INJURIES AND DISEASES OF THE LIVER AND BILIARY PASSAGES.

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Topographical Anatomy.—The relations of the liver to the right pleural cavity, the arrangement of the ligaments of the liver, and the best routes for reaching disease processes in different portions of the liver, should be understood by every abdominal surgeon. The left lobe of the liver lies relatively free in the mesogastric and hypochondriac regions, and is therefore more accessible than the right lobe, which is covered by ribs and the convex surface of the diaphragm. The suspensory ligament which separates the right and left lobes is a reduplication of the peritoneum from the diaphragm to the upper surface of the liver. It fastens the liver to the diaphragm and anterior abdominal wall. As it is placed in a sagittal plane, it separates the portion of the peritoneal cavity between the liver and diaphragm into a right and a left pocket, a point of pathological importance, as inflammation existing in one of these pockets rarely passes into the other. The portion of the suspensory ligament which extends from the umbilicus to the under surface of the liver is called the round ligament. When this ligament is divided, the motion upward of the liver is considerably increased and operations on its under surface are thereby facilitated. The gall-bladder and biliary passages are attached to the under surface of the right lobe. These structures are described further on.

It is important to know how far the right pleura extends in front, at the side, and behind. In other words, how much of the ribs and cartilages can be cut away to expose the liver without opening the pleural cavity. The cartilage of the seventh rib is almost always beyond the pleural cavity. This is true of the cartilages and a portion of the bones of the lower ribs from the eighth to the twelfth. The distance not covered with pleura increases on each successive rib until on the twelfth it is about 6 cm. (2.4 inches). The margin of the pleura crosses the right mammary line at the lower border of the sixth costal cartilage, and the anterior axillary line at the lower border of the ninth cartilage. From here it extends to about the middle of the twelfth rib. In order to expose the convex surface of the liver it is necessary to open the complementary space of the right pleural cavity. If the liver contains an abscess or suppurating echinococcus cyst, this portion of the pleural cavity is usually obliterated. Through an abdominal wound the lower surface of the liver and the anterior margin are easily accessible. The anterior surface is reached with difficulty unless one removes the costal cartilages which lie beyond the reflection of the pleura.

CHAPTER XXIII.

INJURIES OF THE LIVER AND BILE-DUCTS.

INJURIES OF THE LIVER.

Pathological Anatomy.—Holm, in 1867, made experiments to show the process of repair in wounds of the liver. Others have experimented with the same object, and surgeons owe their present knowledge to them, but especially to Ponfick, who demonstrated that three-fourths of the liver of an animal may be removed without serious injury. This loss is made good by hyperplastic and hypertrophic changes in the remnant of the organ.

There are three forms of subcutaneous injury to be considered: 1. Rupture of the hepatic tissue combined with tears in the capsule. 2. Separation of the capsule with subcapsular hæmatoma. 3. Central ruptures which often give rise to separate or united hæmatomata which may develop into cysts or abscesses. Peripheral injuries if recovered from usually produce adhesions to the neighboring organs.

Rupture of the liver following contusion is six times as common in the right as in the left lobe, and is twice as common on the convex as on the concave surface. The fissures may be superficial or deep, single or multiple, stellate, gaping, irregular, etc. A portion of the liver may be entirely separated and be found loose in the peritoneal cavity.

The severest degree of injury to the liver is the complete crushing of a portion of its substance. Such an injury is associated with fractures of the rib, injury of the lung or heart, fracture of the skull, etc. In rupture of the liver the hepatic cells may enter the venous current and set up pulmonary embolism. Stab-wounds and incised wounds of the liver are followed by severe hemorrhage. Such may or may not be the case with gunshot-wounds.

Etiology.—The size and firmness of the liver and its position between the ribs and vertebral column expose it to injuries. It has scarcely any elastic fibres, and is not compressible, so that when crushed it ruptures far more frequently than the other abdominal glands. Such injury may take place without any mark upon the external skin. The liver may even be torn by a fall from a height upon the feet, the sudden jar dragging the heavy organ away from its suspensory ligament. But the usual cause of subcutaneous injury is a crush of the body beneath a wagon-wheel or other heavy object, or a blow. The changes in the organ produced by tuberculosis, syphilis, and amyloid degeneration favor rupture of the liver.

Symptoms.—The early symptoms of rupture of the liver do not differ from those following injury to other abdominal organs. There is no single pathognomonic symptom of rupture of the liver. Cases are recorded in which shock and collapse and other marked symptoms were wholly wanting in spite of rupture of the liver so severe as to cause the patient's death in a short time. Such accidents are, however, exceptions. There are usually signs of internal hemorrhage, the blood collecting in the right side of the abdomen. The flow of blood toward the pelvis is interrupted by the mesentery and the cæcum, so that the blood may not appear in the iliac fossa or pelvis, but the exact situation of the blood is a sign of no great practical value. The character of the accident may indicate the organ which is injured. If the hemorrhage continues, the patient becomes anæmic, restless, and complains of intense local pain as well as diffuse abdominal pain. Sometimes, but not always, pain is referred to the right shoulder. In about 20 per cent. of the cases icterus develops some three or four days after the injury, on account of resorption of bile which has escaped into the peritoneal cavity. Urobilin may be increased. Occasionally glycosuria has been noted. Biliousness, vomiting, hiccough, and contraction of the abdominal muscles, are symptoms not peculiar to rupture of the liver. Pain caused by deep breathing and painful cough are symptoms which may also be due to fracture of the ribs, or injury of the diaphragm or lung.

If the wound is an open one, the hemorrhage is usually profuse. The blood streams out as from an angioma which has been cut into. A flow of bile from the wound often takes place five or six days later when the superficial layer of necrosis separates from the healthy tissue. In other respects the symptoms of an open wound are essentially those of a contusion.

Diagnosis.—It is apparent that in many cases it is impossible to say positively whether or not the liver has been injured, and yet this is an injury the proper treatment of which requires early diagnosis. It is therefore desirable to obtain an exact description of the way in which the patient was injured, and in case the right side of the thorax or abdomen was crushed, the possibility of injury of the liver should be uppermost in the mind. Only in rare instances has it been possible to palpate a fissure of the liver through the abdominal wall. Ordinarily the surgeon must content himself with the diagnosis of internal hemorrhage, and must ascertain the source of the bleeding at operation.

Prognosis.—Formerly the prognosis of injuries of the liver was considered hopeless, but since the introduction of aseptic methods of operating life may be saved in many cases. It should not be forgotten that infection may be added to the hemorrhage, bacteria reaching the wound through the portal circulation, or, more often, perhaps, through the biliary tract, since a healthy intestinal wall, as shown by experiments, does not permit the passage of any bacteria. A serious complication of extensive rupture of the liver, and one from which the late President Carnot suffered, is injury of the portal vein. It is con-

ceivable that a wound of this vessel might be stopped by tampons or suture, as has been done in cases in which it has been accidentally cut or torn during operation.

In the last ten years a number of cases of successful treatment of gunshot- and stab-wounds of the liver have been reported. Some of the published lists show a recovery in more than half of the cases. This is doubtless too high on account of the tendency of surgeons to report their successes rather than their failures. But still if the hemorrhage is not exhaustive and there are no serious complications the prognosis is relatively favorable. From 1896 to 1901 Terrier and Auvray collected records of 42 operations with a mortality of 24 per cent. They found that incised and stab-wounds had a mortality of 11 per cent., subcutaneous ruptures a mortality of 30 per cent., and gunshot-wounds a mortality of 36 per cent. These results, excepting those following gunshot-wounds, are considerably better than those following operations performed before 1896. The improvement is due rather to earlier diagnosis than to changes in the technic of operating.

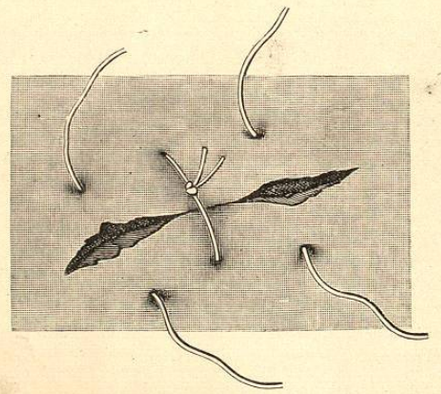
Treatment.—In open wounds of the liver, whether caused by a bullet or a knife, it is generally agreed that the abdomen should be opened to control hemorrhage and to prevent infection.

In subcutaneous ruptures it is more difficult to decide whether immediate operation is indicated. It cannot be disputed that extensive ruptures of the liver have been recovered from spontaneously. Still, if one decides to postpone operation until there are well-marked symptoms of hemorrhage or peritonitis, many lives will be lost which might otherwise be saved. The wisest plan is to operate not only when the diagnosis is a certain one, but also when the nature of the accident and the condition of the patient make it probable that the liver has been injured. An early exploratory incision is fully justified by Edler's statistics, which show that most patients with injury of the liver who die from hemorrhage do so in the first twenty-four hours. An exploratory incision carries with it little risk. It can easily be made with the help of a local anæsthetic and a view be obtained as to the condition of the liver and the presence or absence of blood in the general peritoneal cavity. If there is such hemorrhage, the patient can then be given a general anæsthetic, the incision extended, and the injured parts properly treated. The probable diagnosis will in most cases be found the correct one. Naturally, one would not operate in a case in which there was absolutely no sign suggestive of severe injury of the liver. Such a patient should be seen at frequent intervals and preparation made for operation so that it can be performed if necessary without delay.

If the external wound is a narrow one, it should be sufficiently enlarged to permit a satisfactory inspection of the liver. In case of gunshot-wounds a separate incision in the median line may be preferable. If the injury is subcutaneous, the incision should be made in the middle line, between the ensiform cartilage and the umbilicus. This incision gives free access to the left lobe. A transverse incision

through the right rectus muscle may be added to enable the surgeon to reach the right lobe of the liver. It is essential to expose the liver thoroughly even though the incision in the abdominal wall be a long one. Division of the round ligament and nicking of the coronary and

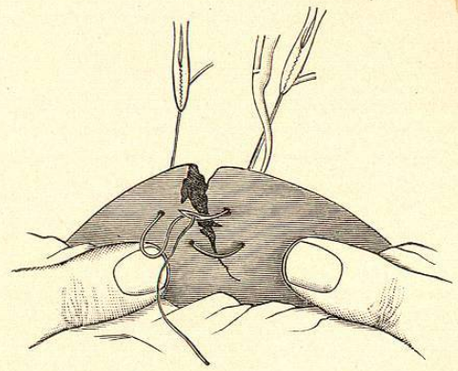
FIG. 304.



Suture of a rupture of the liver. (Lejars.)

triangular ligaments make the liver more movable and therefore more accessible. If the convex surface is wounded, resection of the costal cartilages may be necessary. (Compare the operation for subphrenic echinococcus, page 652.)

FIG. 305.



Suture of a rupture of the liver. (Lejars.)

If the wound in the liver itself is a simple one, it may be sutured. Deep stitches introduced with large curved needles to control hemorrhage should be supplemented by a superficial suture of the capsule. (Figs. 304 and 305.) The catgut or silk employed should be of good

size, so that it will not cut through. Suture of a healthy adult liver is not difficult. In childhood and after disease the tissue is very friable. Large vessels should be ligated directly or by means of an aneurism-needle. If the wound in the liver is very deep, it is best to combine tamponade with suture. When the hemorrhage is perfectly controlled, the abdominal wound may be sutured. A tampon delays recovery but reduces the risk, and is preferable to a suture in the treatment of gunshot- and punctured wounds since it is equally efficacious and is more quickly introduced.

If the liver is extensively crushed, suture is useless. The wound should be tamponed with sterile gauze.

Hemorrhage may sometimes be stopped by means of the thermo-cautery, but this treatment is unreliable in the case of large vessels and needs to be supplemented with tamponade. Several operators have reported good results from the use of steam as a hæmostatic.

Reasonable search should be made for wounds of the stomach, pancreas, kidney, etc. It should also be borne in mind that the liver may be ruptured in two or more places. Bits of clothing and other foreign bodies are likely to escape notice unless one operates directly through the enlarged wound. It is unwise to make a prolonged search for such objects. If blood or bile reaccumulates in the abdominal cavity, a second operation must be performed.

There is nothing peculiar in the after-treatment. A rise of temperature may be due to an abscess in the liver or in the subphrenic space, or to suppuration in the right pleural cavity.

INJURIES OF THE BILE-DUCTS.

Experiments upon animals have shown that the escape of bile into the peritoneal cavity produces violent symptoms but does not give rise to fatal peritonitis. If the bile remains for a considerable time a serofibrinous plastic peritonitis develops and all the intestine becomes covered with a fibrinous membrane which may be peeled off. As much as twenty kilos (quarts) of bile has been known to collect in the abdominal cavity.

If the gall-bladder is distended—for example, when the cystic duct is occluded by a calculus—it may be ruptured by a fall on the right side more easily than a normal bladder. In general the injuries which produce rupture of the liver may also produce rupture of the bile-ducts.

Rupture of the gall-bladder gives about the same symptoms as rupture of the liver, namely, collapse, pain in the right hypochondrium which may extend to the back and to the right shoulder, vomiting, and restlessness. In three or more days jaundice appears, due to absorption of bile from the peritoneal cavity. If the peritoneum is the seat of chronic inflammation, it may be incapable of resorbing bile, so that jaundice under such circumstances may not appear. As the bile in the peritoneal cavity increases, the abdomen becomes more

and more distended. The fluid which first escapes from a wound in the gall-bladder may contain considerable blood. The presence of a large percentage of bile indicates rupture of the biliary passages rather than that of the liver. Absence of bile-pigment from the stools suggests injury of the common duct rather than that of the gall-bladder.

Courvoisier mentions 34 cases of subcutaneous rupture of the biliary passages, with death in 22 of them. In 5 cases death occurred in thirty hours from collapse, and in the rest of the fatal cases it was due to fibrinous peritonitis and toxic action of the resorbed bile. He also reports 14 cases of penetrating wounds, with death in 3 cases from collapse and in 6 from sepsis. But since his time the prognosis has been somewhat improved by prompt aseptic treatment. It has been shown that bile escaping from healthy bile-ducts does not usually produce septic peritonitis. It is, however, a good culture-medium for the development of micro-organisms; and, furthermore, germs may pass from the duodenum into the common duct. If there is disease of the gall-bladder or other biliary passages, infection may develop when the bile escapes into the peritoneal cavity. The possibility of cholæmic intoxication, the result of resorption of bile by the peritoneum, must further be borne in mind.

Whenever a diagnosis of rupture of the bile-ducts is made, the abdomen should be opened. Some have advocated a transverse incision, some a longitudinal. The principal thing is to make an incision sufficiently large to permit free inspection. In cases of doubt a small exploratory incision should be made to confirm or correct the diagnosis.

If there is a small wound in the gall-bladder, its edges should be trimmed and approximated by a double row of sutures which do not include the mucous membrane. A stitch which penetrates the cavity of the gall-bladder may become the nucleus of a calculus. Formalin catgut is the best suture material for this purpose. If the gall-bladder is badly injured, it should be incised. If the cystic duct is wounded or torn across, it should be sutured or ligated. In the latter case the gall-bladder should be removed. If the common duct or hepatic duct is injured, the wound should be treated by a tampon of sterile gauze. While it is possible to suture a common duct which has been dilated by reason of the presence of a calculus, suture of a wound in a normal common duct is often difficult. A drain may be inserted into the hepatic duct so that the bile may be brought outside the body for a few days. In these cases the operator is often compelled to do what can be done quickly in order to save his patient. If the common duct is torn across, the patient may be treated by a cholecystenterostomy, but on account of the risk of infection from the intestine it is better to approximate the torn duct as nearly as possible and to treat the wound with a tampon of sterile gauze. Experience has shown that wounds in the common duct 3 or 4 cm. (1.2 or 1.6 inches) long, and even transverse divisions of the duct, may heal perfectly.

Extensive injuries of the gall-bladder and ruptures of the biliary

passages are commonly associated with injuries of the liver, the operations for the treatment of which are given above. There are often coexistent wounds of the intestine, pancreas, kidney, etc.

If an injury of the gall-bladder or bile-ducts is not recognized until the symptoms of collapse have passed off, and jaundice or fluid in the peritoneal cavity suggests it, recovery may follow repeated aspiration of the extravasated bile. The tear in the gall-bladder may heal spontaneously. However, if the strength of the patient permits it, it is better to make a short incision which will permit escape of the fluid and will at the same time enable the surgeon to inspect the biliary tract.

CHAPTER XXIV.

DISEASES OF THE LIVER.

ABSCESS OF THE LIVER.

ACUTE hepatitis, a disease more often seen in the tropics than in the temperate zone, frequently leads to abscess of the liver. It is thought to be due to micro-organisms which enter the liver from the intestine through the lymphatic or blood- or biliary vessels. The excessive use of alcohol, strong cathartics, etc., are considered predisposing factors in this disease. Be that as it may, white men are the chief sufferers from this affection, and these people, especially when only a short time in the tropics, are unwilling to content themselves with the simple and scanty fare of the natives. The tropical abscess of the liver follows dysentery in the majority of cases. Several observers have found the amœba of dysentery in the pus from the abscess. There are also instances in which hepatic abscess has followed malaria, influenza, and yellow fever.

This subject is of practical importance to physicians living in a temperate zone, since those who return home after a long stay in the tropics occasionally develop hepatic abscess. Sometimes a foreign body has been found in an abscess of the liver—fishbone, a bit of straw, etc. Abscess may also be due to contusion, the infection in such cases being introduced through the blood or biliary channels. In open wounds of the liver the infection may enter from without. Round worms may enter the biliary passages and set up abscess. Other agents are coccidia, the ray fungus of actinomycosis, and, in rare instances, the bacilli of tuberculosis. A syphilitic gumma of the liver may suppurate. Abscesses secondary to lesions of echinococcus and cholelithiasis are somewhat more common.

Any infectious disease, and especially typhoid fever, may set up suppurative cholelithiasis and cholangitis, which in turn may produce pericholecystitis, pericholangitis, suppurative thrombosis of the veins, and abscess of the liver. Ulcer of the stomach or duodenum may produce adhesions to the liver and break through its capsule, forming an abscess in the substance of the liver. Abscess of the kidney may act in a similar way.

The metastatic abscesses of pyæmia, some of which may occur in the liver, have little interest for the surgeon, as they are lesions of the last stage of this disease. Abscess of the liver which follows ulceration in some organ connected with the portal system is of greater sig-