the suppuration extends beyond the ducts, and there is localized liver abscess, or there is perforation of the gall-bladder with the formation of abscess between the liver and stomach.

Clinically it is characterized by a fever which may be intermittent, but more commonly is remittent and without prolonged intervals of apyrexia. The jaundice is rarely so intense, nor do we see the deepening of the color after the paroxysms. There is usually greater enlargement of the liver and tenderness and more definite signs of septicæmia. The cases run a shorter course, and recovery never takes place.

3. **The More Remote Effects of Gall-stones.** — (*a*) Biliary Fistulæ. These are not uncommon. There may, for instance, be abnormal communication between the gall-bladder and the hepatic duct or the gall-bladder and a cavity in the liver itself. More rarely perforation occurs between the common duct and the portal vein. Of this there are at least four instances on record, among them the celebrated case of Ignatius Loyola. Perforation into the abdominal cavity is not uncommon; 119 cases exist in the literature (Courvoisier), in 70 of which the rupture occurred directly into the peritoneal cavity; in 49 there was encapsulated abscess. Perforation may take place from an intrahepatic branch or from the hepatic, common, or cystic ducts. Perforation from the gall-bladder is the most common.

Fistulous communications between the bile-passages and the gastro-intestinal canal are frequent. Openings into the stomach are rare. Between the duodenum and bile-passages they are much more common. Courvoisier has collected 10 instances of communication between the ductus communis and the duodenum, and 73 cases between the gall-bladder and the duodenum. Communication with the ileum and jejunum is extremely rare. Of fistulous opening into the colon 39 cases are on record. These communications can rarely be diagnosed; they may be present without any symptoms whatever. It is probably by ulceration into the duodenum or colon that the large gall-stones escape.

Occasionally fistulous communication exists between the gall-bladder and the urinary passages, and the stones may be found in the bladder. The opening has been either into the pelvis of the kidney or, as has been supposed, the gall-bladder has become adherent in the neighborhood of the navel, and the stone has escaped through an open urachus. It is possible that adhesions may form between the distended gall-bladder and urinary bladder, since the former has been found adherent as low as the broad ligament.

Many instances are on record of fistulæ between the bile-passages and the lungs. Courvoisier has collected twenty-four cases. Bile may be coughed up with the expectoration, sometimes in considerable quantities. In only seven cases did recovery take place. In some of these the abscess formation was due to hydatids, in some to ascarides. The perforation usually takes place through the lung, by a liver abscess communicating with the pleura, or occasionally the abscess enters the mediastinum and perforates a bronchus.

Of all fistulous communications the external or cutaneous is the most common. Courvoisier's statistics number 184 cases, in fifty per cent of which the perforation took place in the right hypochondrium; in twenty-nine per cent in the region of the navel. The number of stones discharged varied from one or two to many hundreds. Recovery took place in 78 cases; some with, some without operation.

(*b*) Obstruction of the bowel by gall-stones. Reference has already been made to this, the frequency which appears from the fact that of 295 cases of obstruction, occurring during the past eight years, analyzed by Fitz, 23 were by gall-stone. Courvoisier's statistics give a total number of 131 cases, in six of which the calculi had a peculiar situation, as in a diverticulum or in the appendix. Of the remaining 125 cases, in 70 the stone was spontaneously passed, usually with severe symptoms. The post-mortem reports show that in some of these cases even very large stones have passed *per viam naturalem*, as the gall-duct has been enormously distended, its orifice admitting the finger freely. This, however, is extremely rare. The stones have been found most commonly in the ileum.

Other Affections of the Bile-ducts.

Cancer will be considered later.

Stenosis or complete occlusion may follow ulceration, most commonly after the passage of a gall-stone. In these instances the obstruction is usually situated low down in the common duct. Instances of this are extremely rare. Foreign bodies, such as the seeds of various fruits, may enter the duct, and occasionally round worms crawl into it. In the Wistar-Horner Museum of the University of Pennsylvania there is a remarkable specimen showing the common and hepatic ducts enormously distended and densely packed with a dozen or more lumbricoid worms. A similar specimen exists in one of the Paris museums. Liver-flukes and echinococci are rare causes of obstruction in man.

Obstruction by *pressure* from without is more frequent. Naturally cancer of the head of the pancreas is apt to involve the terminal portion of the duct; less often cancer of the pylorus. Secondary involvement of the lymph glands of the liver is a common cause of occlusion of the duct, and is met with in many cases of cancer of the stomach and other abdominal organs. Rare causes of obstruction are aneurism of a branch of the cœliac axis or of the aorta, or pressure of very large abdominal tumors.

The symptoms produced are those of chronic obstructive jaundice. At first, the liver is usually enlarged, but in chronic cases it may be reduced in size, and of a deeply bronzed color, and firm, owing to slight increase in the connective tissue. The hepatic intermittent fever may be associated with occlusion of the duct from any cause, but it is most fre-

quently met with in chronic obstruction by gall-stones. Permanent occlusion of the duct terminates in death. In a majority of the cases the conditions which lead to the obstruction are in themselves fatal. Cases of cicatricial occlusion may last for years. A patient under my care, who was permanently jaundiced for nearly three years, had a fibroid occlusion of the duct.

The *diagnosis* of the nature of the occlusion is often very difficult. A history of colic, jaundice of varying intensity, paroxysms of pain, and intermittent fever point to gall-stones. In cancerous obstruction the tumor mass can sometimes be felt in the epigastric region. In cases in which the lymph glands in the transverse fissure are cancerous, the primary disease may be in the pelvic organs or the rectum, or there may be a limited cancer of the stomach, which has not given any symptoms. In these cases the examination of the other lymphatic glands may be of value. In a case, recently under observation, with jaundice of seven weeks' duration, and believed to be catarrhal (as the patient's general condition was good and he was said not to have lost flesh), a small nodular mass was detected at the navel, which on removal proved to be scirrhus. Involvement of the clavicular groups of lymph glands may also be serviceable in diagnosis. As already mentioned, the gall-bladder is often but little enlarged in obstruction of the common duct. Great and progressive enlargement of the liver with jaundice and moderate continued fever is more commonly met with in cancer. In hypertrophic cirrhosis a similar condition exists, but the organ is smooth and there is rarely progressive enlargement while under observation.

Treatment of Gall-stones and their Effects.—In an attack of biliary colic the patient should be kept under morphia, given hypodermically, in quarter-grain doses. In an agonizing paroxysm it is well to give a whiff or two of chloroform until the morphia has had time to act. Great relief is experienced from the hot bath and from fomentations in the region of the liver. The patient should be given laxatives and should drink copiously of alkaline mineral waters. Olive oil has proved useless in my hands. When taken in large quantities, fatty concretions are passed with the stools, which have been mistaken for calculi. Since the days of Durande, whose mixture of ether and turpentine is still largely used in France, various remedies have been advised to dissolve the stones within the gall-bladder, none of which are efficacious.

The diet should be regulated, the patient should take regular exercise and avoid, as much as possible, the starchy and saccharine foods. The soda salts recommended by Prout are believed to prevent the concentration of the bile and the formation of gall-stones. Either the sulphate or the phosphate may be taken in doses of from one to two drachms daily.

Expression of gall-stones from the bladder by digital manipulation, as recommended by George Harley, is a highly irrational procedure, not to be followed. So long as gall-stones remain in the bladder they do little

or no harm in a great majority of cases. To force them on into the duct is to render the patient liable to severe colic or to the still more serious danger of permanent obstruction.

When the cystic duct is occluded and the gall-bladder distended, an exploratory puncture may be made, as practised by the elder Pepper, in 1857, in a case of empyema of the gall-bladder, and by Bartholow in 1878. The puncture may be made either to draw off fluid from a distended bladder or to explore for gall-stones. Aspiration is usually a safe procedure, though a fatal result has followed. When the gall-bladder is distended and plainly palpable, to sound for stones by an exploratory puncture is justifiable, but under no other circumstances. "The easy and safe method of sounding for impacted stones," recommended a few years ago by a London physician, in which it is advised to thrust a sharp needle six inches long between the navel and the margin of the liver, may be characterized as one of the most extraordinary operations ever advocated, and would probably always prove fatal, as in the case of the unhappy victim upon whom it was practised.

The surgical treatment of gall-stones has of late years made rapid progress. The operation of cholecystotomy, or opening the gall-bladder and removing the stones, which was advised by Sims, has been remarkably successful, particularly in the hands of Lawson Tait. The removal of the gall-bladder, cholecystectomy, has also been practised with success. The indications for operation are: (*a*) Repeated attacks of gall-stone colic, of great severity and danger. (*b*) The presence of a distended gall-bladder, associated with attacks of pain or with fever. Many cases of obstruction of the cystic duct with moderate distention of the gall-bladder produce little or no inconvenience, and perfect recovery may take place with contraction and obliteration. (*c*) When a gall-stone is permanently lodged in the common duct, and presents the group of symptoms above described. It must, however, be borne in mind that, contrary to the experiences of Charcot and other French writers, three of my cases recovered—one after persistence of the condition for eight months, another for three years; two died of the effects of the prolonged jaundice, and two after operation. The question, then, of advising removal in such cases should depend largely upon the personal methods and success of the surgeon who is available. The common duct has been explored and gall-stones removed from it. The operation is necessarily much more serious and difficult than that upon the gall-bladder.