ANOMALIES OF THE GALL-BLADDER AND BILE-PASSAGES

WITH THE REPORT OF A DOUBLE GALL-BLADDER AND A FLOATING GALL-BLADDER

By August Schachner, M.D.
of Louisville, Kentucky

Abdominal surgeons of to-day, and more especially of the future, will hardly be content with a general knowledge of the anatomy of the abdominal viscera.

Refinements in operative and diagnostic technic will demand a detailed knowledge of the anomalies in whole or in part of abdominal organs.

In view of this forecast, it behooves us to investigate and more fully report the various anomalies as they present themselves.

To this end there should be a closer coöperation between the operating room, the anatomic laboratory, and the pathologic laboratory, in order that definite data may at an early period be recorded, indicating the possible frequency of the various anomalies.

This paper is based upon an inquiry into the literature, present and past, and an exchange of communications with a number of surgeons and hospitals. I wish to publicly record my thanks to the various surgeons and hospitals for their answers to my communications.

The inquiry developed the fact that practically no additional material was acquired through these communications. That this result is misleading, there can be but slight doubt, and the fact that one operator (Kehr) who follows somewhat different lines and with different results, so far as anomalies are concerned, strongly supports this view.

The array of anomalies presented by Kehr stands alone both as to number and variety. This exceptional collection is partially explained through Kehr's statement, that a more thorough search should be undertaken at the time of operation and that the operative procedure should be carried out through a larger incision, or at least an incision yielding a more accurate survey of the field of activity. He condemns what he calls "the button-hole incision," so commonly employed in American surgery.

We feel inclined to add that the result of the correspondence left us convinced that inadequate incisions do defeat an accurate survey, and that many valuable findings have been lost in the past through the absence of proper search and a suitable system of recording the anomalies that were revealed.

It may be well to say that this paper is restricted to congenital anomalies, and not to malformations resulting from pathological processes. Further, many reports encountered, in examining the literature, were rejected because they were so obviously deficient in definition, or so apparently due to pathological processes, that their value as reports was hardly justified. No effort was made to study the vascular anomalies attending the blood supply of the liver, gall-bladder, or bile passages.

In many instances it was shown in the cases reported, that anomalies in this region follow the rule of anomalies elsewhere in the human subject, namely, in not occurring singly, *i.e.*, an anomaly of the gall-bladder may have an attending anomaly of the ducts or the blood supply, or some other part of the hepatic system. This is especially noticeable in the properly conducted post-mortem examinations, where the investigations could be carried out in detail, a privilege often denied during a surgical operation.

When the development during the embryological period is disturbed, this disturbance is usually not of an isolated nature.

SYNOPSIS

ANOMALIES OF GALL-BLADDER

Anomalies relating to gall-bladder cavity	Double gall-bladder.
	Bilobed gall-bladder.
	Diverticulum of gall-bladder.
Anomalies relating to location of gall-bladder	Intrahepatic gall-bladder.
	Left-sided gall-bladder.
	Transposition of viscera.
	Floating gall-bladder.
Individual anomalies	Absence of gall-bladder.
	Hour-glass gall-bladder.

ANOMALIES OF BILE PASSAGES

(1) Double cystic duct.
(2) Anomalies of hepatic ducts.
(3) Absence of common duct.
(4) Anomalies of common duct.

Double Gall-bladder.—To come under the above classification, each gall-bladder should have its independent cystic duct, thus differentiating it from a bifid gall-bladder in which the cavities are distinctly separate, but communicate with the common duct through a single cystic duct.

CASE I.—Dr. Purser exhibited a liver with two gall-bladders. It was taken from a girl aged eleven, who had lately died of malignant scarlatina in Sir Patrick Dunn's Hospital. At the postmortem, besides the ordinary changes caused by the disease, two separate gall-bladders were found, each of which had a distinct cystic duct; and these opened into the bile duct, the one at some distance from the other. There were no marked anomalies in the liver except that the common hepatic duct, instead of dividing into two branches when coming into the

liver, divided into three, one to the left, another to the right, and a third running into the posterior part of the liver. These ducts did not communicate with one another, but were distinct in their whole course.

CASE II.—Dr. Purser (*British Medical Journal*, 1886, vol. ii, p. 1102) was indebted to Dr. Foot for a case recorded in the Philosophical Transactions. The subject was a lady aged thirty-one, who for some time before her death had suffered from loss of appetite, vomiting and pain. At the post-mortem examination, her lungs were found to be in a state of commencing phthisis. The spleen was smaller than usual, but the liver was so large that it occupied the left hypochondrium as well as the right; there were strong adhesions on both sides; there were two gall-bladders, both distended with bile, one in the right and the other in the left lobe of the liver.

CASE III.—The existence of the double gall-bladder was not recognized until the peritoneal covering was removed. Then it was apparent that the gall-bladder was double from the fundus to the neck.

There were two cystic ducts, the one communicated with the hepatic duct. The second subdivided into two subdivisions. The course of one subdivision was unavoidably lost, and that of the other subdivision communicated with the common duct. The points in the case are double gall-bladder with a single neck and two cystic ducts. (Cruveilhier, E.: *Bul. Soc. Anat. de Paris*, 1860, xxxv, p. 66.)

CASE IV.—On opening the abdomen through the right rectus muscle, I found a distended gall-bladder which I could not empty. On tracing the cystic duct downward to discover the cause of the obstruction, I came upon a firm nodule, which I took at first to be a calculus. As it was apparently firmly impacted, I cut through the peritoneum covering the duct and discovered that the supposed calculus was a thickening in its wall about three-quarters of an inch from its junction with the common bile duct. I ligatured and divided the duct and then found that I could not strip up the gall-bladder in the usual way, and the duct tore just above the nodule in the attempt. On further dissection I found another duct which I ligatured and divided, covering the stump with peritoneum, and closed the belly.

On examining the specimen (now in the Museum of the Royal College of Surgeons of England, No. 561.31), the ducts were at once evident and closer examinations revealed another sack above and completely concealed by the distended lower one. On section two complete gall-bladders were evident, joined only along a narrow portion of their circumference. The larger one contained thick bile-stained mucus, the smaller thin bile. On examining the portion of the cystic duct belonging to the larger gall-bladder, I found it patent at its common duct end; at the site of the nodule, its lumen was a little increased in size and ulcerated, as if from the lodgement of a calculus. Above this it appeared to be obliterated. (Sherren: ANNALS OF SURGERY, vol. liv, p. 204.)

CASE V.—Author's case of double gall-bladder. Miss G., aged fifty-two, of Simpsonville, Ky., was referred to me through the kindness of her physician, Dr. Joseph Perrin, of the same place. She had been a sufferer from gall-stone colic and dyspepsia for the last 15 or 20 years.

Operation.—At the Jewish Hospital, March, 1914. Incision right semilunar line. On exposing the gall-bladder, a raphé was

evident, passing from the fundus to the neck and dividing the gall-bladder surface into two unequal halves. A mesentery existed, which also passed from the fundus to the neck. The inner blade of this mesentery became lost in the peritoneal covering of the duodenum; the outer blade was reflected over the hepatic flexure of the colon with which it became merged. The mesentery, which measured about 6 cm. from its central to peripheral borders, was freed from the gall-bladder, permitting of easy access to the same. The unequal division of the surface was at first thought to be the result of former inflammatory attacks. On opening the gall-bladder, the error of this conclusion became evident. The gall-bladder was plainly a double one, with stones in each gall-bladder. After draining these and removing the stones, a careful examination was conducted to more fully determine the exact arrangement. The result of this was a double gall-bladder, each with its independent neck and, so far as we were able to determine, two cystic ducts. Both gall-bladders were drained, the patient making a satisfactory recovery, which has continued.

Bilobed Gall-bladder.—A gall-bladder, the cavity of which consists of two lobes communicating with the common duct through a single cystic duct.

CASE I.—The gall-bladder was bilobed. The greater lobe being discolored, and almost gangrenous at its lower portion. This lobe contained one calculus. The other lobe seemed to be normal. There was only one cystic duct draining both lobes. It was patulous. (Deaver and Ashhurst: vol. ii, p. 42.)

Diverticulum of Gall-bladder.—A gall-bladder consisting of one large cavity and one or more smaller cavities or recesses communicating with the larger or true gall-bladder.

CASE I.—The gall-bladder was distended and full of calculi of various sizes. The neck of the gall-bladder just above the cystic duct was pouched in such a way as to form a sack which pressed upon the common duct and caused obstructive jaundice. (Deaver and Ashhurst: vol. ii, p. 42.)

CASE II.—Kehr (vol. i, p. 127) reports a diverticulum of gall-bladder filled with stones and in the same case the common duct divided just beyond the entrance of the cystic duct into two divisions.

CASE III.—Kehr (vol. ii, p. 291) reports another case of diverticulum together with unusual vascular anomalies and pathology.

AUTHOR'S COMMENT.—The operation lasted one hour and it is remarkable that so much vascular anomaly and pathology could be revealed and cared for in one hour, even though the incision was a free one.

CASE IV.—Macroscopic appearance: The gall-bladder on its inner surface, near the fundus, presented an enlargement of an oval shape. The maximum measurement in length was 15 mm. The maximum measurement in breadth was 8 mm. The highest point above the surrounding surface was 3 mm. An opening into this 1 mm. in width was present.

CASE V.—Macroscopic appearance: The wall of the gall-bladder measured 6 mm. in thickness. This thickness was made up of distinct lamellæ, much like in structure to that of a thrombus. The peritoneal covering is also thickened. On the inner surface of the gall-bladder, a wedge-shaped opening 8 mm. in length was observed. This cavity was lined throughout by mucous membrane.

CASE VI.—Macroscopic appearance: In the fundus of the gall-bladder there was a funnel-shaped excavation. The surrounding edges of this cavity were 3 mm. in thickness and 4 mm. in width. In this case the microscopic examination proved this to be adenomatous in character. (Herman Wieltz, Kiel: Ueber Divertikel Der Gallenblase.

CASE VII.—Diverticulum of gall-bladder occurring in a child one year of age. The compartment occurred near the fundus. The dividing septum occupied a transverse position and measured 2 mm. in thickness. The septum was 8 mm. in distance from the fundus. (Dévé: Bul. Soc. Anat., Paris, 1903.)

ANOMALIES RELATING TO LOCATION OF GALL-BLADDER

Intrahepatic Gall-bladder.—A gall-bladder partly or entirely imbedded in liver substance as opposed to merely occupying the classical gall-bladder depression on the under surface of the liver.

All degrees of this condition may occur from a small bridge of liver tissue passing across from the quadrate to the right lobe to complete submersion of the gall-bladder so that no trace of it is discernible from the outside. The latter condition is the only one which would be confused with a misplaced or absent gall-bladder, but in this degree it is extremely rare. According to Dévé the gall-bladder is only truly intrahepatic in infancy. Later on in life the covering of the liver tissue atrophies on the under surface and the gall-bladder becomes exposed. There is a case recorded by Lemon where the fundus of the gall-bladder alone projected and in which gall-stones were present (Walton).

Dévé speaks of the arrangement in reptiles, in which the gall-bladder is almost completely buried within the liver substance. He expresses surprise that the intrahepatic arrangement has not attracted more attention. The existence of intrahepatic gall-bladder was marked through a difference in color, the yellowish or greenish color of the gall-bladder being in striking contrast to the reddish-brown color of the liver substance; as a further guide, the topographic elevations of the overlying liver substance. Dévé, in a study of 130 livers of infants, discovered 11 instances of intrahepatic gall-bladder, 3 were typical and in 8 the fundus alone was more or less imbedded; no intrahepatic condition was noticed in adults.

To the case of Lemon may be added 4 cases observed by Kehr (vol. i, p. 116), making a total of 16 intrahepatic gall-bladders.

Left-sided Gall-bladder.—One occupying a position to the left of the falciform ligament in a normally placed liver.

CASE I.—The present specimen I wish to report was obtained from an anatomical subject, a full-time female fœtus, in the Anatomical School of the London

Hospital. The history of the cause of death was naturally difficult to obtain, but as far as could be ascertained, this took place in prolonged labor. The gall-bladder was situated on the left lobe, but is normal in shape and attachment. The neck of the bladder is directed towards the right instead of towards the left side, and there is a well-marked Hartman's pouch just before the origin of the cystic duct. The fundus reaches to but does not project beyond the free margin of the liver. The gall-bladder lies well to the left of the umbilical vein, but the area between it and the structures which presumably should be called the quadrate lobe, is small, so that in life the gall-bladder lay close to the falciform ligament and was, when viewed from the right side, wholly covered by this structure. If, therefore, symptoms of disease of the gall-bladder or some neighboring structure had arisen which necessitated exploration through the usual incision, traversing the right rectus, the gall-bladder would at operation have been invisible, and even if the liver had been pulled well over to the right, it would have remained hidden beneath the falciform ligament which would have been stretched across it.

The difficulty which would arise at operation with such a condition would be to discover the gall-bladder, and it would be necessary, if the under surface of the right lobe were free from adhesions and visible, to distinguish it from the three following conditions; extreme fibrosis and atrophy of the gall-bladder after inflammation, complete congenital absence of the gall-bladder, and an intrahepatic gall-bladder. (Walton: Lancet, 1912, p. 925.)

CASE II.—A case of left-sided gall-bladder occurred in a child ten years of age, at the Hospital Trousseau, in which there occurred an abnormal arrangement of the caudate and quadrate lobe, together with a gall-bladder attached to the left lobe of the liver.

CASE III.—The gall-bladder was not only left-sided, but was situated obliquely in its relationship to the liver. This occurred in an adult.

CASE IV.—Another case likewise in an adult, in which the neck of the gall-bladder was attached to the left lobe of the liver but the fundus and body detached, was described as a case of ectopia of the gall-ladder. (Dévé Bul. Soc. Anat., Paris, 1903.)

CASE V.—Hochstetter refers to a single case of left-sided gall-bladder mentioned by Huschke. Huschke's case was that of an eighteen-month-old child, in which the gall-bladder, otherwise normal, was situated to the left side and practically covered by the ligamentum teres.

CASE VI.—Left-sided gall-bladder and transposition of the umbilical vein to the right. This case was that of an adult. There was an absence of the lobus quadratus and the presence of a left-sided gall-bladder. The gall-bladder was located to the left of the ligamentum teres, with a small area of liver substance between the gall-bladder and the ligaments. Circulatory anomalies were present in this case.

CASE VII.—Recently born infant. The gall-bladder located to the left of the ligamentum teres and an absence of the lobus quadratus. In addition, in this case, the left lobe exceeded in size the right lobe of the liver. In this, as in the former case, there was an anastomosis between the umbilical and portal vein.

CASE VIII.—Body of an adult in which the gall-bladder was located immediately to the left of the ligamentum teres. The venous arrangement was practically normal.

CASE IX.—Body of an adult. In this the right and left lobes were about an

equal size and the quadrate lobe was absent. The gall-bladder was located to the left of the ligamentum teres.

CASE X.—A child, eighteen months old. The quadrate lobe was absent and the gall-bladder was located immediately to the left of the ligamentum teres. (Hochstetter, Ferdinand: Archiv f. Anatomie und Physiol., 1886, p. 369.)

CASES XI and XII are represented by two cases referred to by Kehr, vol. i, p. 119.

CASE XIII.—See Case II, Double Gall-bladder. In this the gall-bladders were widely separated, one occupying the right and the other the left lobe of the liver.

Transposition of Viscera.—In this condition the liver not only occupies the left instead of the right hypochondrium, but there is a reversal of the lobes, the left being larger than the right, and receives the gall-bladder.

Last, there is a dextro-position of the heart as well as reversal of duodenum and stomach, which becomes our most important diagnostic aid in verifying our suspicions regarding the visceral transposition and disturbances that might arise in a gall-bladder so situated.

CASE I.—A left rectus incision was made. The gall-bladder was readily accessible. Its walls were thickened, but free from adhesions. About 70 c.c. of greenish black bile was aspirated and the gall-bladder was incised. Four mulberry stones, the size of a pea, were removed. The ducts were freed. The gall-bladder was drained. The anomaly of transposition of the viscera was verified. The patient did not bear the anæsthesia well and a hasty closure was made. An uneventful recovery followed. (Horn: Situs Viscerum Inversus with Gall-stones. ANNALS OF SURGERY, vol. lxii, p. 425.)

Horn refers in his paper to cases by Beck, Fenger, Kehr, Hupp, and Bland Sutton, in which the reports definitely refer to the verifications of the condition through operation. There are two other cases in Horn's report, one by Billings, in which no mention is made of operative verification, and one from the Mayo Clinic, with desirable details lacking. If we accept the cases in Horn's paper, we have a report of 8 cases.

Kehr reports two cases of situs transversus (vol. i, pp. 121 and 122), and in the absence of definite information, assuming that one of the two cases has been mentioned by Horn, we have another case. Kehr further mentions the report of Benda (vol. i, p. 123), who has found two cases of situs transversus in 10,000 autopsies at the Urban Hospital in Berlin. This gives a total of 11 cases of situs transversus.

Floating Gall-bladder.—A gall-bladder with a distinct mesentery and usually attended with a wide range of mobility.

CASE I.—Gall-bladder found to be small and containing numerous calculi. The remains of pericholecystic inflammation were evident in numerous adhesions.

The gall-bladder was freely movable after the adhesions were liberated and had a distinct mesovesicæ which extended from near the fundus to the cystic duct. (Deaver and Ashhurst: vol. ii, p. 43.)

CASE II.—Kehr (vol. i, p. 182) reports one case of a gall-bladder with a well-developed mesentery.

CASE III.—Author's case of floating gall-bladder. Mrs. H., aged about forty-five years, living near Ellettsville, Ind., was seen through the kindness of Dr. W. W. Harris, of Ellettsville, Ind., in consultation with Dr. Allen Pierson, of Spencer, Ind., in the month of June, 1906. She had been suffering from digestive disturbances, with vague pains in the upper abdomen. On inspection and palpation, a movable mass, somewhat the shape and about the size of a normal kidney, could easily be mapped out through a rather thin abdominal wall. The range of motion was extensive enough to permit this mass to be pushed to either kidney region, but its downward excursion was more limited. The diagnosis lay between a floating kidney and intestinal neoplasm, and a distended gall-bladder. On opening the abdomen it proved to be the latter. The gall-bladder possessed a mesentery passing between the upper surface of the same and the under surface of the liver. The operation, which occurred in a farm house, was made through the smallest possible incision, that unfortunately did not permit a careful examination of the peritoneal arrangement. The gall-bladder was aspirated, removing about 250 c.c. of clear, glycerin-like fluid, and a stone that was impacted in the neck.

CASES IV, V, VI, VII and VIII.—Brewer, in the examination of 100 subjects in the Anatomical Laboratory of Columbia University, found 5 cases of gall-bladders with distinct mesenteries, allowing considerable movement. In 3 of these there was also an extension outward of the free border of the lesser omentum to the fundus and, in one instance, to a point one inch beyond the fundus, thus forming a double mesentery, the upper being attached to the under surface of the liver, the lower to the duodenum and transverse colon, and in the one instance, to the hepatic flexure of the colon. (Brewer: Anatomy of Gall-bladder and Ducts, ANNALS OF SURGERY, vol. xxix, p. 723.)

Absence of Gall-bladder.—Including only cases of a congenital absence or agenesis, as opposed to an absence of gall-bladder due to a destruction of the same through a pathologic process.

CASE I.—The case occurred in a rhachitic colored child, two years old, that had never walked unsupported and had presented no symptoms suggestive of any anatomic peculiarity referable to the biliary apparatus or to other structures.

At the postmortem the liver appeared of normal size and condition. It presented a whitish nodule at its anterior margin.

Histological examination of section from which shows the remains of hepatic parenchyma in part in a state of fatty degeneration, together with the hyperplasia of connective tissues, accumulations of round-cells, and in places homogeneous

loss of structure, changes that I take to be syphilitic origin. The section that I exhibit shows the presence of the hepatic portal and biliary vessels. No gall-bladder could, however, be found, either attached to or detached from the liver, or even contained within the structure of this organ, and as I show you, the usual fissure for the gall-bladder is wanting, and there is nothing suggestive of the previous presence of this viscus.

The case thus clearly resolves itself into one of agenesis of the gall-bladder. The absence of the gall-bladder is common in some animals, as, for instance, the elephant, the rhinoceros, the camel, the goat, the deer, and some species of fish, some birds, and some rodents.

CASE II.—In 1865, Sands (*New York Medical Journal,* June, 1865, vol. i, p. 222), before the New York Pathological Society, reported finding in the dissecting room in a tuberculous male subject, about twenty years old, a liver without a gall-bladder and without a fissure for its lodgement. The liver was small, weighing one and three-fourths pounds, and its quadrate lobe was wanting.

CASE III.—Tambault and Schachman (*Bulletin de la Société Anatom. de Paris,* 1882, lvii, Ann. 4e sér., tome vii, p. 499) have reported the case of a paretic dement, who after death presented, in addition to classic lesion of paretic dementia, a small liver with absence of the gall-bladder; the fossa for this viscus being replaced by a small fissure. There was no indication of a cystic duct. The hepatic ducts presented no abnormalities. During life there had been no symptoms suggestive of the absence of the gall-bladder. (A. A. Eschner: Congenital Absence of the Gall-bladder, Med. News, Phil., 1894, lxiv.)

The same author reported a series of 12 cases, including his own, and from these 12 cases the first 3 above reported have been taken, the remaining 9 of Eschner's list being too doubtful to justify repetition. Eschner himself is uncertain regarding the majority of his cases as being cases of agenesis of the gall-bladder.

CASE IV.—This specimen was removed at the post-mortem examination of a man, aged forty-nine, who died from pulmonary tuberculosis. There was nothing of any interest in his previous history. The main point of interest about the specimen is that, in spite of the absence of the gall-bladder, the hepatic ducts are normal, and there is no dilation of the bile ducts. (Arthur Latham: Absence of Gall-bladder. Journal of Anatomy and Physiology, 1897–1898.)

CASE V.—According to Rolliston, a second one was shown by Thursfield, at a meeting of the Pathological Society in 1903. Both of these (one of these being Latham's) were carefully dissected, so there was no doubt that the condition was one of complete absence and not extreme fibrosis after inflammation.

CASE VI.—There is a third specimen in the London Hospital Museum, No. 1395 A, where also the condition is clear. In this case there is a deep furrow in the position which the gall-bladder should occupy, so that the quadrate lobe is quite distinct from the rest of the right lobe. (A. J. Walton: Lancet, 1912, p. 925.)

CASE VII.—The case was that of a child that died on the eighth day. The abnormally large right lobe over the left was apparent from the upper surface. On the under surface the absence of the gall-bladder and the lobus quadratus, as well as the unusually small left lobe, were notable. The sagittal fissure was converted into a canal through the presence of a bridge of liver substance. This canal was traversed by the umbilical veins. (Hochstetter, F., Archiv f. Anatomie u. Physiologie, 1886.)

Förster refers to the gall-bladder being absent in a number of cases and adds that in such cases the common duct is usually larger than customary. He also mentions the possible absence of the common and hepatic ducts, and in other cases the hepatic ducts remaining united and emptying separately into the duodenum, or one into the duodenum and the other into the stomach, and, further, the possible division of the common duct in which one-half communicates with the stomach and the other half with the large intestine. (Förster, August: Die Missbildungen des Menschen, Jena, 1865).

Weltz, without giving details, refers to cases of absence of gall-bladder reported by Wahlborn, A. G. Richter, Wiedeman, Amussat, and Buttner. (Weltz, G. H.: Ueber Divertikel der Gallenblase, Kiel, 1894.)

Hour-glass Gall-bladder.—A gall-bladder consisting of two cavities separated by a pervious isthmus. Adhering to the rule of recognizing only such anomalies that are of congenital origin, instead of anomalies dependent upon a pathologic process, the writer has been unable to find any instance of a true hour-glass gall-bladder. Several cases of hour-glass gall-bladder of an inflammatory origin have been recorded by Deaver and Ashhurst and Kehr, as follows:

Adhesions between the gall-bladder and stomach. These were ligated and cut and the gall-bladder was found to be hour-glass in shape, both pouches filled with calculi. The other reference by Deaver is as follows: Adhesions between liver and duodenum. Gall-bladder was hour-glass in shape, the two portions being united by a fibrous band. Distal portion, which was free from calculi, was removed. Proximal portion contained four stones. Cholecystostomy was performed. (Deaver: vol. i, p. 43.)

Kehr refers to several cases of hour-glass gall-bladder due to the presence of a former ulcer.

ANOMALIES OF BILE PASSAGES

Double Cystic Duct.—CASE I.—Dr. Dressmann reports a case of double cystic duct as follows:

The woman was forty-two years of age. For the last six or seven years she had abdominal pains, especially at the time of her menstruation. On examination a tumor the size of a fist, movable and occupying the left side above the level of the umbilicus. The uterus was anteflexed and had a small subserous myoma. An abdominal section was performed January 4, 1907. The left-sided movable tumor above referred to proved to be an enlarged and elongated gall-bladder containing numerous large stones. A cholecystectomy was performed. The bladder was separated from the liver, cystic artery ligated, and the cystic duct divided to permit an investigation of the common duct. After a division of the cystic duct, much to the surprise of the operator, a second cystic duct became apparent. On careful investigation it was proven that both ducts united just before their junction

with the common duct. These two ducts paralleled one another and opened independently in the gall-bladder, each opening being separated from the other through a space of 1 cm. (Dressmann: Deutsche Zeitschrift fur Chirurgie, vol. xcii, 1908, p. 401.)

CASE II.—Kehr refers to two cases of double cystic duct reported by Ruge and Dressmann, the latter being the foregoing case (vol. i, p. 127).

Anomaly of Hepatic Duct.—CASE III.—The specimen was taken from the body of a man, aged forty-nine, who died in the Great Northern Hospital, under the care of Dr. Cholmeley.

The excretory apparatus of the liver is here so arranged that the whole of the bile must have passed through the gall-bladder on its way to the intestine. The gall-bladder itself is much smaller than usual. When laid open it measured two inches in length, and rather less in breadth. It would hold about two drachms of fluid. In its upper or attached wall, there are two openings, the larger one near the centre is the orifice of the principal hepatic duct, the smaller one nearer the fundus is the orifice of a cystohepatic duct. The large ducts of the left lobe pass across the longitudinal and transverse fissures where they become superficial, and join the principal duct of the right lobe shortly before it opens into the gall-bladder.

The cystic duct which appears to be the sole channel of communication between the liver and duodenum is, at its commencement, constricted so as to admit nothing larger than a probe, but immediately dilates considerably. The arrangement described in this case, which appears to be so abnormal in man, is the normal one among some of the lower animals. Thus Prof. Owens states that in certain fishes, wolf fish, *Erythrnus Lepidosiren,* the bile is conveyed to the gall-bladder by hepatocystic ducts, and thence by cystic duct to the duodenum. Again in certain reptiles *Siren Amphiuma* the hepatic ducts communicate with the cystic or the gall-bladder, and the bile is conveyed directly by the cystic duct to the beginning of the intestine. In *Mammalia,* on the other hand, as a rule, all ducts unite into one trunk, which in those having a gall-bladder joins the cystic duct to form the common duct.

Malformation of the Gall-bladder and Hepatic Duct.—H. H. Crooknell (Trans. Path. Soc. London, vol. xxii, p. 163.)

CASE IV.—See Case I, Double Gall-bladder. The hepatic duct divided into three divisions, right, left and posterior. These ducts did not communicate with one another, but remained distinct throughout their course.

Accessory Hepatic Ducts.—CASES V, VI and VII are represented by three cases reported by Kehr, which terminated blindly near the neck of the gall-bladder. Kehr further describes three possible anomalies of the hepatic duct and gall-bladder, one consisting of accessory hepatic duct, emptying directly into the gall-bladder, as it occurred in one of his cases. Second, where the right hepatic duct, singly or divided, empties into the gall-bladder, so that the bile from the right lobe passes through the gall-bladder in its way to the common duct, or duodenum, and a third variety, in which both hepatic ducts emptied directly into the gall-bladder and thus all the bile passed through the gall-bladder on its way to the duodenum (vol. i, p. 127).

Absence of Common Duct.—CASE VIII.—After an easy and natural labor of some four hours' duration, she was delivered of a well-developed boy weighing

a little over 9 pounds. For the twenty-four hours after birth, the child betrayed no abnormal symptoms. At my next visit, however (about thirty hours after delivery), I noticed an icteric appearance of the countenance, and upon closer inspection a well-marked yellow tinge on the whole surface was discovered. The nurse informed me that the discharges from the bowels were "almost like clay" and that the child had frequent attacks of vomiting. The symptoms continued to grow worse. The color of the skin changed to a brownish-yellow or bronze. The irritability of the stomach increased, convulsions supervened and in about twelve hours after my second visit, or seventy-two hours after birth, the child died in profound coma.

Sectio cadaveris, the tissues throughout the body were stained intensely yellow. The liver was swollen and enlarged. This was evidently due to distention of the biliary duct, as upon cutting into it an unusual amount of very thick bile oozed from the cut surface. The gall-bladder occupied its normal position and was enormously distended with bile of about the consistency of syrup. The cystic and hepatic ducts presented nothing unusual except that they were very much enlarged, a point I shall allude to again. They united at the usual place to form the common duct, the ductus communis choledochus also was very greatly distended and was about ¾ inch long; it then terminated abruptly in a very blunt, club-shaped extremity, without reaching the intestinal wall at all. (I. N. Danforth: Chicago Med. Jour., vol. xxvii, p. 110, 1870.)

GESSNER (Ueber Congenitalen verschluss der Grossen Gallengange, Halle, 1886), after collecting the reports of 24 cases of congenital obliteration of the major bile passages, to which a twenty-fifth case, his own, was added, reached the following conclusions:

1. That so far no undoubted case of congenital obliteration of the major bile passages has been observed.

2. That many so-called cases are of uncertain etiological origin.

3. That the most certain, if not satisfactory, explanation for the so-called malformations, is a condition that is luetic in origin.

AUTHOR'S COMMENT.—None of Gessner's cases, in the writer's opinion, justified acceptance. All were in infants of a few weeks to a few months of age. A number were outspoken luetic, others doubtful, and still others more remotely doubtful. The cases suggested a luetic perihepatitis that has its origin during the fetal period of existence and resulted in an atresia rather than a malformation. In fact some of Gessner's cases were entirely free from jaundice at birth.

CONCLUSIONS

1. Refinements in operative and diagnostic technic demand a detailed knowledge of the anomalies of abdominal organs, and therefore it behooves us to more fully investigate and report the various anomalies as they present themselves.

2. A more thorough search should, if possible, be made at the time

of operation, and the operative procedure, carried out through an incision yielding a more accurate survey of the field of activity.

3. The "button-hole incision" is not alone responsible for incomplete surgery, but through its employment many anomalies are overlooked.

4. Anomalies of the hepatic region follow the rule of anomalies in other regions in not occurring singly, *i.e.*, an anomaly of the gall-bladder may have an attending anomaly of the ducts or the blood supply or some other part of the hepatic system.

5. A double gall-bladder is one in which each gall-bladder has its independent cystic duct, thus differentiating it from a bifid gall-bladder in which the cavities are distinctly separate, but communicate with the common duct through a single cystic duct.

6. Five cases of double gall-bladder are recorded. Of these, one case was without other anomalies. Of those in which other anomalies were present (Case I) there existed, in addition to the double gall-bladder, an anomaly of the hepatic duct, which, instead of dividing into two branches, divided into three, right, left and posterior, and these ducts did not communicate with one another, but were distinct in their whole course. Case II, one gall-bladder was located on the right lobe and the other on the left lobe. Case III, there occurred a subdivision of one of the cystic ducts. Case V, there existed a mesentery, one blade of which became lost over the duodenum and the other over the hepatic flexure of colon.

7. In a bilobed gall-bladder the cavity consists of two lobes with a single cystic duct. Of this anomaly there is one recorded case.

8. In a diverticulum of the gall-bladder there is one large cavity and a smaller recess communicating with the larger or true gall-bladder cavity.

9. Seven cases of diverticulum of gall-bladder are recorded. Of these, 5 cases were simple and 2 cases complicated. Case II was complicated by a division of the common duct just beyond the entrance of the cystic duct; Case III by unusual vascular anomalies.

10. An intrahepatic gall-bladder is partly or entirely imbedded in the liver substance instead of merely occupying the classical gall-bladder depression. Of this anomaly 16 uncomplicated cases are recorded.

11. A completely imbedded gall-bladder may be confused with a left-sided or absent gall-bladder. According to Dévé, this anomaly is most common in infants and reptiles.

12. A left-sided gall-bladder occupies a position to the left of the falciform ligament in a normally placed liver. Of this anomaly 13 cases

are recorded. Seven cases were uncomplicated. Case II was complicated by an abnormal arrangement of the caudate and quadrate lobe, Case IV by an ectopia of gall-bladder. Cases VII and VIII by vascular and lobar anomalies. Case IX by absence of quadrate lobe. In Case XIII two gall-bladders existed, one on the right and the other the left lobe.

13. A left-sided gall-bladder may be concealed behind the falciform ligament and at an operation be overlooked entirely, or confused with a congenital absence, extreme fibrosis, or an intrahepatic gall-bladder.

14. In transposition of viscera, the liver not only occupies the left instead of the right hypochondrium, but there is a reversal of the lobe, the left being larger than the right and receiving the gall-bladder. There is a dextroposition of the heart, as well as reversal of the duodenum and stomach, which becomes our most important diagnostic aid. Of this anomaly, 11 cases are recorded.

15. A floating gall-bladder has a distinct mesentery and is usually attended with a wide range of mobility. Of this anomaly there are eight cases recorded.

16. Absence of gall-bladder includes only cases of agenesis or congenital absence, as opposed to absence due to destruction through pathologic process. There are 7 cases of this anomaly recorded. Of these, Cases II and VII were complicated by the absence of quadrate lobe.

17. Absence of gall-bladder is common in some animals, elephant, rhinoceros, camel, goat, deer, some species of fish, some birds, and some rodents (Eschner).

18. There were no cases of congenital hour-glass gall-bladder discovered. Several cases are on record occasioned by pathologic processes.

19. There were eight cases of anomaly of bile passages as follows: 2 cases of double cystic duct; 5 cases of anomalies of hepatic ducts, and 1 case of absence of common duct.

20. The total anomalies numbered 76, of which 62, or 81+ per cent., were single, and 14, or 18+ per cent., were multiple.

BIBLIOGRAPHY

Giese, O.: Ueber Defect and Congent. Obliteration der Gallenausfirengsgange, Bonn 80, Leipsic, 1896.

Crucknell, H. H.: Tr. Path. Soc. Lon., 1870, 1, xxii.

Cruveilhier, E.: Bul. Soc. Anat. de Paris, 1860, xxxv.

Weltz. G. H.: Ueber Divertikel der Gallenblase, Kiel, 1894.

Walton, A. G.: Malposition Gall-bladder. Lancet, 1912, vol. i.

Purser: British Medical Journal, 1886.

Danforth, J. N.: Absence of Duct. Commun. Choledochus. Chicago Med. Journ., 1870, xxvii.

Morgan, J. H.: Case of Congenital Malformation of the Common Duct. Tr. Path. Soc., London, 1878, xxix.

Eshner, A. A.: Congenital Abscence of the Gall-bladder. Med. News, Phil., 1894, lxiv.

Latham, A.: Absence of Gall-bladder. Proc. Anat. Soc., Gr. Britain and Ireland, London, 1898.

Gessner, E.: Ueber Congenitalen verschluss der grossen Gallensgange, Halle, 1886.

Hochstetter, Ferdinand: Anomalien der Pfortader und der Nabelvene in Verbindung mit Defect oder Linkslage der Gallenblase. Archiv fur Anatomie und Physiologie, 1886.

Dévé, F.: De quelques particularites anatomiques et anomalies de la vesicule biliare. Bulletins de la Societe Anatomique de Paris, 1903.

Lemon, F.: The Lancet, May 13, 1905.

Sherren, James: A Double Gall-bladder Removed by Operation. ANNALS OF SURGERY, vol. liv.

Förster, August: Missbildungen des Menschen. Jena, 1861, p. 125.

Klebs: Handbuch des Pathologlichen, Anatomie, 1869.

Meckel, J. F.: Handbuch der Menschlichen Anatomie, 1820, Band iv.

Von Sömmering, T. H.: Vom Bau des menschlichen Korpes, v Band, 1844.

Dressmann: Beitrag zur Kenntnis der Kongenitalen Anomalien der Gallenwege. Deutsche Zeitschrift f. Chirurgie, vol. xcii, 1908.

Horn, Harry W.: Situs Viscerum Inversus with Gall-stones. ANNALS OF SURGERY, lxii.

Brewer, Geo. E.: Anatomy of Gall-bladder and Ducts. ANNALS OF SURGERY, vol. xxix.

Deaver and Ashhurst: Surgery of the Upper Abdomen, vol. ii.

Kehr, Hans: Die Praxis der Gallenwege Chirurgie, Bd. I und II.