that he is suffering from a grave malady. In one instance recorded by König the disease had existed nine years before a physician was consulted.

Diagnosis.—Perhaps in no part of the body does tuberculosis offer such an encouraging field for operative work as in the intestinal tract, since, on account of the anatomical character of the gut, the disease can here be most completely and thoroughly removed. While this is true of tuberculosis in general, it is particularly so of the so-called hypertrophic form, for the very fact that newly formed fibrous tissue is produced in considerable quantity is an evidence of the resisting power of the organism; and as a consequence the diagnosis becomes a matter of much importance.

In all forms of intestinal obstruction there occur certain symptoms more or less characteristic that first direct the attention of the clinician to the probable nature of the disease, and, as there are a great number of different causes that may give rise to occlusion of the tract, the diagnosis often presents very great difficulties. Fortunately for us in this connection it is rare where the stenosis resulting from chronic tuberculosis could be mistaken for the much more common acute causes of this condition; the symptoms of the latter come on with great suddenness, as a rule, thus differing from those produced by the lesions of tuberculosis, and, generally speaking, each form presents certain peculiarities that serve to distinguish it. Thus, for example, intussusception is most common under ten years of age; twists and knots are usually seen in the latter half of life, and occur most commonly in the sigmoid flexure of the large intestine; in occlusion by foreign bodies the history generally points out the true character of the condition, and motor paralysis of the gut usually follows blows or operations upon the abdomen. It should never be forgotten

that herniæ frequently produce occlusion of the bowel,—the condition and the symptoms produced by them coming oftentimes with great suddenness,—but in almost all instances the diagnosis can be made by a careful examining of the regions in which these conditions develop. It is of value, also, to remember that collapse is, as a rule, greater in acute cases than in the chronic ones, and that in the former visible peristalsis is rarely, if ever, observed. Acute peritonitis may simulate intestinal obstruction, but the history, in connection with the almost invariable presence of fever, will in most instances make the diagnosis clear.

Of much more importance is the differentiation between the various forms of chronic intestinal occlusion. Under these circumstances the symptoms develop much more slowly; the patient gives a history, as a rule, of alternating attacks of diarrhœa and constipation, and colicky pains are almost without exception complained of. The fæces sometimes contain blood and pus. During the attacks of constipation preceding the diarrhœa, the region in which the intestinal obstruction is present becomes tender and quite painful, gas collects above the occlusion in considerable quantity, and after the muscular coats of the intestine become hypertrophic the rhythmic peristaltic contractions can be very plainly seen, the movement finally dying away just above the site of the stenosis; loud gurgling noises may be frequently heard while these contractions are in progress. Of much more importance is the presence of a tumor which occurs in many forms of intestinal occlusion. When the obstruction finally becomes complete, the sufferer complains of great pains, quickly followed in almost all instances by vomiting, which becomes bilious, and later of a stercoraceous character, to be followed by collapse and death if the condition be not relieved.

When we meet with such a combination of symptoms, it is our duty immediately to make a complete and thorough examination for hernia; if the condition be found, and if it be reducible, we should still consider the possibility of it being at the bottom of the trouble if relief does not follow the re-

placing of the gut in the abdominal cavity, since there are many instances on record where adhesions have formed in the neighborhood of old herniæ, giving rise to occlusion of the intestine.

Of the remaining causes of chronic obstruction it is not improbable that hypertrophic tuberculosis is the most frequent, if the statistics of Eisenhardt, of Munich, can be relied upon, he having found nine instances of the disease in 1000 post-mortems. Carcinoma is perhaps, on the whole, not so common, since, according to Nothnagel,¹³ this disease was found in 343 times out of 41,831 post-mortems in Vienna. While it is perhaps in some instances impossible to make the diagnosis between the two affections, we should be able to do so in the majority of instances. Carcinoma occurs in the latter half of life, while the great majority of instances of hypertrophic tuberculosis that have been recorded were found in individuals between twenty and forty years of age. Of the 343 cases of carcinoma of the intestine occurring in Vienna, just referred to, seven were in the duodenum, ten in the ileum, 164 in the colon, and 162 in the rectum; it being thus seen that in almost 50 per cent. of instances of the disease the lesion is found in the rectum, and that the affection is almost limited to the large intestine. Tuberculosis, as is well known, occurs in the lower part of the ileum and beginning of the large intestine in an overwhelming proportion of cases; out of ninety-six cases the disease was found sixty-three times in the region of the ileocecal valve (in the appendix twice), twenty-two times in the small intestine (almost entirely in the ileum), and eleven times in the large gut. It is noteworthy that there is but one instance where the lesion occurred in the sigmoid flexure and but one in the descending colon; there is no record of the disease ever having occurred in the rectum. In both of the affections under consideration a tumor is not uncommonly found. In doubtful cases the presence of tuberculosis in the lungs or other parts of the body associated with anæmia, exacerbations of temperature, and rapid pulse may serve to make the diagnosis probable, while a profound cachexia not accom-

panied by elevations of temperature, but rather by a tendency of the body heat to be lower than normal, may be of value as indicating cancer.

Old ulcers of the intestine occasionally heal, and the scar that forms sometimes causes a greater or less constriction of the gut. Instances of this kind have been observed as a sequel to the so-called fæcal ulcers occurring in the large intestine, to syphilis, and very rarely to round ulcers in the duodenum, and to the lesions of dysentery and typhoid fever. While we cannot usually diagnose a stenosis resulting from any one of the above-mentioned causes, the absence of the signs of general tuberculosis usually makes it extremely probable that the lesion is not of this character. Of the different varieties of stenosis just referred to, the syphilitic form is certainly the most important. The disease is almost entirely limited to the rectum, and very curiously occurs in women in an overwhelming proportion of cases. Poelchen has advanced the theory that the disease is not always syphilitic, and that it results in women from gonorrhœal infection of the glands of Bartholin, with the later formation of scar tissue extending into the rectum.

Membranous colitis may be mistaken for this disease, an instance of which I have recently seen; but this error is not admissible after the membranes are passed. It is perhaps not generally recognized that in mucous colitis the membranes may collect and cause obstruction of the bowel. The first authentic record of a case of this disease occurred in the Ambassador of Charles V to France, and death resulted from the accident just referred to; we owe to Fernelius¹⁴ the description of this case.

Adhesions are not uncommonly found around the intestinal tract, and by constriction gradually produce more or less occlusion. This generally results from peritonitis produced by operations, perityphlitis, appendicitis, and inflammatory conditions of the Fallopian tubes. As has been before remarked, bands of newly formed fibrous tissue may be also produced in the neighborhood of herniæ. The history, with a careful

examination, and the exclusion of tuberculosis in other parts of the body, will in most instances prevent error in cases of this kind.

Impacted fæces sometimes cause the symptoms of occlusion. The tumor that results from this condition is soft and doughy, somewhat movable and comparatively painless, and its size and shape change after movements of the bowels. The mass can generally be made out clearly by a digital examination of the rectum.

From the stand-point of diagnosis and from the view of possible operative procedures, the location of a stenosis of the bowel is of much importance. While it is impossible to go into the matter thoroughly in this paper, the article will not be complete without some reference to this very important subject. The following points will be of service in determining the situation of these lesions: Where the obstruction is high up in the intestine, the abdomen does not, as a rule, become greatly swollen; it should not, however, be forgotten that collections of gas may form below the constriction, and in this way obscure the diagnosis. If the lesion be situated in the large intestine, the gut becomes enormously distended, and on account of its greater size we may in some instances be able to determine that it is not the small intestine; the large gut, on account of the nature of its attachment, is somewhat more movable than the coils of small intestine. Nothnagel says that in cases of stenosis of the large intestine he has been able to make out pronounced resonances in the region of the distended gut in the posterior lumbar area. Visible peristalsis may occur in stenosis of either the large or small intestine, but it is usually more rapid in the latter. In the lesions occurring in the neighborhood of the sigmoid flexure, one-sided meteorism is sometimes very pronounced,—the distended intestine being plainly visible when the abdomen is bared. Where blood is found in the stool, and where tenesmus is marked, the lesion is most likely situated in the large intestine. When vomiting comes on early and is persistent, the lesion is commonly present in the small intestine, though exceptions to this rule not un-

commonly occur. If indican be found in quantity on the second or third day after symptoms of occlusion come on, it is very probable that the disease is located in the small intestine; the continued absence of this substance would mean that the lesion was located in the large gut.

Prognosis and Treatment.—Medical treatment can, of course, be of no avail in this malady, an operation being absolutely necessary in order to effect a cure, or even to prolong the patient's life. The statistics as regards operative interference are, upon the whole, encouraging,—sixty cases have been cured and four improved out of a total of eighty-eight operated upon.

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