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A PAPER

ON

CHOLE-LITHIASIS,

BY

JOHN A. OCTERLONY, A. M., M. D.

READ BEFORE THE KENTUCKY STATE MEDICAL SOCIETY AT ITS MEETING IN LOUISVILLE, KY., APRIL, 1877.

PUBLISHED AT THE REQUEST OF THE SOCIETY.

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PRINTED FOR THE AUTHOR BY JOHN P. MORTON AND COMPANY.
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Dr. Woodward
with kind regards of
The author

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A PAPER ON CHOLE-LITHIASIS.

This name, derived from the Greek (*Χολη*, bile, and *λιζος*, a stone), is used to designate that state of the system in which biliary calculi are formed. This disease, without being one of the most frequent, is yet far from rare. A good deal of practical knowledge concerning it has already been accumulated, yet we must admit much remains to be acquired, and much is still shrouded in obscurity.

The following paper is based upon the study of thirty-five cases observed and treated by me, and is offered as embodying the results of my studies and clinical experience with a disease which for years has been of deep interest to me.

It has been suggested by several distinguished observers that the formation of gallstones depends upon a peculiar diathesis. In support of this view they allege that in many of these patients there is an evident predisposition manifested by a constant formation of gallstones, and this in spite of all treatment; that the disease is often hereditary; that there is a certain close connection between the state of the system that induces the formation of gallstones and which results in the formation of urinary calculi; and, finally, that this constitutional state is *gout*. I have not been able to corroborate this view; on the contrary, I have been compelled to regard this disease as due to local or general causes entirely independent of any diathesis whatever.

Some cases are rebellious, and obstinately resist all our efforts to cure; but when one reflects how difficult it is to continuously and completely control these patients, and when the various features of the disease are taken into account, this rebelliousness to treatment is more readily explained by the persistence of local causes without assuming the existence of a peculiar constitutional vice.

In only two of my cases were any of their ancestors known to have

had gallstones, and I therefore conclude that heredity plays but a feeble part in their production. Morgagni thought that *hepatic colic* in a patient subject to *urinary calculi* gave strong reason for suspecting the existence of biliary calculi, especially if the patient be an adult. Subsequent writers have noted the co-existence of these two forms of lithiasis, and have expressed a belief in their mutual connection. I am led to believe it is quite rare and incidental, for it was not observed in a single one of my thirty-five cases. Neither did I ever find any of the usual manifestations of gout in the persons I have treated for gallstone. Gout is notoriously uncommon in women, but it is especially in them that gallstones are most often found.

Causation.

The etiology of gallstones is one of the "dark points" upon which much additional light must be shed before our knowledge concerning them can be satisfactory and complete.

Age is one of the general conditions operating at least as a predisposing cause.

Gallstones are most common after middle-age. My oldest case was in a woman seventy-six years old; my youngest was another woman aged twenty-two.

They have, however, been found in children *ten* and *two* years old, and even in new-born infants. These very young subjects did not, so far as I can learn, suffer from hepatic colic, and the presence of the concretion was only recognized after death. I do not know what is the earliest recorded age at which they have begun their travels and thereby occasioned trouble.

Sex.—The greater susceptibility of women than men to this disease is well known. It is said to be in the proportion of *three* of the former to two of the latter. In my cases the difference was even more marked, being twenty-nine women to six men.

Habit and Regimen.

The majority of persons suffering from chole-lithiasis are large eaters, and fats enter prominently into their dietary. Jaccoud insists that they are generally corpulent. A tendency to obesity was noticed by me in thirty out of thirty-five. A sedentary life predisposes to chole-lithiasis by obstructing that process of tissue metamorphosis

whose rapidity and perfection is so essential to health. It also promotes deposition of biliary constituents in the gall-bladder, which is strongly favored by *too prolonged intervals between* meals, and indeed by any retardation of the flow of the bile. Precipitation of the solid constituents of the bile may be determined by a variety of local conditions, which I will mention in detail. The general conditions just set forth act at most as a predisposing cause, which, without the action of a local cause, would be wholly inoperative so far as the development of gallstones is concerned.

Diet undoubtedly has a certain influence in the production of gallstones, both in man and in some of the lower animals.

It has been observed that biliary calculi are more frequent in the gall-bladder of stall-fed oxen and sheep who have been fed on dry hay than in those who have been at pasture. I have inquired as to the occurrence of gallstones in horses with the hope of throwing additional light on the general etiology of this disease, but was surprised to learn that among them it is so rare that only one case has been recorded. Percival* believes this immunity is due to the simplicity of the biliary apparatus in these animals.

Local Causes.

1. Increase in the solids of the bile to such amount that the physiological solvent can no longer hold them in solution, the excess being thrown down and forming biliary calculi. This mode of formation is beyond the reach of demonstration, but one can readily conceive it to be possible, and certain facts render it quite probable. Gallstones become frequent at the age when the bile contains a larger amount of cholesterin, and Chevreul has shown that in several persons with chole-lithiasis the bile was excessively charged with fats.†

2. A diminution in the amount of biliary solvents, cholate and choleate of soda and potassa, causing a precipitation of solids normally held in solution. This mode of formation is still less capable of demonstration than the former, but it is rendered probable by the effects that have been observed on administration of biliary salts in certain cases of chole-lithiasis.

* On the Diseases of the Digestive Organs of the Horse. London, 1855.
† Jaccoud Pathologie Interne.

3. The presence of foreign substances in the gall-bladder.

Dr. Thudicum* notes that in some cases the unclear part is composed of casts of the bile-ducts, and the central part often consists of small concretions of bile pigment which have fallen from the smaller ducts. A clot of blood, a globule of mercury, a fruit-stone, have been found as nuclei of gallstones. In one case the nucleus was composed of a lumbricoid worm, in another it was a pin. This is doubtless a rare mode of formation, but it does occur, which shows that when once a nucleus exists biliary matters tend to become deposited around it.

4. Catarrhal inflammation of the biliary passages.

This is the most efficient and probably the most frequent cause of gallstones. In health all the constituents of the bile are held in solution, probably by the *cholate of soda*. But when catarrhal inflammation of the mucous membrane of the gall-bladder sets in, its solvent power is lost, the bile is decomposed, and its solids are thrown down either in the form of a pulverulent mass or larger particles, which tend to increase by continued accretion.†

Drs. Thudicum and Gomp. Bezanez have shown that when bile is allowed to stand for a long time in a bottle, acid decomposition takes place spontaneously and pigment hitherto dissolved is deposited. That the influence of catarrhal mucus in the gall-bladder plays an important part in the decomposition and precipitation of bile, and the subsequent formation of calculi is rendered still more probable by analogous changes in the urinary bladder, owing to cystitis, so familiar to all that more extended mention is superfluous.

5. Another suggestion made by Thudicum is that decomposition of bile may also be due to a putrid ferment absorbed by the intestine; but of this I have seen no proof, nor of its agency in the production of gallstones.

Catarrh affecting the biliary passages within the liver may, though rarely, produce a similar result as when affecting the gall-bladder.

Structure.

The usual seat of gallstones is in the gall-bladder. They are less commonly found in the cystic, hepatic, and common choledoch duct,

*Thudicum on Gallstones, page 166.

†Jaccoud loc. cit.

and it is only seldom that they are found occupying the biliary canals within the liver. In this latter locality they are invariably quite small. Their volume varies from the small size of sandy particles to that of a hen's egg, and even larger,* and is in inverse ratio to their number.

When there is only a single calculus present it may fill the whole gall-bladder, and usually corresponds in outline to the form of the latter. The surface of the concretion may be rough or smooth, but the walls of its receptacle generally fit it closely, sometimes sending down processes of mucous membrane into the depressions which here and there furrow its surface. Multiple calculi, by reciprocal attrition and pressure, assume facet shapes and convex and concave surfaces, and thus come to fit perfectly together. Sometimes they present the form of regular tetra- or octa-hedral crystals.

In consistence they may be firm or waxy, but are most often brittle, break readily between the fingers, and soon crumble either spontaneously or on slight pressure. I have, however, in my collection, gallstones passed twelve and thirteen years ago, and which are still perfectly hard and intact.

The material holding the particles together is thought to be cholic or choloidic acid, or both; it has also been supposed to be mucus.

The color is subject to infinite variation; they may be whitish, brownish yellow, brown, green, blackish, mottled, or streaked. They are made up of many strata of different materials, and the differences in color between these various layers are often very great.

The calculi have a nucleus, sometimes multiple, chiefly composed of biliary pigment in combination with lime, traces of mucus, and earthy phosphates. Around this nucleus the materials that constitute the concretion become deposited in regular or uneven strata. A majority of the calculi are composed entirely of cholesterin, with a nucleus of calcareous matter, or pigment. Now and then this pigment is more abundant, and is sometimes uniformly distributed throughout the mass; at other times it and cholesterin form alternating layers. In some cases there is no cholesterin at all, and the calculi consist exclusively of carbonate and phosphate of lime.

Uric acid† has been found in them, and they generally contain traces of iron, manganese, and copper.

* See an interesting case, with illustration, recorded in the American Practitioner February, 1877.

† Stöckhard and Marchand.

The specific gravity is light, and varies with the composition; when chiefly of cholesterin they float in water. Ordinarily they are slightly heavier than this liquid, and sink in it.

There may be fullness of the gall-bladder, and when palpation is practiced the calculi are felt as hard, movable bodies, producing by contact with each other, a crackling sound, which may be heard with the stethoscope, and is said to resemble the noise made by tapping upon a bag containing nuts or dry beans.* A large calculus can be accurately made out, as shown by Buckler and others.

Biliary calculi being once formed may remain quiescent within the gall-bladder for an indefinite length of time.

I have never seen a case where the diagnosis could be made under such circumstances, though it is sometimes practicable.† In certain cases, however, they do not remain latent, but give rise to disturbances of different kinds.

1. The *calculi excite irritation within the gall-bladder.* Ordinarily they may exist even in large numbers without giving rise to changes in the mucous membrane; at other times they are merely the lesions peculiar to a catarrhal inflammation.† But in a smaller proportion of cases their presence induces suppurative inflammation, which may terminate in perforation, sometimes into the peritoneum, the stomach, the bowel portal vein, ureter, or into the pleura. But fortunately it is usually preceded by the formation of adhesions to neighboring organs. This is especially likely where the opening takes place externally. Such a case came under my observation many years ago through the kindness of the late Dr. Lewis Rogers, who was so justly distinguished in life and so deeply mourned in death. The patient, a woman of middle-age, had for a long time suffered from dull, recurrent pains in the region of the gall-bladder. After a while she had sharp, shooting, and then throbbing pains and fever. A swelling appeared, and an abscess formed, which broke externally, and several gallstones were discharged through the wound. In time the opening closed and the patient recovered.

Chronic inflammation may also be developed when the walls of the gall-bladder thicken and contract and the liquid contents become condensed by absorption of the water, and the gallstones become

* Petit.

† Jaccoud Path. Int.

welded together by a chalky mass lying in immediate and close contact with the contracted gall-bladder.

2. The gallstones are disturbed and travel along the ducts, giving rise in their migrations to the symptoms of hepatic or gallstone colic.

I have often found biliary calculi at the post mortem examinations of persons in whom their presence had never been suspected during life, and many persons pass small gallstones without any pain, especially at Carlsbad and Marienbad while drinking of these justly celebrated mineral waters; yet ordinarily the passage of one of these concretions is attended by characteristic and severe symptoms.

Symptoms and Course.

Calculi within the liver itself are even more likely to remain latent than when they quietly occupy the gall-bladder, but their symptoms are so extremely obscure that a diagnosis can scarcely be based upon them. Ill defined paroxysmal pains, not radiating, but confined to the right hypochondriac region, absence of jaundice, and hepatic enlargements, with, perhaps, slight digestive derangements, constitute their whole number. When an intra-hepatic calculus in its downward course becomes lodged in the *hepatic duct* there is fixed pain, persistent jaundice, with whitish evacuations, and the liver becomes speedily enlarged, but *the gall-bladder* is not distended, and this is a symptom of diagnostic importance in differentiating between obstruction of the choledoch duct and of the hepatic duct.

It has already been mentioned that calculi may remain for a long time in the gall-bladder without giving rise to irritation, but in certain cases their presence induces *chole-cystitis*, sometimes so slight and superficial as to be unattended by any symptoms, while at other times involving the whole thickness of the wall of the gall-bladder and signalized by acute symptoms of great severity.

There are then severe pains in the region of the gall-bladder, constant, but with paroxysmal exacerbations, during which they radiate to the epigastrium, loins, and right shoulder, and also fever.

The neck of the gall-bladder is of necessity implicated in the inflammatory process, and becomes obstructed; hence, to the symptoms above related is added distension of the gall-bladder, which gives rise to a pyriform tumor in this region. But there is no *jaundice*, which

is a point of importance as establishing the diagnosis between this condition and obstruction of the choledoch duct.

Chole-cystitis ordinarily terminates in recovery, but may result in perforation and peritonitis, as already mentioned, with the alarming and grave symptoms that accompany that event. An interesting case of chole-cystitis from gallstones is reported by M. Paulet in Allg. Wiener Med. Zeitung, 1875, as follows: A woman aged 42, mother of eight children, began in November, 1874, to feel a severe pain in the right side. On examination there was found a somewhat diffuse tumor about the size of a child's head, which extended from the umbilicus to the anterior superior spinous process of the ileum. As the case was attended by fever it was diagnosticated as one of suppurative ovaritis. In December it was determined to open the tumor with Vienna paste. In three days the skin was destroyed, and in seven the aponeurosis. An exploratory incision was now made, from which a little fluid escaped, but the needle came in contact with numerous hard bodies, which on removal proved to be gallstones. Forty of these were then taken out and a large one found almost encapsulated. It was broken, divided, and extracted without much difficulty, and some bile was also discharged. This biliary fistula soon closed, and in March, 1875, the patient had entirely recovered.

It is difficult to understand why in some persons gallstones, even in large numbers, should remain in the gall-bladder without indicating their presence by any symptoms, and why in other cases they should be so often disturbed from their resting-place and urged along the various passages until finally ejected from the system. Speculation on this point is vain.

There seems to be some connection between the inception of an attack of biliary colic and the period of greatest functional activity of the small intestine and neighboring parts consequent upon a full meal. The paroxysm ordinarily begins two or three hours after a meal, and patients are prone to believe that food has disagreed.

When active duodenal contraction on the arrival of the chyme stimulates the gall-bladder to pour forth its contents the bile thus set in motion engages the calculus in the neck of the gall-bladder. When once entered into the cystic duct muscular contractions, aided by the *vis a tergo* of the bile, propel the calculus until it has cleared the ductus

choledochus and drops into the bowel. It has already been remarked that biliary sand and concretions of larger size may pass without unpleasant symptoms, and even without the knowledge of the patient, but such is not the general rule.

I have noted the symptoms of at least 150 attacks of gallstone colic, and though they were subject to great variation as to severity and duration they were also characterized by great uniformity, so far as their number and character were concerned.

(*a*) The earliest symptom is usually either shivering or a sense of discomfort and distress in the epigastrium. This is soon followed by (*b*) nausea, vomiting, and (*c*) pain.

THE NAUSEA recurs in paroxysms, though it may be unremitting. The matters vomited consist at first of more or less completely digested food, but, continuing after the stomach has been completely emptied, the ejecta consisting of bilious, green-looking liquid. When the calculus has reached the choledoch duct the vomiting of this greenish liquid ceases, though the nausea and retching may not have stopped.

Bilious vomiting, as suggested by Trousseau, indicates that the common duct is free, and that the calculus is either at the neck of the bladder or in the cystic duct.

THE PAIN is, in most cases, at the commencement of the paroxysm referred to the pit of the stomach, and *not to the liver*. Subsequently it may radiate to the navel or the right shoulder, and become located more distinctly about the lower edge of the liver. The pain varies in character. It is described by patients as burning, cutting, tearing, or boring, or as a sense of painful constriction. It may be light, but is more frequently severe, and in a well-marked paroxysm it is excruciating, with remissions and violent exacerbations, which are said sometimes to occur in a regular rhythm.*

Among all painful diseases I have observed there is none which entails more intense suffering than this, and women have repeatedly told me that they have endured far greater agony in passing a gallstone than in giving birth to a child.

Some of my patients would in vain seek relief by frequent change of posture; others would remain perfectly quiet on their back, finding that every motion aggravated their sufferings.

* Jaccoud loc. cit.

Sudden and abrupt cessation of the pain, according to my observation, most frequently indicates that the calculus has tumbled back into the gall-bladder after having engaged in the neck. Ordinarily, and especially when the calculus is large and angular, the mucous membrane of the ducts has been bruised and lacerated during its downward passage, and though there is a sudden abatement of the pain when the stone drops into the bowel, yet perfect relief is not attained for some time, and tenderness and soreness continue perhaps for several days. The abdomen is often retracted, and its muscles may sometimes be seen to contract spasmodically.

Jaccoud suggests that the abdominal muscles keep rhythm with the contractions of the gall-bladder, endeavoring to expel the calculus. The face is often pale, and the forehead covered with perspiration, the pupils are dilated, the pulse is often slow, but in many cases, and especially when the paroxysm is severe and has been protracted, the pulse becomes small, quick, and irregular.

The urine is often voided frequently and in large quantities, and is very pale and of low specific gravity during the paroxysm, but after it is over the urine becomes scanty, high-colored, contains bile and urates, and is of high specific gravity.

In ordinary hepatic colic there is *no fever*. I have, however, observed two cases in which well-marked febrile excitement set in and lasted throughout the paroxysm, then suddenly passed away with the cause. Frerichs reports similar cases in which the temperature rose as high as 104°, but the duration of the fever and paroxysm was exactly the same.

When the paroxysm has lasted for some time distension of the gall-bladder may become quite perceptible. In my cases this was so rare that I find it recorded only in a case of protracted colic, lasting forty-eight hours, and in another case where the calculus became impacted in the common chole-duct, and which terminated in death.

Dr. Hayden* also remarks that the round, smooth, yielding tumor mentioned by authors as formed by the distended gall-bladder is very rarely met with. In some when tumefaction of the gall-bladder was present there was also enlargement of the liver; both pass away together as the obstruction is relieved, unless extensive inflammatory action has been excited.

*Dublin Journal of Medical Science, April, 1876.

JAUNDICE.

In twenty out of my thirty-five cases this symptom was never present, and among the fifteen cases in which it was observed it was not an invariable concomitant of the colic fits, these patients having many paroxysms in connection with which this symptom was absent. From this it appears that jaundice is not an invariable or necessary part of biliary colic. A calculus descending the cystic duct will not induce it, and even when the common choledoch duct is obstructed, jaundice sets in only if the impaction be protracted and the obstruction is complete; if the latter, the jaundice is permanent. Such was the case with one of my patients, who died profoundly jaundiced and comatose.

Most frequently the jaundice develops during the twenty-four hours immediately after the cessation of a paroxysm, and is then most likely due to tumefaction of the ducts from engorgement caused by the bruising and laceration of the mucous membrane during the descent of the stone.

Dr. Goodeve* has remarked that in some instances there are convulsive movements of the abdomen. This I did not observe in any of my cases, nor general convulsions or delirium, which are said sometimes to occur in this connection.

THE DURATION of an attack of biliary colic varies greatly from a few hours to many days. I have had patients in whom it lasted forty-eight hours, and Trousseau records one case in which it lasted six months. It appears to be determined by the size and number of calculi passing.

The subsidence of the pain which marks the close of the seizure is often sudden, but in my experience generally not complete. The patient complains of soreness and weakness; there is tenderness over the liver and gall-bladder, and these in proportion to the *duration* and *severity* of the attacks. When the attack has been protracted, and when one follows another in rapid succession, I have often noticed steady and marked loss in weight.

One attack of gallstone colic is, as a rule, the precursor of others. The frequency of their occurrence appears to depend, among other causes, upon the number of gallstones contained in the gall-bladder,

* Reynold's System of Medicine, vol. iii, p. 315.

and upon the rapidity with which new ones are formed. In some cases weeks, months, and even years may mark the intervals between the attacks. In other cases these recur within a few days, or even a few hours.

In the latter class there are multiple calculi which migrate in rapid succession, or a single calculus repeatedly engages in the funnel-shaped orifice of the cystic duct, and then falls back into the gall-bladder; or it traverses the narrow cystic duct, and on entering the com. choledoch duct, which is of larger caliber, the pain greatly abates, and finally it engages the narrow orifice of the latter, when the pain again returns with increased violence, until the calculus at last clears it and drops into the bowel, and the fit is at an end. I have on several occasions been led to the opinion that a calculus having engaged in the orifice of the cystic duct had receded and fallen back into the gall-bladder.

The following points have guided me in these cases: (*a*) The short duration of the seizure; (*b*) the sudden cessation of pain; (*c*) entire absence of jaundice during and after the paroxysm; (*d*) failure to find a calculus in the evacuations though careful search was continued for two or three days after the fit had ceased.

But in many cases no such minute diagnosis is possible. Indeed the diagnosis of gallstone colic is often obscure, and the true nature of the disease is not seldom overlooked. An illustrative case occurred not long ago in a western city, the particulars of which were communicated to me by a medical friend, who performed the post mortem examination. The gall-bladder was filled with biliary calculi; the duct com. choledoch was obstructed by a large concretion which had become impacted at the orifice of the duct, causing not only inflammation, but obstruction of the duodenum.

Gallstone colic may be distinguished from ordinary colic by the latter never being associated with jaundice; by the relief afforded by emetics and purgatives; by the pain being located further down, and by the absence of tenderness and soreness over the liver and gall-bladder.

Renal colic is accompanied with irritation of the urinary organs, the course or microscopic appearance of blood in the urine, the course of the pain, retraction of the testicle, passage of gravel per urethram, etc.

In *hepatic neuralgia* the pain is far less severe. There is apt to be neuralgia in other parts with which it alternates; there is absence of jaundice, no enlargement of the gall-bladder and liver, and no gall-stones are passed. Hepatic neuralgia, besides, is exceedingly rare, and occurs mostly in hysterical women and in connection with neuralgia of other parts.

Cancer of the pylorus has been mistaken for hepatic colic. I have differentiated them by noting that in the former the pain is more constant, though less severe; there is no jaundice, the liver and gall-bladder are not enlarged, and the tumor, when pressed, is seated higher in the abdomen and nearer the median line than the gall-bladder.

In carcinoma of the liver I have seen jaundice and enlargement of the gall-bladder from pressure of a cancerous nodule on the ducts, but the steadiness of the pain, the nodulated enlargement of the liver, the cachexia, and absence of the paroxysmal elements render the diagnosis easy.

Aneurism of the abdominal aörta and hepatic artery have been associated with paroxysms of excruciating pain, and jaundice, and even enlargement of the gall-bladder, and in some instances these lesions have been mistaken for gallstone colic; but aneurism in this locality is usually recognized without difficulty by attention to its characteristic signs.

The only *positive* sign of gallstone colic is the finding of the calculus, or fragments of it, or biliary sand in the evacuations. Careful search for them should, therefore, always be made when their presence is suspected. Every evacuation for several days after the seizure should be kept for investigation.

I generally prescribe a dose of some purgative the day after an attack of biliary colic, most often castor oil, which is indicated on account of the constipation that then commonly exists; and it has besides the effect of hastening the ejection of any calculi that may have found their way into the bowel. The method of search is a matter of some importance. A double thickness of fine mosquito netting is tied over the top of a slop-bucket, the fæces softened and diluted by the addition of warm water should then be poured upon the netting. All solids, such as pieces of bone, undigested vegetable-matter, or *gallstones* are detained, while all the soluble portions filter through. When sought

for in this manner even small calculi can not escape detection. It is rather tedious and unpleasant work, but it should never be neglected, and rarely entrusted to others. In one case my diagnosis was hotly contested, and its correctness admitted only when, after two days' search, a rather large calculus was found.

If the calculus is large, round, or oval, with uneven surface and single it is probable that no others remain behind. If, on the contrary, it or they be facet-shaped and polished, the gall-bladder will probably contain more that have not yet passed. The latter is the most common, and among the numerous biliary calculi that I have found only *one* had the appearance of being solitary.

The Complications and Sequelæ

Are sometimes of serious character, and require a somewhat more extended mention than that already incidentally made. In my own cases unfavorable developments were very rare, and my knowledge of them is derived in part from dead-house experience in the hospitals to which I have been attached, and in part from acquaintance with writers on the subject.

The calculi, whether in the liver, gall-bladder, or ducts, may give rise to inflammation, suppuration, and the establishment of internal or external fistula. The former are beyond our reach, but the latter have repeatedly terminated in perfect recovery, as shown by cases quoted in these pages.

Rupture of the ducts or of the gall-bladder and general and fatal peritonitis happen occasionally. The literature of chole-lithiasis furnishes a number of instances, but it must be of rare occurrence.

A calculus may become permanently impacted in the ductus choledochus, or this duct may become obliterated from inflammation excited by the passage of a gallstone. Under such circumstances there is enlargement of the gall-bladder, tumefaction of the liver, with enormous dilatation of the biliary ducts, which may form fluctuating tumors like abscesses. There is persistent jaundice, but sometimes the fæces regain their normal color, and the jaundice abates, because, under increasing pressure from behind, the bile filters through between the wall of the duct and the impacted concretion.

Gangrene of the duct, followed by sudden death, has occurred.*

* Bretonneau.

Even when the calculus has passed into the intestine all danger is not over. If large it may cause fatal obstruction of the bowel. Such cases have been related by Murchison (Diseases of Liver); by Cohnheim (Virchow's Archives, 1866); by Jeaffreson (British Medical Journal, May 30, 1868).

In other cases the calculus has been extracted from the rectum during life. Such a one was reported by Dr. Mitchell in the American Journal of Medical Science, 1866.

If the calculi be small they may become arrested in the vermiform appendix and cause perforation and fatal peritonitis.*

Dr. Dorkin relates a death from pressure of gallstones upon the vena portæ. (Med. Times and Gazette, 1868.)

A tendency to syncope is occasionally observed during the paroxysm, and proved fatal in one case reported by Portal in 1813. Another patient, reported in the American Journal of Medical Science, 1866, by Dr. Buckler, of Baltimore, appears to have died from this cause; also a third, in which death occurred in sixteen hours. (Leigh, Medical Times and Gazette, 1867.)

One of the rarest complications of chole-lithiasis is reported by Trousseau,† and consisted in reflex paraplegia, with general hyperæsthesia of the skin, from which, however, the patient finally recovered.

Prognosis.

In the majority of cases this is favorable, but the possible occurrence of such grave complications as those just enumerated must not be overlooked. Twenty-two out of thirty-five cases have passed from under my observation, but previously appeared to be permanently relieved; eleven still remain under my observation, and in all of these years have elapsed since the last seizure. Two died, as already stated. The length of time required to effect a cure is impossible to foretell. It depends in great measure upon the intelligent and hearty co-operation of the patient. The disease runs no definite course, but may extend over several years.

Treatment.

The therapeutic indications are two-fold, viz.: (1) To relieve the patient during the attack, and (2) to prevent its recurrence.

*Trousseau Clin. Med. †Clin. Med.

To accomplish these objects is not always easy, and, as in almost every exigency, there is ample scope for the exercise of sound judgment and nice discrimination in the selection of means and methods appropriate to the particular case in hand.

The agent that in my hands has been most uniformly efficacious for the relief of pain and prevention of shock to the nervous system is morphia. I have also thought that it tends to shorten the paroxysm, as well as to lessen its severity. It should be administered hypodermically. I usually give from one fourth to half a grain, and I repeat this every hour or two until the pain is relieved. The earlier in the seizure it is resorted to the more certain it is to afford speedy relief.

In a recent article, on this subject Dr. Hayden, of Dublin,* confirms, by his results, the opinion I have expressed about this remedy, and declares that hypodermic injections of morphine are more efficacious than the inhalations of chloroform.

Opiates should never be given by the mouth or in solid form for the relief of gallstone colic.

In some cases I have treated, the pains were so atrocious that morphia was inadequate to allay them, and the administration of chloroform is then the best alternative. It may be given simply for the relief of pain and to induce such relaxation of the tissues as to thereby facilitate the passage of the gallstone, and then the best method of using it is by inhalation. But the paroxysm may be so protracted as to make the continued inhalation of chloroform not only inconvenient, but absolutely unsafe, and I have more than once been compelled to discontinue its use on such account.

Chloroform is also given internally with the view of causing the rapid solution of the gallstones *in situ*. Its administration in this way is based on the fact that chloroform is a powerful solvent of cholesterin calculi out of the body, and upon the supposition that it is not changed in the blood and passes from this fluid into the gall-bladder, where its solvent action is exerted upon the contained calculi.

One is inclined to reject at once this theory of its action as highly improbable. For it is indeed difficult to believe that a quantity of chloroform sufficient to dissolve these calculi *in situ* can be safely administered to a patient, even if the passage of the volatile liquid into the gall-bladder were at all proved.

*Dublin Journal of Medical Science, April, 1876.

Dr. Buckler,* of Baltimore, has adhered to this treatment for over twenty years, and declares that he has invariably found it trustworthy and successful. He gave *a teaspoonful of chloroform internally every hour while the pain lasted and a teaspoonful* after each meal for five days longer, and saw a large calculus in the gall-bladder melt away under its use, so that at the end of this period the tumor had disappeared.

Dr. John Barclay,† Physician to the Infirmary, Leicester, England, gives the same *modus operandi* and entertains the same high opinion of the value of chloroform administered internally in this disease, and declares that he has found it to give invariable and permanent relief in many instances. But his good results were obtained with much smaller doses than those given and advised by Dr. Buckler; two or three drops three or four times a day being all he gave. In my experience these large and frequent doses of chloroform produced alarming symptoms, and I have never been able to give them with the freedom recommended by Dr. Buckler. The smaller doses I have found utterly without effect.

The general, prolonged hot bath I have sometimes found of signal benefit in producing relaxation and relieving pain, but it is often inconvenient, and perhaps as often impossible of access. Surrounding the patient's waist with a folded sheet wrung out of hot water will sometimes give relief, and in several instances I found the application of leeches speedily effectual when every thing else had failed.

Jaccoud states that general blood-letting has in several cases been followed by sudden cessation of spasm of the ducts and subsidence of the attack.

Emetics are often resorted to by the patient himself on account of the nausea and retching, which induce him to believe that if he could only vomit freely the pain, as well as nausea, would cease. But emetics ought to be rigorously proscribed, for if they do favor the progress of the gallstone by provoking more powerful contractions, they are also likely to produce rupture of the ducts.

When the paroxysm is over I believe the administration of a purgative, such as castor oil, is advisable and hastens the ejection of the gallstone.

* Amer. Jour. Med. Sciences, July, 1867. † British Med. Jour., 1870.

In order to prevent the recurrence of the paroxysms at least two conditions must be fulfilled: (*a*) Any gallstones remaining in the gall-bladder must be dissolved; (*b*) Formation of new concretions must be prevented.

The well-known solvent powers of ethers upon cholesterin was supposed to be active within as well as out of the gall-bladder. Upon this principle the treatment for gallstones by means of Durande's remedy was based. Trousseau, while rejecting the theory, accepted the remedy, which is composed of ether. sulph. ʒ iij, ol. terebinth. ʒ ij. Dose ʒ ss in the morning, and gradually increased until about a pound of the mixture has been taken. At present this medicine is little used on account of its disagreeable taste, which soon becomes loathsome to the patient. I have never prescribed it.

Success in preventing future paroxysms must depend upon our ability to arrest the formation of new concretions and to facilitate the expulsion of those already formed.

So long as gallstones remain in the gall-bladder the liability to future paroxysms of colic continues, and this must be clearly explained to the patients.

When our efforts are adequately seconded by the patient a cure can generally be effected so that no new gallstones will be formed.

The patient's food should be plain but nourishing. Highly seasoned viands, malt liquors, fats, and sweets, and rich soups must be interdicted. He should eat moderately, at short intervals, not less than three meals a day. He should take active exercise, by walking; all other exercise is inferior to this. So long as any calculi remain in the gall-bladder he should not indulge in violent exertions, such as running, wrestling, etc. His daily life must be regulated with the view of establishing rapid and perfect tissue change, perfect combustion and complete and speedy elimination.

Dr. Buckler, in the paper already mentioned, suggests that any remedy capable of preventing the formation of gallstones must be a highly oxygenated compound, and further states that the difficulty of dissolving cholesterin by any other substance than ether and chloroform grows out of the fact that cholesterin contains a very small amount of oxygen, from 1½ to 2 per cent, which is less than that of almost any other substance.

He proposed succinic acid and peroxide of iron on account of the large amount of oxygen contained in both of them, and had them made into a hydrated succinate of peroxide of iron. It should be taken for six months continuously at least, according to the following formula:

℞ Hydrated succinate of peroxide of iron..... ℥ jss;
Distilled water..... ℥ vjss.
S. Teaspoonful after each meal.

I have used this salt according to this formula, as prepared by my friend, Prof. E. Scheffer, of the College of Pharmacy in this city, and in almost every case with complete success.

It has also been my practice to put the patients upon a course of Carlsbad water. Vichy or Marienbad waters have also been used with benefit. These waters are imported by Mr. C. L. Diehl, of this city. Artificial mineral waters of good quality are made by Wm. Springer & Co., and I have often prescribed them with excellent results. It is difficult to say how they act. At Carlsbad patients who drink the waters often begin without pain to pass gallstones, whose existence they had never suspected.

As insufficient alkalinity of the bile and the prolonged stay in the gall-bladder of that fluid favor the formation of gallstones it is possible that these alkaline waters become remedial by provoking a more active and abundant percolation of highly attenuated and hyper-alkaline bile, which will prevent the deposition of bile pigment and the formation of calculi.

The action of these waters upon catarrhal states of the mucous membranes may also have a share in their good effects in this disease which so frequently depends upon catarrh of the gall-bladder. Whatever their *modus operandi* may be, their curative value is undisputed.

In my earlier cases I relied upon a remedy that was employed with much advantage by the late distinguished Dr. Lewis Rogers, of this city:

℞ Ammoniæ muriatis..... ℥ ss;
Ext. taraxaci..... ℥ ss;
Aquæ..... ℥ vj.
M. Dessertspoonful *ter in die.*

About four or five years ago Schiff, of Germany, suggested that gallstones are formed of cholesterin, not because this substance is

formed in too great abundance, but because the bile is deficient in principles which maintain it in solution; these are soda and potash salts of cholic and choleic acid. Schiff therefore recommended that eight grains of choleate of soda be given twice daily, and increased unto *saturation*, as indicated by irregularity of the pulse, which becomes slow during repose and accelerated by the least effort. The dose may then be diminished, but not entirely suspended. It should be kept up at least a week to produce amelioration of leading symptoms.

Dr. Dabney, of Virginia, has recently published some cases fully bearing out the previous dicta of Schiff. While on my eastern tour last summer I procured some capsules of the cholate of soda for a patient, but it so soon gave rise to gastric disturbance that we were glad to return to the use of succinate of the peroxide iron with Carlsbad water.