The Lloyd Roberts Lecture ON ATTIC SALT FOR GALL STONES.

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BY

SIR JOHN BLAND-SUTTON, P.R.C.S.ENG.,
CONSULTING SURGEON TO THE MIDDLESEX HOSPITAL.

A CHANCE observation in natural history by a boy may influence him in a particular line of study. My father, learning that pearls occur in freshwater mussels, led us to collect from the moat a bushel of mussels, and after carefully searching them he found one pearl as big as a grain of mustard seed. This simple experience quickened in me an interest in animal concretions, especially pearls, bezoars, aegagropiles (Fig. 1), and finally gall stones. The museum of the Royal College of Surgeons of England possesses a large collection of animal concretions which was well displayed and admirably catalogued by Thomas Taylor in 1845. It contains among other things:

Gall stones from women, men, and apes,
Enteroliths from cows and snakes;
Vesical stones from cats and dogs,
And calculi from boys and hogs.
Oat-hair concretions found in man,
Bezoars from wild-goat, calf, and ram;
Aegagropiles of many styles,
From women, girls, and crocodiles.

Bezoars and enteroliths have an interest for mankind.

They form in the alimentary canal of mammals, birds, reptiles, amphibia, and fishes. They are common in goats, calves, and horses, especially millers' horses. A foreign body such as a chip of wood, or metal, a button, nail, or fruit-stone, serves as a nucleus and becomes embedded in hairs which mammals lick from their skins and swallow. In many instances the foreign body is encased in a deposit of triple phosphates which forms a hard stone-ball. The deposit is often arranged in concentric layers. The example represented in Fig. 2, A, is as big as a cricket ball; I have seen one a foot in diameter, and it was used as a door-stop in a museum.

Bezoar powder is highly prized as a remedy in many countries. In the *Dispensatory* of the Royal College of Physicians, 1746, will be found an account of a famous remedy known as "*pulvis e chelis cancrorum compositus*," containing tips of crab's claws, prepared pearls, and red coral. This was converted into "*pulvis bezoardicus*" by the addition of powder obtained from an Oriental bezoar. This mode of prescribing the powder arose from the fact that bezoar powder, being costly, was sometimes clandestinely omitted. In order to heighten the virtue of the powder it was directed to be made into pellets with the jelly of vipers. It enjoyed great favour for the treatment of epilepsy, jaundice, melancholy, contagious fevers, and worms. The crab's claws powder was commonly called Gascoign's powder, after its inventor.

FAITH IN DRUGS.

Next to belief in the existence of a future place of permanent bliss, nothing is more deeply rooted in the mind of man than faith in drugs. Among uncivilized tribes the medicine-man is of great importance, and the filthy things he prescribes are swallowed by members of the tribe with confidence. In England, in Shakespeare's time, many remedies were of the same nature as those forming the stock in trade of the African medicine-man. Some idea of their nature may be gathered from the list of the ingre-

dients for the hell-broth in the famous cauldron scene in *Macbeth*. In addition to hemlock root, gall of goat, and slips of yew, it contained:

Eye of newt, and toe of frog,
Wool of bat, and tongue of dog,
Adder's fork, and blindworm's sting,
Lizard's leg, and owl's wing.

The *Pharmacopoeia* of 1746 had little to boast of in comparison with the odd commodities of a witch's stew. It contained in addition to other curious remedies—

Pulvis e chelis cancrorum compositus,
Jus vipcrinum, vin. *vipcrinum*,
Chalybis rubigo preparata,
Pil. saponacea, *pule. bezoardicus*.

There is great virtue in a Latin prescription; it looks like an exorcism (Dean Inge). The above prescriptions, stripped of dog-Latin phraseology and writ in witch jargon, run:

Claws of crabs, and pearls ground fine,
Viper broth, and viper wine,
Steel filings, and their dried rust,
Pills of soap, and bezoar dust.

In 1900 I was much amused when a distinguished Fellow of the Royal College of Physicians recommended me to give a man soap pills with the "intention" to promote the escape of a gall stone, presumably impacted in the common bile duct, instead of removing it by operation. We laugh at the Chinese vendor of quack remedies who sells at a high price scrapings from the fossilized bones of ante-diluvian monsters which he calls dragon's bones, to be swallowed by rich and poor, forgetful of the fact that some of our most potent remedies are derived from fossilized trees and plants—coal.

Some drugs used to-day, and professionally sanctioned, are remnants of a lingering faith in the medicinal value of animal secretions and concretions. It is true that bezoar powder is no longer prescribed by orthodox physicians, but musk, a secretion from the musk-deer, is recommended as an antispasmodic for hysterical maidens. Ox-gall, as a cure for jaundice, still stands in the druggist's list, in spite of the activity of surgeons in removing obstructions from the common bile duct.

PEARLS.

The pearl, an ornament associated in all civilized countries with beauty and riches, is formed on the same principles as a bezoar. The nucleus may be an intestinal parasite, a grain of sand, or a small fish entombed in layers of pearl substance—aragonite—arranged as in a bezoar (Fig. 2, B). The discovery of a parasite as the nucleus of a pearl led Raphael Dubois, in 1901, to describe the pearl as the brilliant sarcophagus of a worm! Pearls were formerly

used as remedies; seed pearls were swallowed whole. Scrapings from pearls served as ingredients in an electuary prescribed for its stimulant and restorative properties by Arabian physicians, and the compound powder of crabs claws of the *British Pharmacopoeia* contained prepared pearls and red coral. Human credulity in regard to animal concretions has not spared even ambergris, a fragrant pathological product found in the guts of sperm whales. It was formerly in favour as an aphrodisiac, and is still used in the East by cooks for flavouring dishes, in Italy for spicing wine, and in England for scent, soap, and pomatum.

GALL STONES.

Gall stones were late in attracting attention, not only from naturalists, but also from physicians, pathologists, and, last of all, surgeons. The nature of gall stones was ill understood until the French chemist Chevreul discovered the crystallizable fatty body now known as cholesterol. Chevreul recognized it as the chief constituent of gall

FIG. 1.—Aegagropile from the stomach of a cow. The spiral arrangement of the hair is due to peristaltic movement. (Museum, Royal College of Surgeons.)

stones, and laid the foundation of our knowledge of biliary concretions. Gall stones are often formed of spheres arranged concentrically around a nucleus, as in pearls and bezoars (Fig. 2, C). The soft brown masses sometimes found in the gall bladder of oxen has been used as drugs by apothecaries and as pigment by artists.

Modern surgery is responsible for a great increase in our knowledge of man's viscera. This is true of the gall bladder. It is established that gall stones are mainly formed in the gall bladder. This receptacle is liable to several forms of infection, and the presence of gall stones in the gall bladder and the associated ducts leads to consequences which not only cause discomfort, inconvenience, and pain, but imperil health and life in various ways. In 1883 I was busy rearranging the specimens in the museum of the Middlesex Hospital, and became deeply interested in an instructive set of specimens, illustrating diseases of the gall bladder and its ducts, collected by Dr. Murchison from the dead-house. Murchison held the post of physician and pathologist to the hospital for ten years. In 1891 my interest was quickened in the clinical aspect of gall stones, for in that year I successfully excised some gall stones from the common duct of a woman of 58. At that date cholecystotomy was a novelty. This woman reported herself alive and well ten years later. I followed gall-stone surgery keenly, and in 1907 opened a discussion in the Section of Surgery at the meeting of the British Medical Association at Exeter, on cholecystectomy.* This formed the basis of my monograph on *Gall-stones and Diseases of the Bile-Ducts*. Early in my surgical work I became convinced of the advantage to the patient of removing the gall bladder in preference to draining it, when infected and occupied by concretions; this attitude is supported by recent researches into the mode of formation of gall stones.

The study of animal concretions throws some light on the physical and chemical processes concerned in their production. Like hailstones, bezoars, and urinary calculi, gall stones are formed around a core, and for a long time it has been accepted by surgeons that this core, or nucleus, may be a clump of shed epithelium, mixed with pigment, crystals of cholesterol, or a cluster of bacteria; infection of the gall bladder is a primary factor in the production of gall stones. During the last twenty years investigations relating to this matter conducted by Aschoff, McNee, and Rovsing, indicate that sepsis is not a common cause of gall stones, but sepsis is a serious sequel of gall stones. Stasis of the bile in the gall bladder, by permitting the separating out of the constituents from the bile, is also an important factor in the production of these concretions. When a gall bladder containing gall stones becomes septic the infection leads to an excess of lime salts in the bile, and these salts coat the stones with mantles of chalk.

These investigations teach that the majority of gall stones arise in the gall bladder. Rovsing believes that the faceted shape of gall stones is not due to the mutual pressure of concretions one upon the other by the spasmodic clutch of the gall bladder. He suggests that the facets are the expression of the intrinsic properties of certain gall stones, just as in the urinary bladder the oxalate stone is spherical while the urate stone is oval. He also suggests that the core of a gall stone is formed of bile pigment. Such views destroy the picturesque simile that a gall stone is the tomb of a clump of bacteria. In spite of the difference of opinion among men who have studied the modes in which gall stones form, this seems clear: temporary bacterial

cholecystitis associated with concentration and stagnation of bile is a frequent cause of gall stones. The occurrence of chalk in gall stones is of clinical value; it facilitates the detection of stones in the living body by radiology and simplifies diagnosis in an extraordinary fashion.

CHOLECYSTOTOMY.

In 1879 Lawson Tait deliberately opened a woman's gall bladder and removed a gall stone impacted in the cystic duct. This marked the beginning of gall-stone surgery in Great Britain. He took no further interest in the extension of this class of surgery and was content with the simple method of cholecystotomy; but this simple experience led his acute mind to realize that the best results of gall-stone surgery were obtained in conditions unassociated with jaundice. The removal of the gall bladder seemed to Tait radically absurd, wholly unnecessary, and might have a deleterious influence on the health of the patient.

It soon became clear to other surgeons that there were disadvantages connected with cholecystotomy—the mere draining of the gall bladder through an external opening—because the liver excretes 40 ounces of bile in twenty-four hours. The bile normally drains into the intestine, the fluid part is absorbed, and the colouring matter mingles with the faeces. When bile escapes

through a fistula to be collected in a bottle, or caught in cotton-wool or gauze, it is a nuisance. In 1894 a medical student submitted to cholecystotomy for calculous obstruction: the fistula has been discharging mucus and bile to the present time—thirty years. This man clings obstinately to his gall bladder, and has used more than a ton of cotton-wool for absorbing the escaping bile.

Many surgeons have agreed that when a gall bladder contains an apparently solitary calculus it is sufficient to remove the stone. Experience teaches that it is difficult to decide in the course of an operation that the stone is solitary. When gall stones exist in hundreds and the gall bladder resembles a bag containing shot, who can be sure that he has emptied it? The sutures used to secure the edges of the opening in the gall bladder to the margins of the incision in the abdominal wall become encrusted with

FIG. 2.—A, Bezoar in section. The nucleus consists of twigs. (Natural size.) B, Pearl in section, magnified (Rubbel). C, Gall stone in section. It consists mainly of cholesterol. (Natural size.)

* BRITISH MEDICAL JOURNAL, 1907, ii, p. 877.

cholesterol paste and bilirubin calcium; such things are as unpleasant as gall stones. These sequelae are well known. Experience and observation have taught surgeons that the majority of gall stones are formed in the gall bladder, and it is wise to remove this troublesome pocket when it has acquired the habit of moulding gall stones. Surgeons agree in the truth expressed in the epigram, "A gall bladder that has been subjected to a cholecystotomy is a liability rather than an asset." In the early years, when draining a calculous gall bladder was the rule, surgeons sometimes suggested that recurrence of gall stones was an extremely rare event. Few hold this opinion to-day. I have removed the gall bladder from many patients who have been submitted to cholecystotomy by various surgeons, and found gall stones therein. In 1889 Knowsley Thornton removed from the common bile duct of a spinster a large gall stone and one from her gall bladder, which was shrunken and useless. In 1913 I removed from the ampulla of this woman a gall stone, in shape like a blunt cone, with a vertical height of 3 cm. and a circumference at the base of 4 cm. (Fig. 3). The common duct admitted my forefinger easily.

Some of the reasons urged for the retention of the gall bladder are odd. A Canadian surgeon stated that an individual with a gall bladder sleeps better than one who has lost it. Another reason, equally odd, relates to a woman with intestinal obstruction; her gall bladder was opened and she was fed for five days through the cholecystotomy opening, and finally recovered. Once I found the gall bladder useful in a surgical emergency in a man with a perforated duodenal ulcer. The tissues around the hole were so rigid that I could not infold the bowel. In this dilemma I plugged the hole with the gall bladder, secured it in position with a few stitches, and performed a routine gastro-jejunostomy. The man recovered in spite of the insult to his gall bladder. Hamlet reminds Horatio that the toe of the peasant comes so near the heel of the courtier he galls his kibe. Certainly the gall bladder might complain of being put to a base use in these terms:

Although I hold the bile as in a butt
It is too mean to use me as a bung
To plug an opening in a leaking gut.

It is unwise to argue from an isolated experience that a patient should be advised to keep a diseased gall bladder against a similar contingency.

CHOLECYSTECTOMY.

Reflection on the development of surgery in relation to what is called visceral surgery teaches this—nearly all the methods of dealing with what were called encysted dropsies followed nearly the same order. They began with tapping frequently repeated; then incision and drainage, the margins of the artificial openings made in the cyst wall being stitched to the edges of the parietal incision. Since the discovery of anaesthetics and the use of reliable ligatures, complete removal (extirpation) of cysts has been adopted, with comfort and safety to patients. Drainage methods were employed for ovarian cysts, hydatid colonies, hydronephrosis, and dropsical distensions of the gall bladder. No one uses such methods to-day for ovarian cysts or hydronephrotic kidneys, and they are removed with little risk throughout the civilized world.

The operation for removing the gall bladder—cholecystectomy—has passed through a groping stage, then a period of extreme specialization, ending in broad generalization. The first time I met Lister in consultation was over a patient with calculous cholecystitis, and I wished to remove the gall bladder. Lister agreed with the diagnosis, but dissented in regard to operative interference, for these reasons: When the abdomen is opened and nothing big removed it is very difficult to secure the abdominal wound safely. He explained to me that his own experience in this matter had been very sad. I am old enough to have seen the evil results when abdominal incisions failed to unite by primary union, and it is a privilege to have lived to see Listerian principles of wound treatment universally accepted, and abdominal incisions heal as readily as surgical incisions of the face and limbs.

For twenty years I have consistently followed the practice of removing the gall bladder when occupied by gall stones, pus, or infected bile. Many surgeons only remove it when cholecystotomy is impracticable, and many hesitate to remove it in the condition known as acute septic cholecystitis. The best results follow cholecystectomy for septic cholecystitis.

Tanner (1924) analysed 117 consecutive cases of gall stones, operated on in Guy's Hospital, and found that patients submitted to cholecystectomy were half as long in the hospital as those submitted to cholecystotomy. The advantages of cholecystectomy are "even more striking when the patients themselves are seen" in preference to trusting reports.

An important fact in regard to diseases of the gall bladder revealed by modern surgery concerns cancer of this receptacle. Thirty years ago primary cancer of the gall bladder was regarded as a rare disease; few specimens were available for study, and all of them, in pathological museums, were spoils from the dead-house. To-day primary cancer of the gall bladder is known to be a frequent disease and rebellious to surgical treatment; it is often found in gall bladders excised for gall stones, and its presence unsuspected until the parts are examined in the laboratory. Gradually it has been established that in 95 per cent. of cancerous gall bladders, gall stones are also present. It is a fact that gall bladders submitted to cholecystotomy for gall stones and drained temporarily, or permanently, are liable to become cancerous. This is a strong reason for removing the gall bladder when patients suffer from calculous cholecystitis.

VAGARIES OF THE GALL BLADDER.

Some of the abnormal relations of gall bladders give rise to clinical puzzles. The fundus of a gall bladder has been found strangulated in the sac of a right femoral hernia. (Museum, St. Bartholomew's Hospital.) In a sexagenarian spinster, under my observation, the gall bladder containing many calculi could be easily felt through the thin abdominal wall, and the gall stones made to grate together in the course of a clinical examination. A gall bladder may be so mobile that it rotates and twists its narrow neck like a rope. In size a gall bladder with its cystic duct obstructed with a calculus may become so distended with mucus as to reach the pelvis and resemble in clinical characters an ovarian cyst. Lawson Tait began an operation under the impression that he was dealing with an ovarian cyst; his astonishment was great when he discovered it to be a gall bladder converted into a huge mucocele. The cystic duct was obstructed by a solitary gall stone and the gall bladder contained eleven pints of fluid. Distended gall bladders of twice and thrice this capacity have been reported by Collinson and Terrier. A similar experience occurred in my practice; I expected to find a large subserous cystic fibroid, but found a huge calculous and cancerous gall bladder in contact with the fundus of the uterus.

FIG. 3.—Two gall stones (natural size). The larger was removed from the common bile duct of a spinster. The faceted stone was removed from the ampulla of a spinster aged 50, who had shown no signs of jaundice. A fistula existed between the gall bladder and colon. (Museum, Middlesex Hospital.)

When the gall bladder is converted into a mucocele with thin translucent walls its removal is a simple surgical exercise. When it resembles a big red sausage with thick walls, and as tense as the parchment of a well tuned drum, it startles the novice in surgery. In such a condition the stripping of the gall bladder from its bed in the liver is easily accomplished, and with little bleeding, because the hepatic vessels in immediate relation with it are thrombosed; however, the cystic artery in such conditions often bleeds viciously and may delude the surgeon into the idea

that he has cut the hepatic artery. It is worth remembering that the surface of the liver, stripped by the removal of a simple mucocele, will often bleed more freely than after the removal of an infected gall bladder. When the detachment exposes a wide area of the liver, bile sometimes leaks from small bile ducts thus damaged, sometimes so freely for twenty-four hours or more as to raise the suspicion that the ligature has slipped off the cystic duct.

COMPLICATIONS OF CHOLECYSTECTOMY.

An important complication of calculous cholecystitis is fistulous union of the gall bladder and colon due to ulceration and escape of gall stones into the gut. A gall stone which slips into the colon in this way may be as big as a bantam's egg. The museum of St. Mary's Hospital, London, contains a segment of pelvic colon with a gall stone of this size impacted in it, and with fatal consequences. Many stones escape through fistulous openings in the gastrointestinal tract, to the permanent advantage of the patient. The orifice of escape in such a complication shrinks to a narrow funnel and this occasionally resembles a cord. In dealing with apparently solid cords a ligature should carefully be applied; a narrow channel communicating with the gut may exist in it and be sufficient to set up local sepsis, illustrating the maxim—a small leak neglected may sink a great ship.

Nothing seems more surely established in clinical observation than the idea that complete obstruction of the common bile duct is inevitably followed by jaundice. A spinster, aged 50, complained of a pain in the region of the gall bladder. She was thin and I could feel a gall stone in the position of the common bile duct. There was neither sign nor history of jaundice. I removed a large stone from the common duct which had completely plugged it (Fig. 3). The gall bladder adhered to and communicated freely with the transverse colon. In this woman the bile found its way to the gall bladder by the cystic duct and dribbled through the fistula into the gut, to the patient's temporary advantage. As the removal of the stone reopened the natural outlet for the bile, I removed the gall bladder and closed the hole in the colon. The woman reported herself in good condition ten years afterwards.

The gall bladder is a diverticulum of the hepatic duct. The mere loss of the gall bladder is unattended with sinister consequences. Many mammals and birds lack a gall bladder. Some parrots have a gall bladder and some not. Hamlet, in his soliloquy on the First Player, says:

But I am pigeon-liver'd and lack gall
To make oppression bitter.
Act ii, 2, 605.

This clearly indicates Shakespeare knew that the pigeon lacks a gall bladder. Absence of the gall bladder neither causes inconvenience nor shortens life. In 1906 I removed the gall bladder of a widow, aged 76, for acute calculous cholecystitis. The mucous membrane of the gall bladder was thickly beset with flakes of cholesterol and glistened like the tinselled coat of Harlequin. The patient lives, aged 94, and bids fair to become a centenarian.

RADIOGRAPHY AND GALL STONES.

One of the difficulties in persuading patients to submit to operative treatment for suspected gall stones was uncertainty of diagnosis. "Give us a sign" was the imperative and persistent demand. Many physicians preferred to trust soap pills and olive oil, rather than the scalpel. The position has changed. Radiography can secure shadows on photographic plates which indicate not only the presence of gall stones, but their size and shape. With such evidence patients now willingly submit to surgery; and, as a rule, quick healing, freedom from leakage, and from the recurrence of gall stones, with quick restoration to health and usefulness, are the usual consequences of cholecystectomy. To operate for acute cholecystitis and not remove the gall bladder is as reprehensible as operating for gangrenous appendicitis and leaving the appendix.

The golden rule for surgeons to observe is this: Examine the main ducts—cystic, common, and hepatic—especially the ampulla, and be satisfied they are free of concretions,

remembering always: *An undiscovered concretion in the common duct will wreck a cholecystectomy.* The manifestation may be long delayed, but it will surely come. Although the medicine-man can point to some wonderful cures, and sorcerers can cast out imaginary devils, neither a sorcerer nor a physician can expel gall stones.

A British Medical Association Lecture.

ON

LUMBO-SACRAL BACKACHE.*

BY

P. JENNER VERRALL, F.R.C.S.,

ORTHOPAEDIC SURGEON, MINISTRY OF PENSIONS HOSPITAL, SHEPHERD'S
BUSH, AND NORTHCOURT HOSPITAL FOR CHILDREN;
CHIEF ASSISTANT, ORTHOPAEDIC DEPARTMENT,
ST. BARTHOLOMEW'S HOSPITAL.

LUMBO-SACRAL pain is exceedingly common, very disabling, and often so resistant to treatment that patients will resign themselves to it. Either its treatment devolves on the general practitioner entirely, or the patients, if they can afford it, go from specialist to specialist in search of relief. We have often to deal with a vicious circle involving many systems, but with only one symptom—pain. This pain may be situated in various positions, may or may not be affected by jarring of the spine, standing, or walking, and may be variously described as sharp, gnawing, or aching. It is of the first importance in diagnosis to obtain an accurate account of this symptom from the patient. We may simplify the subject by dividing the possible causes into five groups, three of which, the most serious, will not detain us long, but must be carefully excluded before we consider the other more common causes. We have to deal with a complex system of bones, joints, ligaments, muscles, and nerves, but we may separate the sacro-iliac joints for consideration later.

Severe Bone and Joint Disease.

Caries of the lumbar spine is not uncommon, and it must be remembered that adults are by no means exempt and that caries does not necessarily affect the bodies of the vertebrae, but may affect, though less commonly, the laminae, transverse processes, etc. Diagnosis will be made by consideration of the extreme rigidity, possible deformity and abscess formation, and by the x-ray findings. Spinal skiagraphy is by no means easy, and in doubtful cases it is essential to have a skiagram by an expert expertly interpreted. The possibility of gummatous deposits in the spine must not be forgotten; the symptoms resemble those of tuberculous caries, and the two diseases may coexist. Syphilis of the spine is, however, a rarity, and the same may be said of sarcoma; but secondary carcinoma, frequently associated with a mammary tumour (possibly unsuspected), is by no means uncommon. Forewarned is forearmed, and severe localized pain coming on in a patient liable to carcinoma will lead to an adequate x-ray examination, when diagnosis is usually easy, as the skiagraphic appearances are generally characteristic. Aneurysm and acute osteomyelitis are, of course, exceedingly rare, but we must not forget them. I do not propose to enter into the treatment of these cases as this would take us too far.

Arthritis of the Lumbar Spine.

Here again the skiagram affords us the only absolutely sure method of diagnosis. Lipping of the edges of the vertebral bodies and osteophytic outgrowths are characteristic. These latter may even go to the extent of complete fusion, producing actual bony ankylosis between the vertebrae. Severe arthritis (spondylitis deformans), with its flat absolutely rigid spine, is fortunately rare, as treatment can achieve little more than the arrest of the disease when it is well advanced, early diagnosis being the only hope. Gonorrhoea is responsible for at least 65 per cent. of such cases. Some surgeons would put the percentage higher, but quite 30 per cent. are due to metastatic infection from

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