

The secondary deposits excite local distress, and each addition to the area of suppuration increases the hectic fever. Deposits in the brain cause delirium and stupor, but, without these, low-muttering delirium comes on, with a typhoid state, and death occurs in a gradually deepening coma. The fatal result may occur in one week, or may be postponed to six weeks—the average being about three.

The diagnosis must always be a matter of extreme difficulty, and can, indeed, be made only when the cause is clear and all the symptoms appear in their proper relation. It will be impossible in any doubtful case to differentiate between pylephlebitis and abscess of the liver.

The treatment is without utility. While this is true, it is certain, however, that much may be done to relieve pain by the hypodermatic injection of morphia. It is in a high degree probable that large doses of quinia may be very serviceable in checking suppuration, and the free use of alcohol is certainly applicable in the same direction. The combination of morphia and quinia, with the conjoined administration of alcoholic stimulants, offers the best prospect of relief.

DISEASES OF THE BILIARY PASSAGES: CATARRH OF THE BILE-DUCTS.

Definition.—By catarrh of the bile-ducts is meant an inflammation of the mucous membrane, with an increased production of mucus. Very rarely there occurs a croupous inflammation, associated with infectious maladies, as pyæmia, diphtheria, etc.

Cause.—Catarrh of the biliary passages may arise spontaneously from climatic causes or from malarial influence. It occurs, therefore, more frequently in the autumn, when cool nights succeed to warm days, and when malaria is most rife. Malaria may induce jaundice by catarrhal swelling of the bile-ducts, without any febrile disturbance.* Catarrh of the bile-ducts is usually a secondary disease, secondary to duodenal or gastro-intestinal catarrh, which extends by continuity of tissue up the bile-ducts. A variety of causes are concerned in the production of duodenal catarrh—notably, excesses in eating and drinking. Usually the attacks are excited by some article of food which especially disagrees, but a catarrhal state of a chronic kind has preceded the acute attack.

Pathological Anatomy.—More or less extensive hyperæmia is the initial lesion. The common duct is more affected than any other part of the canal-system, but the catarrhal process may extend to and involve the canaliculi. The mucosa is swollen, the more decidedly near the duodenum, and is coated with a tenacious mucus, so that the

* "Des Affections Paludéennes du Foie," par MM. A. Kelsch et P. L. Kiener, "Arch. de Physiologie normale et pathologique," 1878, p. 571, *et seq.*

lumen is much narrowed or obstructed. The mucous secretion of the gall-bladder is increased in amount and mixed with the bile, stored up more abundantly because the obstruction at the outlet existed while the hepatic and cystic ducts were still pervious. The viscid mucus and sero-mucus poured out from the surface of the membrane contain cast-off epithelium, abundant nuclei, and white corpuscles, and the endothelium itself undergoes proliferation. The obstruction below preventing the escape of bile, and the mucus and sero-mucus accumulating by continued production, the ducts above become dilated, and the tissue of the liver presents the usual appearance of bile-staining when there is a biliary stasis. After several days the hyperæmia lessens, and a quantity of dead endothelium is cast off, still more effectually blocking the passage; but the contents of the bile-ducts gradually liquefy, and the lumen is restored to its former dimensions by the escape of these matters into the duodenum. The whole process will occupy several weeks. This fortunate solution of the catarrhal process is not always effected. The soft tissue of the liver-parenchyma is exceedingly liable to degenerative changes. Recent researches (Charcot,* Legg †) have demonstrated that mere mechanical blocking of the common duct leads in a short time to fibroid degeneration (increase of the connective tissue, interstitial hepatitis) and atrophy of the gland-cells. It has long been known that persistent attacks of catarrh, or the frequent repetition of them, will lead to changes in the parenchyma; but these late investigations, by demonstrating the readiness with which pathological alterations occur in the hepatic parenchyma, have added much to the pathogenetic importance of catarrh of the bile-ducts. Rarely, isolated portions of the liver remain obstructed, and dilated ducts, surrounded by parenchyma deeply stained with bile and much altered, exist in patches throughout the organ.

Symptoms.—The signs and symptoms indicating the onset of the malady are not the same for all forms. The form due to alternations of temperature at certain seasons commences abruptly with some pain, soreness, and sense of weight in the right hypochondrium; constipation exists, the tongue is coated, and the appetite absent; and there are some feverishness and general *malaise*. There are also much depression of spirits and a feeling of illness, greater than the actual lesions warrant. In from three to five days the eyes become yellow, and icterus, or jaundice, then gradually appears over the whole body. Usually the fever disappears in two or three days, the skin becomes dry and harsh, and the surface cold. The pulse is slow, the action of the heart weak, and the strength depressed. When this form of jaun-

* "Leçons sur les Maladies du Foie, des Voies Biliaires et des Reins," Paris, 1877, p. 354.

† "St. Bartholomew's Hospital Reports," vol. ix; various articles in the "British Medical Journal," etc.

dice is produced by malarial infection, the symptoms will develop more slowly, unless, indeed, the disturbance in the hepatic functions is accompanied by malarial fever—intermittent or remittent. The most usual determining cause of catarrhal jaundice is gastro-intestinal, especially duodenal, catarrh. In some subjects a chronic catarrh exists, and but little additional disturbance suffices to close the duct. In others an acute catarrh is brought on by some indigestible food or improper drink. In either case, the patient experiences a good deal of nausea, has a heavily coated tongue, headache, and a somewhat muddy complexion, and there may be more or less fever, or none at all. The jaundice does not appear at once; there must be sufficient time for the extension to the bile-ducts to take place, which will require from one to two weeks. The bile-pigment tints all the tissues of the body, the secretions, and even pathological products, as effusions into the ventricles and thoracic cavity. The urine soon assumes a brownish color, like that of port or black coffee, and is heavily loaded with urates. Some drops of the urine placed on a white porcelain surface, and a little nitric acid made to flow against it, will exhibit the following reaction at the margin where the two fluids come in contact: a greenish tint, quickly followed by blue, violet, to red. This play of colors may not be seen, but bilirubin, when touched by nitric acid, should take on a greenish hue, being converted to biliverdin. During the febrile stage, if fever has existed at all, the pulse rises; but when jaundice appears, if no fever is present, the action of the heart is slowed and the tension of the vascular system lowered. The pulsations may decline so much as twenty or thirty to the minute. This depression of the circulation is due to the action of the biliary salts on the heart itself, for the same effect is produced when the pneumogastric has been previously divided. No bile passing into the intestine, certain substances fail to be digested, especially the fats, and the foods present there decompose, and a great quantity of fetid gas is formed. The results, then, of the absence of bile are white, pasty, or grayish-white, or gray, slate-colored stools, having a very offensive smell, and flatulence. The presence of bile in the skin excites in most persons a great deal of unpleasant itching, which may, indeed, be troublesome enough to prevent sleep. The vision is yellow from the presence of bile-pigment in the humors of the eye. The liver increases in size, and extends a little beyond the margin of the ribs, and the gall-bladder is also sufficiently distended to be felt, in thin persons, projecting beyond the margin of the liver, or be made out by careful percussion. If the gall-bladder partakes in the inflammation, it becomes tender. Usually in from two to five days after the jaundice appears, the unpleasant symptoms subside—the fever ceases, the tongue cleans, and the appetite returns, and only the jaundice and the torpid state of the intestines remain. In a few days the stools become darker and then

normal, the fetid odor disappearing at the same time. The coloration of the tissues and the pigment in the urine continue until the work of elimination is complete, and hence high-colored urine is the final symptom.

Course, Duration, and Termination.—Cases pursuing the ordinary course, having the catarrhal period, the jaundice period, and the period of convalescence, last from three to six weeks, and terminate in complete recovery. Not all cases pursue this favorable course. The resolution may be postponed, and the case assume a chronic character, leading to changes in the hepatic parenchyma, consisting in increase of the connective tissue and an atrophy, largely fatty, of the hepatic cells. The existence of a chronic catarrh of the duodenum invites attacks of acute catarrh involving the ducts, the result being the same—changes in the hepatic parenchyma. Catarrh of the bile-ducts becomes much more important from this point of view.

Diagnosis.—At the beginning, catarrh of the biliary passages may be confounded with the initial symptoms of acute yellow atrophy, but the sex and the condition of pregnancy are so influential in causing the latter that we have in these etiological factors means of differentiating in two thirds of the cases. The subsequent behavior of the two maladies differs so widely as to eliminate all doubt. When the jaundice appears there is a possibility of confounding it with the jaundice which sometimes comes on in the course of cirrhosis and cancer, but an attentive examination of the course and history of each will prevent error.

Treatment.—This is one of the very few conditions in which mercurials may be prescribed in hepatic diseases, not with the view to increase the outflow of bile, but to allay irritation of the mucous membrane. From $\frac{1}{2}$ to $\frac{1}{4}$ grain of calomel, rubbed up with a little sugar, may be administered every four hours for a few days. Simultaneously, whether malaria is or is not an element in the case, two antipyretic doses of quinia (10—15 grains) should be given daily until jaundice appears, and for a few days subsequently to its full development. To maintain free action of the kidneys by salines is highly useful by favoring elimination. The ordinary effervescing powder, or the aperient effervescing powder, if constipation is decided, is well adapted to accomplish the object. The Saratoga waters, or Vichy, or Kissengen, or Carlsbad, may be drunk freely to accomplish the same purpose. In the chronic cases, with persistent plugging of the bile-ducts, which means also persistent jaundice, the most effective remedy is sodium phosphate in 3j doses *ter in die*, and kept up until the jaundice declines. Sulphate of sodium, also, is strongly recommended. But the sodium phosphate is the most appropriate and effective remedy in those cases of chronic gastro-duodenal catarrh with occasional attacks of catarrhal jaundice. Recent experimental (Rutherford) and clinical

experience has shown the value of euonymin and iridin as cholagogues. Two grains of the former and four of the latter, given at night, and followed by a saline, afford excellent results. The mineral acids were formerly held in great esteem in the treatment of these hepatic affections, but it is now known that alkalies are more serviceable. The local application of the acid-bath to the right hypochondrium is an excellent counter-irritant, but the difficulty experienced in preventing injury to the clothing is a strong objection to its use. Careful regulation of the diet is most necessary. Solid food should be withdrawn for the time being, and all fatty, saccharine, and starchy substances also, for these require the action of the bile either for their solution and absorption, or to prevent their decomposition. The most suitable aliments are skimmed milk and beef-juice. The former should be given freely every three hours, and, if the stomach is irritable, a little lime-water should be added. The utility of the milk is twofold—as an aliment and as a diuretic. Bitartrate-of-potassium lemonade is an excellent diuretic in these cases to remove the last staining of the bile. As the catarrhal inflammation subsides, the diet may be increased, but it should consist of milk, eggs, fresh meat, fresh fish, and the succulent vegetables.

OCCLUSION OF THE BILIARY PASSAGES.

Causes.—The pressure of tumors, as cancer of the pancreas, aneurism of the hepatic artery, etc., is an exterior cause; the impaction of a calculus, adhesion of opposed surfaces in exudative inflammation, etc., are internal causes of occlusion of the bile-ducts.

Results of Occlusion.—The mucus formed all along the canals contributes somewhat to the accumulation of fluids when the outlet is closed, but the chief constituent is bile. The neck of the gall-bladder is not unfrequently closed by an impacted calculus, the sac becoming enormously distended with a transparent, faintly greenish fluid, resulting from the transformation of the mucus and of the bile stored up before occlusion. The author has seen one example of occluded orifice of the cystic duct, in which the contents of the gall-bladder consisted of forty-four biliary calculi without any fluid. As the gall-bladder is an organ of convenience and not of necessity, its closure does not disturb the hepatic functions. It forms sometimes—for the secretion of mucus continues—a tumor of considerable size, and pyriform shape, which may be felt projecting from under the liver. Occlusion of the common duct (ductus choledochus) or of the hepatic duct leads to dilatation of the biliary passages and to changes in the structure of the liver. The whole organ is at first enlarged, but it subsequently undergoes atrophy by the pressure, and death ultimately ensues from the blood-poisoning.

BILIARY CALCULI (CHOLELITHIASIS—GALL-STONES).

Causes.—In the normal state the bile does not contain any formed constituents. The formation of calculi or concretions is determined by the precipitation of a crystallizable substance from the bile—cholesterine—which is held in solution by glycocholate of soda. The mucus formed in catarrh of the biliary passages effects a decomposition of this compound. It is probable that this result is promoted by changes in the composition of the bile, and that the cholesterine may be in excess, and hence held feebly in its combination. Calculi form more frequently after than before the middle period of life, for then cholesterine becomes more abundant; and they are encountered in the obese, in hearty feeders by preference, and in the sedentary. Females are more liable than males, especially fat women who eat rich food and take no exercise.

Pathological Anatomy.—Cholesterine is the principal ingredient of biliary calculi, and exists in the crystalline form chiefly. The actual proportion of this constituent to the others is from seventy to eighty per cent. More or less bile-pigment enters into their formation; also the carbonate of lime and earthy phosphates and carbonates; and a particle of mucus or some foreign body is the nucleus about which the other materials crystallize or aggregate. Occasionally there is a single concretion of large size, which fills the gall-bladder, but usually they are very numerous—sometimes amounting to five or six hundred. When there is a single gall-stone it is ovoid or globular, to adapt it to the shape of the sac, but, when there are several, they assume the octahedral shape, with smooth facets. They do not always assume regular shapes: some are covered with warty masses; others are leaf-shaped, etc. In color they are brownish or yellowish-brown, but in exceptional instances are found in all colors from white to black. They are very light, the specific gravity varying from 1.500 to 1.800.* Gall-stones usually contain a nucleus, composed for the most part of mucus, and cholesterine and bile-pigments are deposited in alternating, concentric layers around it. The nucleus is not always in the center, and there may be several nuclei, and hence the arrangement of the layers is irregular, and there may be deposits of earthy matter and pigment, without cholesterine, etc. Gall-stones may be found in any part of the biliary passages. They are rare in the interior of the liver, and they are not often found in the hepatic duct, because of the increasing caliber below, but are found usually and in the largest numbers in the gall-bladder. By pressure the walls are irritated and a catarrh is set up, and also ulcerations of the mucous membrane of considerable depth and extent are induced. The walls of the gall-bladder,

* Thudichum on "Gall-stones," p. 10.

excited to frequent expulsive efforts, undergo hypertrophy, and the mucous membrane becomes reticulated. Inflammation of the peritoneal investment is excited, and the remains of exudations and adhesions are usually found. Not unfrequently the mouth of the gall-bladder is occluded by an impacted calculus, or permanently closed by inflammatory adhesions. The gall-stones may be forced down, producing pains in the passage through the cystic duct, or, the mouth of the gall-bladder being closed, they remain and produce no further mischief. Gall-stones may become impacted in the cystic, hepatic, or common duct; inflammation and ulceration, with perforation, result.

Symptoms.—When gall-stones are free in the biliary passages without obstructing them, they give rise to some pain in the right hypochondrium of an intermittent character, and pains radiating thence to the shoulder, umbilicus, lumbar region, etc. There is present usually nausea, even vomiting, and there may be chills, followed by fever and sweats. These symptoms are due to the irritation of the ducts, without their occlusion. If concretions are impacted in the hepatic duct, there are pains, jaundice, and enlargement of the liver. When calculi escape from the gall-bladder into the cystic duct, if of sufficient size to irritate the mucous membrane and excite spasm, the phenomena of *hepatic colic* ensue. Sometimes, after a fit of anger, or the receipt of evil tidings, but most frequently in about three hours after a meal, a pain of exceeding violence is suddenly felt at the margin of the liver and in the right portion of the epigastric region. The pain has a boring, burning, lancinating character, and radiates through the abdomen and chest and into the shoulders and back, but the situation of the greatest anguish is in the region of the gall-bladder. The pain is so atrocious that the patient writhes with the agony, rushes up and down the room, or tosses from side to side if in bed. The surface is cold and covered with a cold sweat, and often a severe rigor occurs simultaneously. There may be clonic spasms affecting the right side, or an epileptiform seizure, with loss of consciousness, may occur. Intense nausea accompanies the pain. At first the food is thrown up, but presently, after repeated retching, only some mucus, acid and watery; but the vomiting affords no relief. The action of the heart is feeble, and the circulation is correspondingly depressed. The severity of the seizure is influenced by a variety of circumstances—by the size and roughness of the concretion, by the length of canal to be traversed, and by the condition of the nervous system. The duration of the seizure varies from a few hours to several days, and the first attack is apt to be more severe than any succeeding one. When the attack continues for several days, the pain does not always persist even for hours, for there are remissions in which only an acute soreness remains, and the exacerbations behave as regular attacks. It is highly probable that in these cases several concretions are passed in succession. Again, when the calculus passes from the

cystic to the common duct, there is a feeling of relief, but a new paroxysm occurs when the calculus becomes engaged in the duodenal orifice of the ductus choledochus. Inflammation in the peritoneum may be excited about the site of impaction, and involve the neighboring structures, or the duct may become gangrenous. The calculus, by preventing the outflow of bile in the hepatic or common duct, causes jaundice, which is not a usual symptom in impaction of the cystic duct; although it may be present, the surrounding swelling being sufficient to prevent the flow of bile through the common duct, or it is probable that jaundice may be due to the disturbance in the hepatic plexus of nerves. The pain suddenly ceases sometimes by the dropping of the concretion into the duodenum. Jaundice usually succeeds to the pain, and is not often seen during the time of greatest suffering. Sometimes a calculus will remain impacted in the common duct for weeks or even months; jaundice persists, the bile accumulates, the ducts dilate, until suddenly the impaction is overcome, and violent bilious vomiting and diarrhoea announce the delivery. When the concretion remains permanently impacted, the liver undergoes the changes already noted; the connective tissue multiplies, the gland-cells waste and undergo fatty metamorphosis, and the organ shrinks in size (Charcot). Careful search should always be made in the evacuations for the calculus. The fæces should be thoroughly mixed with water, the solid particles allowed to subside and the fluid portion poured off, and this operation must be repeated until the last solid parts are reached. Sometimes—most frequently, probably—there is but one calculus, but there may be a hundred. A marvelous change takes place in the patient as soon as the calculus reaches the intestine. The pain ceases, as well as the nausea and vomiting, the bowels act spontaneously, the appetite returns, the jaundice soon disappears, and the state of health is fully restored.

Course, Duration, and Termination.—From the initial pain to the termination of all symptoms may not be longer than two days, or, if jaundice is present, five days. If a number of calculi pass, the duration of a case is indefinitely prolonged. The severe cases of this kind last several weeks. The usual termination is in health, but death from ulcerative perforation and subsequent peritonitis is not uncommon. Now and then a calculus ulcerates through the duct; in the peritonitis which follows, adhesions are formed, limiting the mischief to the immediate neighborhood; a purulent depot is thus created, and gradually a fistulous communication externally is established, and the calculus is discharged with the pus. Sometimes such a purulent depot opens communication with the intestine, stomach, or bladder. The last-named terminates fatally; the discharge by the stomach, intestine, and externally is often successful. After the calculus reaches the intestinal canal, it may serve as a source of new mischief by forming the nucleus of an impaction of the bowel.

Diagnosis.—The only maladies with which hepatic colic may be confounded are hepatalgia, gastralgia, and enteralgia. The locality of the pain, the absence of local soreness, the absence of jaundice, the absence of calculi in the stools, separate these neuralgic affections from hepatic colic.

Prognosis.—A favorable opinion may be expressed in most cases, but the prognosis must be guarded when the pain does not yield, and when the vital powers begin to flag, especially if local tenderness and fever indicate peritonitis.

Treatment.—The severe pain demands immediate attention. There are two methods of relieving it: by the inhalation of ether, and by the hypodermatic injection of morphine. The action of the former is temporary, and, of course, the relief is confined to the period of unconsciousness. This may be sufficient, but usually prolonged administration is necessary. The hypodermatic injection is more effective. From $\frac{1}{2}$ to $\frac{1}{3}$ of a grain of morphine is usually sufficient for an ordinary case, but, if the suffering be very great, $\frac{1}{4}$ to $\frac{1}{2}$ grain of morphine may be required. The combination of morphine and atropine is both more effective and safer, and hence atropine should be given, $\frac{1}{100}$ grain at each injection. Not only does this remedy remove the pain, but it is the most efficient means of preventing or subduing peritoneal inflammation. Anodynes can not be given by the stomach; anodyne enemata are insufficient in this malady—so that the choice of remedies is much restricted. Five minims of chloroform every half hour, in an emulsion or dropped on sugar, has been proposed, but in the author's experience it is usually rejected, and excites nausea even by its odor. It has been gravely proposed to administer it as a solvent of gall-stones, and to relieve the suffering by effecting a solution of the impacted calculus. Trousseau had, it was supposed, disposed of this notion, but it has been revived again. Chloral has also been employed to relieve the pain, but it is very offensive to the stomach; yet, if given by the rectum, it is highly efficient in relieving the pain by allaying spasm, and also, probably, has some solvent action. Warm baths and hot fomentations to the right hypochondrium contribute to relief. Undoubted advantage is derived from the use of leeches, when, the symptoms persisting, tenderness develops and fever arises.

Prophylaxis is highly important. The author has had abundant and highly favorable experience with the plan which is about to be recommended, and he therefore urges it on the attention of his readers: The diet must be carefully regulated. All fats and articles containing fat in any form are rigorously excluded. Saccharine substances are also prohibited, and the starchy constituents of the diet are reduced to a little white or corn bread—potatoes, beans, peas, and rice being excluded. Lean meat of all kinds, eggs, fish, fruit, and the succulent

vegetables are permitted freely. Wine at dinner is allowed, but malt liquors and spirits are forbidden. Daily exercise is directed. All irregularities of life of every kind are given up. The most effective remedy for the removal of the conditions which lead to the formation of biliary calculi, or to bring about their solution, is sodium phosphate. This is prescribed in the dose of a drachm three times a day, dissolved in sufficient hot water, and taken before meals. This remedy is continued for several weeks or months, and, if there are present evidences of gastro-intestinal catarrh, $\frac{1}{10}$ of a grain of the arseniate of soda is added to each dose of the phosphate. While success seems always to attend this practice, the author has been constantly disappointed in the remedy of Durande (ether and turpentine), and in the administration of chloroform, with a view to its solvent action on retained calculi. As the catarrhal state of the bile-ducts, succeeding to catarrh of the duodenum, is the great factor in the causation of gall-stones, it is highly important to correct it. Without attention to the plan of diet above indicated this can not be accomplished; but the persistent use of phosphate of soda can do much, even without a change in the habits of life, toward bringing about a cure. Vichy-water, and our own Saratoga Vichy, as well as the alkaline waters of this country, which are so abundant, should be used daily in connection with the plan above indicated. Dr. T. H. Buckler, of Baltimore, strongly recommends the use of the hydrated succinate of the peroxide of iron ($\frac{2}{3}$ jss — $\frac{2}{3}$ vjss water—a teaspoonful *ter in die*) as a remedy to prevent the formation of calculi. The use of this remedy is based on some theoretical notions respecting the oxidizing power of succinic acid and its solvent action. Buckler also urges the use of chloroform during the paroxysms of colic, as a solvent of cholesterin. Harley advocates the use of sulphate of soda. Cholate of soda—a constituent of normal bile—theoretically an appropriate remedy, has been lately given with success, in doses of from two to five grains.