shortened. There are instances of chronic peritonitis in which the mesentery is so shortened by this proliferative change that the intestines form a ball not larger than a cocoa-nut situated in the middle line, and after removal of the exudation can be felt as a solid tumor. The intestinal wall is greatly thickened and the mucous membrane of the ileum is thrown into folds like the valvulæ conniventes. This proliferative peritonitis is found frequently in the subjects of chronic alcoholism.

In all forms of chronic peritonitis a friction may be felt usually in the upper zone of the abdomen.

In some instances of chronic peritonitis the membrane presents numerous nodular thickenings, which may be mistaken for tubercles. They may be scattered in numbers on the membranes, and it may be extremely difficult, without the most careful microscopical examination, to determine their nature. J. F. Payne has described a case of this sort associated with disseminating growths throughout the liver which were not cancerous. It has been suggested that some of the cases of tuberculous peritonitis cured by operation have been of this nature, but histological examination would, as a rule, readily determine between the conditions. Miura, in Japan, has reported a case in which these nodules contained the ova of a parasite.

(*d*) **Chronic Hæmorrhagic Peritonitis.**—Blood-stained effusions in the peritonæum occur particularly in cancerous and tuberculous disease. There is a form of chronic inflammation analogous to the hæmorrhagic pachymeningitis of the brain. It was described first by Virchow, and is localized most commonly in the pelvis. Layers of new connective tissue form on the surface of the peritonæum with large wide vessels from which hæmorrhage occurs. This is repeated from time to time with the formation of regular layers of hæmorrhagic effusion. It is rarely diffuse, more commonly circumscribed.

V. NEW GROWTHS IN THE PERITONÆUM.

(*a*) **Tuberculous Peritonitis.**—This has already been considered.

(*b*) **Cancer of the Peritonæum.**—Although as a rule secondary to disease of the stomach, liver, or pelvic organs, cases of primary cancer are occasionally found. Secondary malignant peritonitis occurs in connection with all forms of cancer. It is usually characterized by a number of round tumors scattered over the entire peritonæum, sometimes small and miliary, at others large and nodular, with puckered centres. The disease most commonly starts from the stomach or the ovaries. The omentum is indurated, and, as in tuberculous peritonitis, forms a mass which lies transversely across the upper portion of the abdomen. Primary malignant disease of the peritonæum is extremely rare. Colloid has occurred, forming enormous masses, which in one case weighed over one hundred pounds. Cancer of this membrane spreads, either by the detachment of small particles which are carried in the lymph currents and by the movements to distant parts, or by contact of opposing surfaces. It occurs more frequently in women than in men, and more commonly at the later period of life.

The *diagnosis* of cancer of the peritonæum is easy with a history of a local malignant disease; as when it occurs with ovarian tumor or with cancer of the pylorus. In cases in which there is no evidence of a primary lesion the diagnosis may be doubtful. The clinical picture is usually that of chronic ascites with progressive emaciation. There may be no fever. If there is much effusion nothing definite can be felt on examination. After tapping, irregular nodules or the curled omentum may be felt lying transversely across the upper portion of the abdomen. Unfortunately, this tumor upon which so much stress is laid occurs as frequently in tuberculous peritonitis and may be present in a typical manner in chronic proliferative form, so that in itself it has no special diagnostic value. Multiple nodules, if large, indicate cancer, particularly in persons above middle life. Nodular tuberculous peritonitis is most frequent in children. The presence about the navel of secondary nodules and indurated masses is more common in cancer. Inflammation, suppuration, and the discharge of pus from the navel rarely occur except in tuberculous disease. Considerable enlargement of the inguinal glands may be present in cancer. The nature of the fluid in cancer and in tubercle may be much alike. It may be hæmorrhagic in both; more often in the latter. The histological examination in cancer may show large multinuclear cells or groups of cells—the sprouting cell-groups of Foulis—which are extremely suggestive. The colloid cancer may produce a totally different picture; instead of ascitic fluid, the abdomen is occupied by the semi-solid gelatinous substance, and is firm, not fluctuating.

And, lastly, there are instances of echinococci in the peritonæum which may simulate cancer very closely. I have reported a case of this kind, in which the enlarged liver and the innumerable nodular masses in the peritonæum naturally led to this diagnosis.

VI. ASCITES (*Hydro-peritonæum*).

Definition.—The accumulation of serous fluid in the peritoneal cavity.

Etiology.—(1) **Local Causes.**—(*a*) Chronic inflammation of the peritonæum, either simple, cancerous, or tuberculous. (*b*) Portal obstruction in the terminal branches within the liver, as in cirrhosis, or by compression of the vein in the gastro-hepatic omentum, either by proliferative peritonitis, by new growths, or by aneurism. (*c*) Tumors of the abdomen. The solid growths of the ovaries may cause considerable ascites, which may

completely mask the true condition. The enlarged spleen in leukæmia, less commonly in malaria, may be associated with recurring ascites.

(2) **General Causes.**—The ascites is part of a general dropsy, the result of mechanical effects, as in heart-disease, chronic emphysema, and cirrhosis of the lung. In cardiac lesions the effusion is sometimes confined to the peritonæum, in which case it is due to secondary changes in the liver, or it has been suggested to be connected with a failure of the suction action of this organ, by which the peritonæum is kept dry. Ascites occurs also in the dropsy of Bright's disease, and in hydræmic states of the blood.

Symptoms.—A gradual uniform enlargement of the abdomen is the characteristic symptom of ascites. The physical signs are usually distinctive. (*a*) *Inspection.*—According to the amount of fluid the abdomen is protuberant and flattened at the sides. With large effusions, the skin is tense and may present the lineæ albicantes. Frequently the navel itself and the parts about it are very prominent. In many cases the superficial veins are enlarged and a plexus joining the mammary vessels can be seen. Sometimes it can be determined by pressure on these veins that the current is from below upward. In some instances, as in thrombosis or obliteration of the portal vein, these superficial abdominal vessels may be extensively varicose. About the navel in cases of cirrhosis there is occasionally a large bunch of distended veins, the so-called caput Medusæ.

(*b*) *Palpation.*—Fluctuation is obtained by placing the fingers of one hand upon one side of the abdomen and by giving a sharp tap on the opposite side with the other hand, when a wave is felt to strike as a definite shock against the applied fingers. Even comparatively small quantities of fluid may give this fluctuation shock. When the abdominal walls are thick or very fat, an assistant may place the edge of the hand or a piece of card-board in the front of the abdomen. A different procedure is adopted in palpating for the solid organs in case of ascites. Instead of placing the hand flat upon the abdomen, as in the ordinary method, the pads of the fingers only are placed lightly upon the skin, and then by a sudden depression of the fingers the fluid is displaced and the solid organ or tumor may be felt. By this method of "dipping" or displacement, as it is called, the liver may be felt below the costal margin, or the spleen, or sometimes solid tumors of the omentum or intestine.

(*c*) *Percussion.*—In the dorsal position with a moderate quantity of fluid in the peritonæum the flanks are dull, while the umbilical and epigastric regions, into which the intestines float, are tympanitic. This area of clear resonance may have an oval outline. Having obtained the lateral limit of the dulness on one side, if the patient then turns on the opposite side, the fluid gravitates to the dependent part and the uppermost flank is now tympanitic. In moderate effusions this movable dulness changes greatly in the different postures. Small amounts of fluid, probably under a litre, would scarcely give movable dulness, as the pelvis and the renal

regions hold a considerable quantity. In such cases it is best to place the patient in the knee-elbow position, when a dull note will be determined at the most dependent portion. By careful attention to these details mistakes are usually avoided.

The following are among the conditions which may be mistaken for dropsy: *Ovarian tumor*, in which the sac develops, as a rule, unilaterally, though when large it is centrally placed. The dulness is anterior and the resonance is in the flanks, into which the intestines are pushed by the cyst. Examination *per vaginam* may give important indications. In those rare instances in which gas develops in the cyst the diagnosis may be very difficult. Succussion has been obtained in such cases. A *distended bladder* may reach above the umbilicus. In such instances some urine dribbles away, and suspicion of ascites or a cyst is occasionally entertained. I once saw a trochar thrust into a distended bladder, which was supposed to be an ovarian cyst, and it is stated that John Hunter tapped a bladder, supposing it to be ascites. Such a mistake should be avoided by careful catheterization prior to any operative procedures. And lastly, there are large pancreatic or hydatid cysts in the abdomen which may simulate ascites.

Nature of the Ascitic Fluid.—Usually this is a clear serum, light yellow in the ascites of anæmia and Bright's disease, often darker in color in cirrhosis of the liver. The specific gravity is low, seldom more than 1·010 or 1·015. In the fluid of ovarian cysts the specific gravity is high, 1·020 or over. It is albuminous and sometimes coagulates spontaneously. Hæmorrhagic effusion usually occurs in cancer and tuberculosis, and occasionally in cirrhosis. I have already referred to the instances of hæmorrhagic effusion in connection with ruptured tubal pregnancy. A chylous, milky exudate is occasionally found. Busey has collected thirty-three cases from the literature. There are, as Quincke has pointed out, two distinct varieties, a fatty and a chylous, which may be distinguished by the microscope, as in the former there are distinct fat-globules. These cases have been sometimes connected with peritoneal or mesenteric cancer. In the true chylous ascites the fluid is turbid and milky. In some of the cases, as in Whitla's, a perforation of the thoracic duct has been found. The condition does not necessarily follow obliteration of the thoracic duct. Mild grades of chylous ascites, which are occasionally found clinically, may be due to the fact that the patient upon a milk diet has a permanent lipæmia, such as is present in young animals and in diabetics, in whom the liquor sanguinis is always fatty. Under such circumstances an exudate may contain enough of the molecular base of the chyle to produce turbidity of the fluid. Some of the cases have been associated with filariosis.

Treatment of the Previous Conditions.—(*a*) **Acute Peritonitis.**—Rest is enjoined upon the patient by the severe pain which follows the slightest movement, and he should be propped in the position

which gives him greatest relief. For the pain morphia should be injected hypodermically in full doses. In an adult it is better to give a third or half a grain at once, and subsequently at intervals repeat it in smaller doses, as are necessary. The action of the drug should be carefully watched and the patient should not be allowed to pass into such a degree of unconsciousness that he cannot be aroused. The respiration and the condition of the pupils also give valuable information. The amount of opium which has been given in certain instances is remarkable, and indicates a tolerance of the drug. The doses given by the late Alonzo Clark, of New York, may be truly termed heroic. Austin Flint notes that a patient under the care of this physician took "in the first twenty-four hours, of opium and the sulphate of morphia, a quantity equivalent to 106 grains of opium; in the second twenty-four hours she took 472 grains; on the third day, 236 grains; on the fourth day, 120 grains; on the fifth day, 54 grains; on the sixth day, 22 grains; on the seventh day, 18 grains; after which the treatment was suspended." It is unnecessary to use these enormous doses, as, even when the pain is most intense, from a third to a half grain of morphia every few hours will usually keep the patient thoroughly under the influence of the drug. In a robust, strong patient, seen at the outset, twenty leeches applied over the abdomen will give great relief.

Local applications—either hot turpentine stupes or cloths wrung out of ice-water—may be laid upon the abdomen. The patients sometimes declare that they are greatly relieved by the latter.

The question of the use of purgatives in peritonitis has of late been warmly discussed. Lawson Tait and other gynæcologists have used the saline purges with the greatest benefit in post-operation peritonitis. Theoretically it appears correct to give salines in concentrated form, which cause a rapid and profuse exosmosis of serum from the intestinal vessels, relieving the congestion and reducing the œdema, which is one important factor in causing the meteorism. It is also urged that the increased peristalsis prevents the formation of adhesions. In reading the reports of these successful cases, one is not always convinced, however, that peritonitis actually existed. Still, in cases of acute peritonitis due to extension or following operation or in septic conditions the judgment of many careful men is decidedly in favor of the use of salines. I cannot speak from personal experience on this question. The majority of cases of peritonitis which come under the care of the physician follow lesions of the abdominal viscera or are due to perforation of ulcer of the stomach, the ileum, or the appendix. In such cases, particularly in the large group of appendix cases, to give saline purgatives is, to say the least, most injudicious treatment. The safety of the patient lies in the restriction of the peristalsis and the localization of the inflammation, for which purpose opium alone is of service. In these instances rectal injections should be employed to relieve the large bowel. No symptom in acute peritonitis is more serious than

the tympanites, and none is more difficult to meet. The use of the long tube and injections containing turpentine may be tried. Drugs by the mouth cannot be retained.

For the vomiting, ice and small quantities of soda water may be employed. The patient should be fed on milk, but if the vomiting is distressing it is best not to attempt to give food by the mouth, but to use small nutrient enemata. In all cases of peritonitis it is best to have a surgeon in consultation early in the disease, as the question of operation may come up at any moment. I have already mentioned the conditions under which laparotomy is indicated in perforative appendicitis. The acute purulent cases, particularly those in which the streptococci occur, usually die; but although the results of operative interference in this form have not as yet been very brilliant, the condition, we must remember, is almost hopeless, and too often there has been unnecessary delay in calling in surgical aid. In the acute forms of tuberculous peritonitis operation appears to be more hopeful, but they are not always successful.

(*b*) **Chronic Peritonitis.**—For the cases of chronic proliferative peritonitis very little can be done. The treatment is practically that of ascites. In all these forms, when the distention becomes extreme, tapping is indicated. The treatment of tuberculous peritonitis has fallen largely into the hands of the surgeons, and the results in many cases are very good. According to the statistics of Maurange,* of 71 cases, 28 survived the operation for more than a year. Of 26 additional cases which I have collected,† 14 were dead at the time of the report. Within two years and three months there were six operations performed at the Johns Hopkins Hospital in tuberculous peritonitis, with four recoveries.

(*c*) **Ascites.**—The treatment depends somewhat on the nature of the case. In cirrhosis early and repeated tapping may give time for the establishment of the collateral circulation, and temporary cures have followed this procedure. Permanent drainage with Southey's tube, incision, and washing out the peritonæum have also been practised. In the ascites of heart and renal disease the cathartics are most satisfactory, particularly the bitartrate of potash, given alone or with jalap, and the large doses of salts given an hour before breakfast with as little water as possible. These sometimes cause rapid disappearance of the effusion, but they are not so successful in ascites as in pleurisy with effusion. The stronger cathartics may sometimes be necessary. The ascites forming part of the general anasarca of Bright's disease will receive consideration under another section.

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* Paris Thesis, 1889.

† On Tuberculous Peritonitis, Johns Hopkins Hospital Reports, 1890.