

larged. Gastric disturbance, loss of appetite, nausea, and vomiting are frequent. Progressive loss of flesh and strength may be the first symptoms. Pain or a sensation of uneasiness in the right hypochondriac region may be present, but enormous enlargement of the liver may occur without the slightest pain. Jaundice, which is present in at least one-half of the cases, is usually of moderate extent, unless the common duct is occluded. Ascites is rare, except in the form of cancer with cirrhosis, in which the clinical picture is that of the atrophic form. Pressure by nodules on the portal vein or extension of the cancer to the peritoneum may also induce ascites.

Inspection shows the abdomen to be distended, particularly in the upper zone. In late stages of the disease, when emaciation is marked, the cancerous nodules can be plainly seen beneath the skin, and in rare instances even the umbilications. The superficial veins are enlarged. On palpation the liver is felt, a hand's breadth or more below the costal margin, descending with each inspiration. The surface is usually irregular, and may present large masses or smaller nodular bodies, either rounded or with central depressions. In instances of diffuse infiltration the liver may be greatly enlarged and present a perfectly smooth surface. The growth is progressive, and the edge of the liver may ultimately extend below the level of the navel. Although generally uniform and producing enlargement of the whole organ, occasionally, when the tumor develops from the left lobe, it may form a solid mass, which occupies the epigastric region. By percussion the outline can be accurately limited and the progressive growth of the tumor estimated. The spleen is rarely enlarged. Pyrexia is present in many cases, usually a continuous fever, ranging from 100° to 102°; it may be intermittent, with rigors. This may be associated with the cancer alone, or . . . with suppuration. Edema of the feet, from anemia, usually supervenes. Cancer of the liver kills in from three to fifteen months. One patient lived for more than two years.³

DIAGNOSIS.—“The diagnosis is easy when the liver is greatly enlarged and the surface nodular. The smoother forms of diffuse carcinoma may at first be mistaken for fatty or amyloid liver, but the presence of jaundice, the rapid enlargement, and the more marked cachexia will usually suffice to differentiate it. Perhaps the most puzzling conditions occur in the rare cases of enlarged amyloid liver with irregular gummata. The large echinococcus liver may present a striking similarity to carcinoma, but the projecting nodules are usually softer, the disease lasts much longer, and the cachexia is not marked.”³ “The tumor masses may be so prominent, soft, and fluctuating that the condition of abscess of the liver may be suspected.”⁴

“Hypertrophic cirrhosis may at first be mistaken for carcinoma, as the jaundice is usually deep and the liver very large; but the absence of a marked cachexia and wasting, and the painless, smooth character of the enlargement are points against cancer. When in doubt in these cases, aspiration may be safely performed, and a positive indication may be gained from the materials so obtained. In large, rapidly growing secondary cancers the superficial rounded masses may almost fluctuate and these soft tumor-like projections may contain blood. The form of cancer with cirrhosis can scarcely be separated from atrophic cirrhosis itself. Perhaps the wasting is more extreme and more rapid, but the jaundice and the ascites are identical. Melanosarcoma causes great enlargement of the organ. There are frequently symptoms of involvement of other viscera, as the lungs, kidneys, or spleen. Secondary tumors may develop on the skin. A very important symptom, not present in all cases, is melanuria, the passage of a very dark-colored urine, which may, however, when first voided, be quite normal in color. The existence of a melanosarcoma of the eye, or the history of blindness in one eye, with subsequent extirpation, may indicate at once the true nature of the hepatic enlargement. The secondary tumors may de-

velop some time after the extirpation of the eye, as in the case under the care of J. C. Wilson, at the Philadelphia Hospital, or, as in a case under Tyson at the same institution, the patient may have a sarcoma of the chorioid which had never caused any symptoms.”⁵

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LIVER, DISEASES OF: PERIHEPATITIS.—Perihepatitis, or inflammation of the capsule of the liver, may be acute or chronic. It is usually a secondary affection. The instances of primary acute perihepatitis are rare, and are due to direct injury, or are associated with acute peritonitis or inflammations adjoining. A chronic perihepatitis is said to arise from the long-continued pressure produced by tight lacing, or by wearing a strap about the waist to support the trousers. An hypertrophied heart may cause a similar inflammation on the blunt margin of the left lobe (Thierfelder). Secondary perihepatitis arises by extension of inflammatory processes seated in the neighboring structures. Affections of the diaphragmatic pleura, and of the stomach, duodenum, or pancreas, causing local peritonitis, are attended by perihepatitis. It may be caused by disease of the ribs lying over the organ. All forms of general peritonitis involve the portion of the membrane that covers the liver. The larger number of cases arise by contiguity from some disease of the liver. It is seen in cirrhosis, cancer, abscess, and hydatid cysts, lying near the surface. The presence of gall stones in the gall bladder, cholecystitis, and the occurrence of attacks of hepatic colic, are very frequently attended by local peritonitis.

The investing capsule in perihepatitis is opaque and thickened from the formation of new connective tissue. The liver is intimately attached to adjacent structures. It is rendered more globular or rotund in those cases in which the capsule is the seat of chronic inflammation, and is tightly stretched over it. The adjacent hepatic tissue is not generally altered. Roller and Frerichs state that true cirrhosis may proceed from the chronic capsular inflammation. Sometimes processes of connective tissue are sent out into the parenchyma. Inflammation about the portal fissure leads to subsequent stricture of the hepatic ducts by contraction of the inflammatory new growth. The spleen is rarely enlarged, possibly in many cases owing to an existent perisplenitis. In many cases the disease is part of a chronic proliferative peritonitis; adhesive pleuritis and pericarditis may also be present. Under the title of “pericarditic pseudo-cirrhosis (hepatic),” Pick describes some of these cases; the tendency is, however, not to accept the perihepatitis and accompanying cirrhosis (sometimes seen) as due to or consequent upon the obliterative pericarditis, but as part of a general proliferative process.

The symptoms of acute perihepatitis are often severe. Sudden, sharp, lancinating pain in the region of the liver, increased by movement, by respiration, or by pressure, is experienced. Some dyspnea is provoked by the interference with the breathing. Marked fever attends these phenomena during the first three or four days. The presence of a friction murmur may be detected by auscultation in some rare instances. An acute pleurisy of the right side is very strongly simulated by perihepatitis. Chronic perihepatitis is attended by dull pain, and by friction sounds and fremitus. It may, however, proceed without symptoms for years. After adhesions have formed the liver may not move upon deep inspiration. In some cases, in which owing to extreme contraction of the new-formed tissue the portal

and lymphatic circulation is interfered with, ascites develops, which with a markedly diminished liver area gives a more or less suggestive picture of cirrhosis. The course of these cases is very chronic up to fifteen years, and paracentesis abdominis may be performed an enormous number of times (three hundred and one in one instance).

The treatment is simple. Rest must be enjoined. Warm compresses or poultices to the right hypochondrium may give relief. A flying blister is almost always beneficial. In chronic perihepatitis more prolonged counter-irritation, as by iodine, is required. Morphine, by the mouth or subcutaneously, is necessary in the acute cases. Other opiates may be used. Otherwise the treatment must be directed to the cause.

It is not to be forgotten that the presence of old adhesions between the liver and the diaphragm is often a wise provision. The vessels that develop in the tissue are utilized for setting up a collateral circulation, when the normal hepatic vessels are occluded or compressed. This remark has no reference to the treatment.

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LIVER, DISEASES OF: SURGICAL TREATMENT.—**ANATOMY.**—The lower limits of the pleura are of considerable importance in the operative treatment of diseases of the liver. This is particularly the case when it is necessary to divide or resect one or more of the ribs or costal cartilages. In the right papillary line the limit of the pleura corresponds to the lower border of the sixth costal cartilage. In the axillary line it is at the lower border of the ninth. Posteriorly the lower limit of the pleura passes outward horizontally from the lower border of the twelfth dorsal vertebra, so that the cartilage and the lower half of the twelfth rib are outside of it. By excision of one or more of those cartilages which lie outside of the pleural limit access to the liver and bile passages can be materially facilitated.

The fundus of the gall bladder is usually situated at the lower edge of the ninth costal cartilage at the outer edge of the right rectus muscle. When distended it may be felt through the abdominal wall. Between the ninth and tenth ribs the lower border of the liver passes obliquely across the epigastrium to the anterior end of the eighth rib on the left side.

Preparation for Operations on the Liver.—The preliminary measures used in abdominal operations are employed with equal care in operations on the liver and bile passages. Special stress should be laid upon thorough evacuation of the stomach and intestines. The presence of gas in the intestines may be a serious hindrance to satisfactory exposure of the field of operation and to successful manipulations on the deep structures concerned. The surgeon must expect to meet with difficulties during the course of the operation, particularly in the case of the gall passages. What appeared to be a simple case may prove a complicated one requiring deep dissection, opening and suture of one of the ducts, or even an anastomosis between the gall bladder and intestine. The surgeon must therefore be prepared for any of these possibilities, and an operation should be undertaken only under the most favorable conditions as regards room, light, instruments, assistance, etc. In cases of marked cholemia Robson gives thirty-grain doses of calcium chloride previous to the operation for the purpose of diminishing the tendency to hemorrhage.

The position given the patient on the operating table is in most cases the usual dorsal one. When it is essential to have the best possible access to the field of operation the reversed Trendelenburg position may be employed. The patient is hung by straps under the arms on an inclined plane of about 45°. A sand-bag is placed under the middle of the back so that the patient is bent over it. The use of a sand-bag in this way is in itself a valuable means of increasing the space for working in the upper part of the abdomen.

Abdominal Incision.—The abdominal incision used de-

pends somewhat upon the nature of the case, but there are individual preferences for one or the other form. The oblique incision below and parallel to the free border of the ribs is a favorite one and gives a good exposure. It may be lengthened in either direction. In the case of gall-bladder operations its centre corresponds to the tenth costal cartilage. A vertical incision downward from the tip of the tenth costal cartilage along the outer border of the right rectus also gives a good exposure. Some surgeons divide the rectus muscle in the course of its fibres. When a great deal of room is necessary an angular incision may be employed. A vertical incision in the linea alba is followed by a horizontal one below the umbilicus (Czerny). Excision of one or more of the costal cartilages is occasionally done for the sake of gaining space. In case of tumors or enlargements of the liver or bile passages the incision is made over the prominence of the swelling. The nerve supply of the rectus should, when possible, be preserved.

General Technique.—One or two important principles of technique may be briefly referred to. Sterile gauze pads afford the best means of protecting the intestines from infection and of walling off the field of operation. By means of them infectious foci can be attacked at one sitting without fear of soiling the general peritoneal cavity. Furthermore, they prevent the intestine from encroaching upon the part that is being operated upon, and this is an important consideration when working on the bile ducts.

Drainage is employed in some form in nearly all operations on the liver or bile passages. Hydatid cysts, abscesses, and distended gall bladders are best drained by means of rubber tubing. A sutured gall-bladder or bile duct should be packed down upon with gauze to insure external escape of the bile in case of leakage. An oozing surface resulting from the removal of the gall bladder or a portion of the liver should likewise be covered with gauze packing. All operations on the bile ducts should be accompanied by drainage through a gall-bladder fistula. This is true both in the case of healthy and in that of infected bile, but particularly in the latter.

The arrest of hemorrhage is accomplished by separate ligation of large vessels, suture of the substance of the liver, the use of the thermo-cautery, and by gauze packing. The latter is the most effectual means of stopping oozing, and the gauze should be kept in contact with the wounded surface until the bleeding has been permanently arrested. In cholemic subjects it is necessary that all oozing should be stopped before the abdomen is closed, otherwise secondary hemorrhage may be the result.

THE DIFFERENT DISEASES WHICH CALL FOR SURGICAL TREATMENT.—The diseases of the liver and its ducts which are most frequently the object of surgical treatment are: I. Hepatic abscess; II. Echinococcus cyst; III. Tumors; IV. Cholelithiasis.

Abscess of the liver when single and not of pyæmic variety may be successfully treated by operation. The nature of the operative procedure will depend upon the location of the abscess. A suppurative focus situated near the inferior surface, in the left lobe, or already pointing anteriorly is best reached through an incision in the abdominal wall. An abscess located in the convexity of the organ may require the transpleural route. The position of the abdominal incision will be governed by the probable location of the abscess, and, in case the abscess forms a bulging, the incision will be made over the most prominent part of the swelling. In case the abscess wall is adherent to the parietes it is opened without entering the general peritoneal cavity, and the whole procedure is rendered very simple. The different layers of the abdominal wall are divided down to the abscess wall, an aspirating needle is introduced to verify the nature of the contents, and a knife is then thrust in. The cavity is washed out with decinormal salt solution and a drainage tube introduced. If the abscess is not adherent to the abdominal wall the choice may be made between an operation in one sitting and two separate operative sittings. In the former case the part of the liver in ques-

tion is brought into the wound and surrounded by sterile gauze packing. The general peritoneal cavity having been protected in this way from the possibility of infection, the abscess cavity is opened by means of a pointed knife or the thermo-cautery. The cavity may be irrigated with decinormal salt solution and a drainage tube or gauze packing inserted. The discharge being free for the first few days, the wound requires frequent dressing, but after a couple of weeks the cavity begins to diminish in size and the discharge gradually ceases. Final closure of the sinus may take two or three months or an even longer time. In case of operation at two separate sittings the liver surface is brought in contact with the abdominal wound and either sutured into the same or preferably surrounded with gauze packing. From three to six days later, adhesions having formed which shut off the general peritoneal cavity, the abscess cavity is opened and drained as above. This latter operation is the safer of the two, but a septic condition of the patient may require an immediate opening of the abscess. The latter, on the other hand, may have such an unfavorable location that the general peritoneal cavity cannot be protected during an operation at one sitting, and here a delay of several days, in order to give time for the formation of adhesions, is absolutely indicated. In case an abscess has ruptured into the peritoneal cavity causing general suppurative peritonitis, the usual radical treatment for this condition is adopted.

If the abscess is so far under the ribs as to be out of reach through an abdominal incision it may be necessary to employ the transpleural method. This consists in first resecting two or more ribs and then suturing together the parietal and diaphragmatic pleural layers over a small area so as to shut off the general pleural cavity. These layers and the diaphragm are then incised and, if the latter is adherent to the liver, the abscess can be opened at once. If the liver is not adherent to the diaphragm the parietal and visceral layers of the peritoneum are sutured together, thus shutting off the peritoneal cavity before the abscess is opened. In either case the abscess cavity is drained by means of a rubber tube brought out through the thoracic wound. In place of sutures for uniting the pleural and peritoneal surfaces gauze packing may be employed and adhesions obtained in this way. A third sitting will then be necessary for finally opening the abscess.

The mortality of operations on abscess of the liver has diminished with the earlier recognition of the condition and the improvement in the technique. In case the patient's condition has not been too seriously impaired by the septic absorption, the prognosis is good in the case of a single abscess, even though its location is not the most favorable for its drainage. Thorough protection of the peritoneal cavity by gauze packing, or operation after the formation of adhesions, should prevent peritonitis. Early operation will obviate sepsis.

Echinococcus of the Liver has been subjected to a great variety of methods of treatment, no one of which has proved itself perfectly satisfactory. The older methods of puncture, with or without injection of irritating substances into the sac, and the establishment of a fistula by means of a trocar or tube, have become obsolete. The usual surgical procedure at present consists in opening the abdomen, bringing the involved portion of the liver into the wound, and incising the cyst at once, or after the formation of adhesions. The cyst cavity is then washed out and drained. This procedure has the disadvantage that the whole sac is left behind and the resulting fistula has in some cases been a permanent one. To avoid this, other operations have been devised of late. A procedure which gives excellent results without a fistula consists in enucleation of the mother cyst, cleansing of the fibrous capsule with dry gauze, and complete obliteration of the cavity by suture. Delbet's "capitonnage" consists in emptying the contents of the sac, removing its chitin membrane, and excising as much as possible of the sac wall. The walls are then invaginated and the opposed surfaces sutured. Any form of complete excis-

ion of the cyst is difficult and may become a dangerously bloody operation. Some cysts are more favorably located than others for this form of treatment. Partial excision may, however, be comparatively easy and bloodless. The margins are then sutured into the abdominal wound and a drainage tube is inserted.

Tumors of the liver are seldom amenable to cure by operation. Carcinomata, both the primary and the secondary forms, constitute the most common variety. Secondary carcinoma offers a hopeless prognosis, and operative treatment is usually out of the question. Primary carcinoma is very rare and can be cured only in the very earliest stage. As this stage seldom gives rise to objective symptoms, the proper time for operating is usually missed and an exploratory laparotomy is all that is undertaken. In case an operation is decided upon it consists in removal of the growth with the portion of liver affected. The resulting wound may then be partially sutured and packed. The hemorrhage, which is usually severe, is treated by ligation of the larger vessels, cauterization, gauze packing, and sutures. A large portion of the liver can be successfully removed in this way and permanent cures after operation for primary malignant tumors have been reported.

Another method of dealing with the stump of the liver is to bring it out through the abdominal wound and treat it extraperitoneally. The bleeding from it can here be controlled by a permanent clamp, gauze packing, ligatures, etc. This is a less desirable method, however, as it is more likely to be followed by infection of the peritoneum and by hernia. Before the portion of liver is excised the whole of the organ may be encircled by a rubber tube and the hemorrhage temporarily arrested.

After the tumors have attained a large size, formed glandular enlargements, or produced cachexia, operation is contraindicated.

Cholelithiasis.—Stones in the gall passages are the most frequent abnormalities of the liver requiring surgical interference. The condition of cholelithiasis may give few or no symptoms during life and yet at autopsy the gall bladder may be found filled with calculi. The presence of symptoms depends in general upon inflammation or mechanical obstruction of the gall bladder or gall passages. In other words, the appearance of symptoms always means that the stones have produced more or less severe pathological changes in the gall passages,—changes which may or may not be curable by medical means. The latter are uncertain and should not be too long continued when the symptoms do not improve or attacks of obstruction or inflammation become more frequent. The indications for operation have been extended of late years and the tendency of even the more conservative is to operate early. It seems but reasonable to relieve an individual of the stones as soon as possible after the onset of symptoms and before the serious complications have arisen which so frequently accompany gall-stone disease. The results of incarceration in the common duct, perforation of an empyema into the peritoneal cavity, and persistent cholæmia are so unfavorable even with operation that it is wise to operate before they have become possible. The choice of the method of operation can usually not be made until the abdomen is opened and the conditions are disclosed. No one form of procedure can possibly fulfil the requirements of every case, and the surgeon must be prepared for any operation, from a simple opening of the gall bladder to incision and suture of a bile duct.

Cholecystostomy.—This is the most common form of operation and the most easy to perform. The abdomen is opened over the gall bladder by means of an oblique incision following the free border of the ribs or a vertical incision on the outside of or through the middle of the rectus muscle. The peritoneal cavity having been entered, any slight adhesions of the gall bladder to the parietal peritoneum or neighboring viscera are freed with the fingers or a blunt instrument. Thick adhesions should be divided with scissors under guidance of the eye. The gall bladder and gall ducts should then be examined for stones by direct inspection and palpation.

If it is decided to remove the stones and drain the gall bladder, the choice lies between an operation in one sitting and two separate operative sittings. The former is the preferable method, and under proper precautions the danger of infecting the general peritoneal cavity from bile is not great. The gall bladder is surrounded by sterile gauze pads, aspirated, and opened. The finger or suitable forceps is passed in through the opening and any gall stones that may be present are removed. If any stone is felt in the cystic duct it should, if possible, be pushed back into the gall bladder and removed. If this is impossible owing to impaction of the stone, it may be necessary to incise the cystic duct (cysticotomy), extract the stone, and suture the opening thus made. The edges of the gall bladder wound are now sutured into the abdominal wound and a drainage tube is inserted. Unless an obstruction has been left behind in one of the ducts the fistula will close after a few weeks. A permanent fistula may require a secondary operation for removal of the obstruction. This operation at one sitting is to be preferred to that in two sittings when the gall bladder is accessible and can be readily brought into the abdominal wound. When this is not the case, as in a small contracted gall bladder, it may be necessary to pack down upon the latter and delay incision for several days until adhesions have formed. Another method in such cases is to insert into the gall bladder a long drainage tube, surround it with gauze and bring it out through the abdominal wound. The chief advantage of the operation in one sitting over that in two is that the interior of the gall bladder and cystic duct can be better explored before the former has been stitched into the abdominal wound and any stones lodged in its depths more readily removed.

Cholecystostomy carries with it the possibility of a permanent biliary fistula. Mayo Robson reported fourteen such cases out of one hundred and eighty-nine cholecystostomies. When this is due, as in most of the cases, to a stone impacted in the common duct, a second laparotomy may be necessary, and the common duct opened and sutured. Painful adhesions may also be left behind after the operation, and these in rare cases will require a secondary operation for their removal.

Ideal cholecystostomy is the name given to an operation consisting of opening the gall bladder, removing the stones, and suturing the incision. It obviates the disagreeable effects of the fistula and shortens the time of healing. It is in most cases, however, a questionable procedure, as stones can easily be left behind in the folds of the gall bladder or the cystic duct, and the advantages of drainage of the bladder and ducts are lost. It must be remembered that most cases of cholelithiasis requiring operation are complicated by inflammation of the bile passages of a more or less severe degree. The best means of overcoming this is to allow the infected bile to drain off through the gall-bladder opening. In the so-called ideal operation this is not done and the inflammatory condition inside persists, thus predisposing to the future formation of calculi. It is only in the exceptional cases of uninfamed gall bladder that the ideal operation is permissible, and in such cases the results are good. A modification of this method consists in attaching the sutured gall bladder to the abdominal wall so as to prevent leakage into the peritoneal cavity in case the sutures give way.

Choledochotomy, or incision of the common duct, is the most difficult procedure which the surgeon may be called upon to carry out in performing an operation on the gall passages. It is indicated in the case of a stone impacted in the common duct. The presence of a stone in this duct can be detected by direct palpation of the duct. The forefinger of the left hand is inserted into the foramen of Winslow and the thumb is placed upon the structures in the lesser omentum. Very soft concretions may be crushed with the fingers and their passage into the duodenum thus made possible. The use of padded forceps for this purpose is, however, to be avoided, as serious injury to the wall of the duct may be the result.

If the stone is too hard to crush with the fingers, it may be pushed onward into the duodenum and the incision thus avoided. If incision is decided upon, the field of operation is carefully protected with gauze pads. The easiest point at which one may reach a stone in the common duct is above the pancreas, and, if possible, the stone should be brought to this place by manipulation. A longitudinal incision is made in the distended duct over the stone and the latter extracted. Two rows of sutures are now inserted and the incision is tightly closed. The sutures may be advantageously introduced before the stone is removed. Halsted has devised a special apparatus for facilitating the insertion of the sutures. It consists of cylinder-shaped pieces of metal of different sizes for insertion into the duct, and a handle attachment which gives a support and allows the duct to be drawn somewhat up into the wound. To insure safety in case of leakage, it is always advisable to carry a gauze drain down to the line of suture. It is usually a good plan to drain at the same time the gall passages by performing a cholecystostomy. This has the further advantage of lessening the tension on the sutures in the common duct. Should the gall bladder be contracted, or its wall seemingly impaired by inflammation, its removal may be indicated provided the common duct is patent throughout. When a gall stone is impacted near the duodenal end of the common duct and cannot be reached through the suprapancreatic portion of the duct, it may be removed by transverse incision of the duodenum followed by suture. This is a most difficult procedure, but has been accomplished successfully a number of times. As impaction of a stone in the common bile duct is almost always accompanied by severe jaundice, the tendency in this latter condition to capillary oozing must be remembered. Only by careful arrest of all bleeding before closing the abdomen can one be sure of preventing serious secondary hemorrhages.

Cholecystectomy, or excision of the gall bladder, is a radical and in many cases a most satisfactory method of dealing with gall-bladder disease. It is contraindicated in case the common duct is closed by a calculus. It finds its chief indications in cases in which the gall bladder is so shrivelled and atrophied as to have become useless as a reservoir for bile, or in those in which the walls of the bladder are extremely inflamed or necrotic. By some surgeons it is considered the operation of choice, as it removes the source of the whole affection, obviates a fistula, and is less likely to leave behind troublesome adhesions. On the other hand, it is a more difficult operation than cholecystostomy and there is greater danger from secondary hemorrhage. The operation consists in enucleation of the gall bladder from its attachments to the liver and ligation of the cystic duct. The excision may be begun at the fundus or the apex. In the former case the parietal peritoneum is divided over the bladder, the latter stripped off from the liver by means of the finger or blunt scissors, and finally the cystic duct is reached and tied off with the artery accompanying it. The separation from the liver is in most cases performed without serious hemorrhage. The bleeding can usually be controlled by gauze packing or by the application of the thermo-cautery. Care should be taken not to work into the substance of the liver. The duct and its artery must be securely tied so as to prevent leakage of bile or a hemorrhage. By beginning with ligation of the duct the process of enucleation may be reversed. The wound surface left by the excision is packed down upon with gauze which is brought out through the abdominal wound. In order to prevent the hemorrhage, associated with separation of the wall of the gall bladder from the liver, it has been advised to leave that portion of the bladder behind and remove or destroy with the cautery its mucous-membrane covering. This is necessary only in exceptional cases, as with care the bladder wall, particularly when diseased, is stripped off without great difficulty, and the oozing can be controlled by gauze packing.

Cholecystenterostomy means the establishment of a

communication between the gall bladder and the intestinal tract. It is resorted to in cases of obstruction from a stone or a stricture inside the duct or from a tumor or adhesions pressing on the duct from without. A stone may be so situated in the duct that its removal is impracticable. Furthermore, the duct with its stone may be so surrounded and embedded in adhesions that it cannot be reached. In these cases cholecystenterostomy takes the place of choledochotomy. Obstruction of the duct from without is usually the result of carcinoma of the head of the pancreas or of chronic productive pancreatitis. In the former case the operation becomes a purely palliative one and death usually results in a short time from the continued growth of the carcinoma. In case of chronic productive pancreatitis the establishment of an outlet for the pent-up bile will react favorably upon the inflammation in the head of the pancreas and a diminution in the enlargement followed by re-establishment of the outflow through the common duct may be the result. The operation has a high mortality, particularly in malignant cases, as the individuals are usually in bad general condition, and the pronounced cholemia predisposes to serious or fatal hemorrhage. Furthermore, there is always the possibility of infection of the gall passages after the establishment of this direct communication between the gall bladder and the intestine. The anastomosis is made preferably with the duodenum, but if this is impracticable a loop of jejunum is selected. The colon is used only in exceptional instances. The union may be made by means of sutures only, but this is a tedious and difficult procedure. The Murphy button shortens the time of the operation very considerably, and is easily inserted. Subsequent contraction of the orifice with return of the symptoms is possible.

The indications for this operation are becoming fewer since choledochotomy as now performed can be successfully employed in most cases of obstruction due to calculi. It still has a limited usefulness in cases of malignant and inflammatory strictures, but its mortality will necessarily remain a high one, particularly in the former cases. To lessen the danger from hemorrhage, in patients with pronounced cholæmia, Mayo Robson gives chloride of calcium in thirty-grain doses for two or three days previous to the operation.

Selection of the Operation and Indications.—The choice of the operation will, as has been said, be made in most cases after the abdomen has been opened. A radical operation is, generally speaking, the one to be chosen, provided the patient can stand it. If the patient's condition is bad, simple drainage of the gall bladder may be done first and a more complete operation performed at a more favorable time. If stones are found in the gall bladder, associated with previous inflammatory processes and adhesions, or with acute cholecystitis and a seriously damaged condition of the bladder, cholecystectomy is the operation of choice. Painful adhesions even without stones may demand cholecystectomy. Closure of the cystic duct accompanied by hydrops or empyema should be treated by cholecystostomy with cysticotomy if necessary. Chronic closure of the common duct by a stone or carcinoma requires either choledochotomy or cholecystenterostomy. Acute closure of the common duct by a stone should be treated medically at first, and an operation should not be performed until it is evident that the stone is not going to pass of itself, or until the symptoms have become too urgent for delay. Acute cholecystitis may be treated expectantly during the attack if the symptoms are not too severe. After the attack the gall bladder should be explored, as there always remains behind a certain amount of infective material which will eventually give rise to thickening of the gall bladder, adhesions, inflammation of the ducts, etc. The indications here are much the same as in appendicitis. An operation in the interval is, if possible, to be chosen in preference to one during the attack.

Medical treatment, while of service in many cases of cholelithiasis, should not be tried for too long a time. Constantly recurring attacks of pain which diminish the work-

ing capacity of the individual are a sufficient indication for operation, even though no objective symptoms are present. At other times internal treatment is from the outset hopeless, and the favorable time for operating should not be allowed to pass through unnecessary delay. Such cases include acute suppurative cholecystitis and chronic closure of the cystic ducts or the common duct. Exploration at least is advisable in the presence of persistent symptoms on the part of the biliary passages. Should a condition of affairs be disclosed which precludes the possibility of a cure or which would entail a prolonged and dangerous operation, some palliative measure, such as drainage of the gall bladder, will probably be of service to the patient. The exploration, generally speaking, does no harm and may, by disclosing the real condition of affairs, lead the way to successful treatment.

Cirrhosis of the Liver has of late been the object of operative treatment in an increasing number of cases. It has been found that the ascites associated with cirrhosis may be limited in amount and even cured by the establishment of an anastomosis between the portal circulation and that of the branches of the inferior vena cava. The operation is usually performed after repeated tappings have given no permanent result, and the patient is rendered miserable by the distention of the peritoneal cavity with fluid. The abdomen is opened above the umbilicus in the median line, or at the outer border of the rectus muscle. After a portion of the fluid has escaped, the right lobe of the liver, the spleen, and the parietal peritoneum are vigorously rubbed with dry gauze or scarified with some pointed instrument. The great omentum is then stitched to the scarified parietal peritoneum across the front of the abdomen. The object sought for is the formation of adhesions between the surface of the liver, spleen, and omentum, and the parietal peritoneum. Through these adhesions an anastomosis is brought about between the congested portal system and the veins of the abdominal wall which belong to the vena cava system. The abdominal incision is closed with sutures and a separate opening made above the pubes for the insertion of a drainage tube for carrying off the ascitic fluid. The drainage tube is left in place for several weeks and is then removed. Tappings may be required for some time afterward, but their frequency gradually diminishes. In the best results the fluid ceases to collect within the cavity. This operation has not yet become firmly established, but the results encourage further trials. The mortality at present is comparatively high, owing chiefly to the poor condition of the individuals operated upon and the greater risk of infection of a damaged peritoneum. The patients who have recovered have shown in most instances improvement and in a few cases a cure. The autopsy of cases fatal after a period of several months has usually demonstrated the existence of the anastomosis sought for, large veins being found in the artificial adhesions. As ascites usually represents an advanced stage of the disease, and as the progress under medical treatment affords no hope, the operation seems justifiable. If cases are selected which are not too far advanced and do not have complicating disorders of other organs, the mortality of the operation will be lessened and the chances of a cure will be improved. Stricter asepsis and more careful after-treatment should diminish the dangers of infection. *Benjamin T. Tilton.*

LIVER, DISEASES OF: SYPHILITIC INFLAMMATIONS.—**HISTORICAL.**—The existence of syphilitic disease of the liver was denied by Morgagni. Dittrich, in 1849, gave the first comprehensive description of the disease, the tumor-like formations of which had been previously confused with malignant and other new growths. Virchow has placed our knowledge of hepatic syphilis where it now stands.

CLASSIFICATION.—As with syphilitic affections in general we recognize the acquired and congenital lesions. The lesions of syphilis in the liver belong to the tertiary period of the disease; in fact, outside of the occasional occurrence of jaundice in the efflorescent or

early stage due to uncertain lesions, secondary hepatic affections in syphilis are not recognized.

PATHOLOGY.—1. **Acquired Syphilis.**—Two forms are most commonly met with—(a) A diffuse syphilitic inflammation affecting the interstitial tissue, not readily distinguished from ordinary cirrhosis. The cell proliferation is markedly interacinous, and is said to run between the columns of liver cells oftener than is the case with alcoholic cirrhosis. The same tendency to shrinking (atrophy) is seen.

(b) The much more common gummatous hepatitis occurs in the form of numerous nodules, varying in size from a millet seed to a walnut, of a reddish-gray to whitish-yellow color, irregular, often striated, more or less sharply outlined. The centres of the syphilomata are yellowish-white, caseous, dry, but firm, much more so than a tuberculous caseous mass. These growths tend to develop on the upper surface of the liver, at the attachment of the ligamentum suspensorium, and in the connective-tissue prolongations of Glisson's capsule (peripylephlebitis syphilitica, Schüppell). Microscopically, the fresh red-gray growths consist of round and spindle cells in a homogeneous ground substance; the older caseous areas show masses of fatty necrotic material. The amount of fat and the absence of giant and epithelioid cells are points of differentiation between gumma and tubercle. Alterations of the blood-vessels in these areas, consisting of marked thickening of the medial and adventitial coats, are constant features. Hepatic scars, usually considered to be healing fibrosing gummata, are among the common lesions of acquired syphilis; the extent to which they may deform a liver by their contraction is well known. The possibility, however, of these scars being due to causes other than syphilis is now admitted (Flexner). The gummatous form may be found in connection with the interstitial form. Thickening and adhesions of the liver capsule (perihepatitis) occur constantly with the former condition, and fat infiltration and amyloid degeneration of the liver cells are common. By many, amyloid degeneration of the liver is classed as a form of syphilitic alteration.

2. **Congenital Syphilis.**—The diffuse infiltration is the form most frequently met with; it may occur at any time after the sixth month of fetal life. The liver is usually much enlarged, often equalling six per cent. of the body weight, firm and tough, gray-red to dirty yellow-gray in color, and the lobular markings are usually obliterated. Occasionally the organ may be excessively icteric (brimstone liver). If the infants survive for a sufficient length of time cirrhotic changes may ensue, with consequent atrophic appearances. Syphilis hereditaria tarda affecting the liver, and appearing first in adolescence, can hardly be distinguished from atrophic cirrhosis. Microscopically, there is first hyperæmia with capillary engorgement, massing of leucocytes, and proliferation of the capillary endothelium; later, in the widened interstices of the lobules, are seen round cells in newly formed connective tissue, and the same cells are frequently found inside the lobules, between the capillary walls and rows of liver cells, and in the walls of the blood-vessels. In the later stage connective tissue replaces the round-cell infiltration, and the liver cells, after some nuclear proliferation, shrink and atrophy. If (which is rather rare) the gummatous form occurs, the liver presents multiple miliary formations. An increase of connective tissue, in the form of small circumscribed areas in addition to the diffuse process, may resemble a gummatous condition. As already mentioned, with the exception of a transient jaundice seen occasionally in the secondary stage, syphilitic hepatic affections are distinctly tertiary, and are usually met with years after the formation of the primary lesion; cases of hepatic syphilis developing six and nine months respectively after infection are reported by Key and Biermer. In both the acquired and the congenital disease the liver is one of the organs of the body most frequently affected.

SYMPTOMATOLOGY.—Jaundice has been mentioned as a symptom in the secondary stage. Many cases of hepatic

syphilis are revealed only at autopsy; the more marked cases of the gummatous form show the familiar enlarged knotty and deformed liver, the symptoms in fact being frequently only such as are dependent upon pressure; jaundice is rare in this form of the affection; ascites, due to compression of the portal vein, occurs, and may give the picture of hypertrophic cirrhosis. It may be stated that ascites does not occur in the gummatous form unless the portal circulation is obstructed or the kidneys are vitally affected, but it is more or less to be expected in the general cirrhotic form. The general condition usually suffers, and anæmia and cachexia are more or less marked, sometimes so much so that malignant disease may be suspected. The general diffuse form (syphilitic cirrhosis) presents the picture more or less absolutely of alcoholic cirrhosis, though it is said to be more acute and more rapid in its course, and may speedily terminate fatally. It is remarkable, however, to what an extent a liver may be deformed without giving rise to symptoms. Periods of improvement apart from specific treatment are not infrequently seen; and, on the other hand, even after a supposed cure, relapses and severe after-effects may develop.

In the *congenital form* the symptoms are those of malnutrition, and the infants die after a short existence. Enlarged liver and spleen, anæmia, and cachexia are always present (see above).

DIAGNOSIS.—Gummata may be confused with carcinomatous nodules; the diffuse cirrhosis gives rise to conditions not to be distinguished from an alcoholic affection; but congenital hepatic syphilis is unmistakable.

TREATMENT.—Specific treatment (mercury and iodides) is always indicated, and even in late stages mercury should be employed. Under the influence of this drug gummata may completely vanish, an ascites may disappear, and other severe symptoms may quickly subside. Scar tissue and amyloid change naturally cannot be affected by any treatment. Iron and arsenic are necessary for the anæmic conditions.

John H. Musser.
Norman B. Guyn.

LIVER, DISEASES OF: TUBERCULOSIS.—See THE APPENDIX.

LIVER, PHYSIOLOGY OF THE.—The position of the liver with regard to the circulation is a sufficient indication that its primary function is to cause chemical modifications in the products of digestion which have been taken up from the gastro-intestinal tract, before these are allowed to pass on into the general blood stream for the nutrition of the other tissues of the body. Although important chemical changes occur in these substances in their passage through the columnar cells of the intestinal wall, further changes of both a qualitative and a quantitative character are required before the portal can be allowed to mix with the systemic blood, and these final chemical transformations have their seat in the liver cells.

Hence the liver becomes the final safeguard of the organism from absorbed products which have not undergone complete assimilation; but its physiological importance by no means ends in carrying out this primary function, for it is also the chief metabolic laboratory of the body in which the greater part of the work of purification of the blood, from either extraneous or excessive dissolved substances—or its standardization, so to speak—is accomplished. It is by the liver cells that the degradation products of proteid metabolism in other tissues are prepared for excretion by the kidneys; here also the final products of the breaking up of the hæmoglobin molecule, after being robbed of their iron which is retained and conserved by the liver cells, are either cast out of the circulation in the bile, or prepared for removal by the kidneys in the form of urinary pigments; here too the quantity of carbohydrate entering the systemic circulation is adapted and regulated to the needs of the organism, by a system of chemical storage, and according to some authors is at least in part united with partially disintegrated proteid rests to form proteid molecules anew, and so spare the amount of fresh proteid required from without in order to maintain tissue equilibrium.