

GALL-BLADDER COMPLICATIONS FOLLOWING RESECTION OF STOMACH FOR PEPTIC ULCER*

BY

C. L. H. MAJLOOR, M.D.

Department of Medicine and Röntgen Diagnosis

AND

Th. J. J. SUREN, M.D.

*Department of Surgery**(From the "Charitas" Hospital, Roosendaal, N.Br.,
The Netherlands)*

Abnormal conditions in the upper abdomen which may occur after resection of the stomach for peptic ulcer may be considered under several heads. A detailed investigation into the occurrence and frequency of gastro-jejunal ulcers would be outside the scope of this paper. Occasionally, during the past five years, we have observed severe haemorrhage following gastric resection, but on no occasion was there demonstrable radiological evidence of ulcer. It was noted that the patients rarely complained of pain. Symptoms arising from internal strangulation of the small intestine by abnormal hernial rings are less frequent (for literature, see Suren, 1941).

Of common occurrence are less serious complaints, often of a temporary nature, as observed by Wangenstein (1944). He did not encounter serious disorders or anastomotic ulcers. Poor appetite and a feeling of satiety are common, especially after partaking of liquid food. It would be incorrect to ascribe these phenomena to over-filling of a stomach of reduced capacity; for most radiologists are acquainted with the rapid emptying which follows resection. A reasonable presumption would be that the liquid either fills the afferent loop of the anastomosis or interferes with the flow of pancreatic biliary juices from that loop. Symptoms may conceivably arise in this manner, and they can be anticipated and prevented by advising the patients to eat dry food. It is an outstanding fact that porridge and milk no longer agree with patients who, prior to operation, had lived almost entirely on that diet. Frequently there is an aversion to fatty foods. Finally, some patients are troubled in the early post-operative period by regurgitation of bilious fluid. It is inferred from these findings that the downward flow of bile is impeded in resections of the Billroth II type. In many instances the resulting complications are slight and of a temporary nature. They may, however, be serious.

Stolte (1942) carefully observed 333 cases of ulcer in the Department of Medicine of the "Onze Lieve Vrouwe" Hospital at Amsterdam. Of these 333 patients 83 had previously undergone gastric resection and 26 had had gastro-enterostomy. Stolte found that gastro-jejunal ulcer was a complication in eight of those resected and in ten of those with gastro-enterostomy. Further, 22 patients after resection and four after gastro-enterostomy continued to have symptoms; but in no case could gastro-jejunal ulcer be demonstrated with certainty. The number of patients with abdominal symptoms after operation on the stomach is remarkably large in this series. Their complaints were serious enough to warrant their admission to the medical clinic after they had been operated upon.

We are greatly impressed with the fact that in Stolte's series severe unaccountable symptoms following stomach

operations were more frequent than those arising from proved anastomotic ulcers, and that they were proportionately more frequent after resection than after gastro-enterostomy. Stolte does not state whether he examined the gall-bladder in investigating his series. One sees a similar picture in a review by Kingma (1939) of 65 cases of primary resection operated upon according to the Billroth II method for perforated ulcer. Severe symptoms persisted in six cases; but in only one was gastro-jejunal ulcer (repeated haemorrhage) the probable diagnosis. In the remaining five the diagnosis was uncertain; four of the patients complained of pain and three found that fat did not agree with them. No special attention was paid to the gall-bladder in this investigation.

During the past few years we have learned that severe symptoms occurring after gastric resection by the Polya-Balfour-Reichel type of operation are frequently caused by gallstones. We have not found this fact stated in the literature which we have studied, nor do Wangenstein, Stolte, or Kingma mention it as a possibility. The following case is noteworthy.

An Illustrative Case

Mrs. B. (Case 1), aged 36, was admitted to hospital on April 20, 1943. She had suffered from symptoms referable to the stomach since she was 16. The symptoms had an obvious periodic incidence, and during two pregnancies they were entirely absent. Pain was mostly referred to the left side of the abdomen, was unrelated to the taking of food, and was manifest in attacks lasting for ten or fifteen minutes. The patient did not complain of heartburn, nor did she vomit. In 1938 the pain disappeared when she was given ambulatory treatment elsewhere. In 1942 there was a slight recurrence. Since the autumn of 1942 the patient was never really free from pain.

Nothing of note was discovered on general examination. Some not very dark bile was found on duodenal intubation and no cholesterol crystals were seen in the bile sediment. Test-meal findings showed: free HCl 15°; total acidity 20°. There were no abnormal findings in blood or urine. Radiological examination of stomach and duodenum revealed "kissing ulcers" of the duodenal bulb. After the oral administration of tetraiodo-phenolphthalein in fractions, two of 3 g., a fair-sized gall-bladder was observed, duly filled with dye and free from stones.

On May 5 partial gastrectomy of the Polya-Balfour-Reichel type was performed. The post-operative course was complicated by severe pulmonary embolism on the nineteenth post-operative day. This complication was confirmed by observing a pleural friction rub over the foremost part of the right lower lobe. On June 20 she was discharged from hospital.

On April 12, 1945, the patient reported sick again. After the operation she had remained symptom-free for six months, except for nausea after food. In November, 1943, she had a violent cramp-like pain in the epigastric region after drinking home-made liqueur. From October, 1944, the attacks of cramp became more frequent. The patient did not become jaundiced, nor did she notice any darkening of the urine. She vouchsafed the information that these attacks of pain were of more sudden onset and of greater severity than the pain experienced before the stomach operation. "It is not my stomach," were her words. The pain was localized to the left subcostal region and did not radiate. Physical examination was negative; the blood and urine were normal. The previous operation rendered duodenal intubation impracticable. Radiography of the gall-bladder, using "biliselectan," revealed that it did not fill. A diagnosis of gallstones was made.

Cholecystectomy was performed on April 13. The gall-bladder contained thick bile and more than a thousand small stones of varying sizes. The post-operative course was complicated by slight infiltration of the right lower lobe, which responded to sulphathiazole. On May 2 the patient was discharged from hospital, and when she reported for medical inspection on Jan. 21, 1946, was in excellent condition and

*This paper is dedicated to our friends and colleagues of the Allied Expeditionary Force serving in the neighbourhood of Roosendaal in the winter of 1944-5.

free from pain. Milk and milk puddings do not agree with her, but she tolerates all other foods, even fatty ones.

We are reasonably certain that the gall-bladder was normal at the time of the partial gastrectomy. The first symptoms, presumably due to the gall-bladder, appeared six months after the operation, and one naturally surmises that there was some relationship between the resection and the development of cholelithiasis.

experienced before the operation. The history of Case 2 is less definite: the colicky pains which she had before her gall-bladder operation had certainly never occurred before the resection. All patients now complained of attacks of pain of short duration, recurring at intervals, sometimes long and irregular. The pain was often localized to the upper abdomen and on the left side. Slight transient jaundice occurred once only (Case 5).

TABLE I.—Details of Six Cases

Case	Age at Time of Resection	Sex	Date of Resection	Diagnosis of Ulcer based on	Type of Operation	Time between Stomach Resection and First Gallstone Complaints	Date and Findings of Gall-bladder Skiagram	(a) Date of Gall-bladder Operation (b) Time between Resection and Gall-bladder Operation	Findings at Operation
1 Mrs. B.	36	F.	5/5/43	Skiagram: two craters in duodenal bulb; gall-bladder normal	Polya-Balfour-Reichel. Affluent loop attached to greater curvature	6 months	12/4/45; not filled	(a) 13/4/45 (b) 23 months	Gallstones not to be felt at operation. After operation gall-bladder proves not to be inflamed. Thick bile with a good deal more than a thousand stones ranging in size from a pinhead to small mulberry stones
2 Miss C.	31	F.	29/12/41	Repeated stomach bleedings	" "	Some months	14/11/44 and 17/11/44; not filled	(a) 22/11/44 (b) 35 months	Chronic inflammation with stones; common duct somewhat wide. Many small mulberry-shaped stones in gall-bladder
3 C.v.A.	67	M.	20/9/43	Acute perforation of duodenal ulcer on 30/6/43	" "	18 months	30/5/45 and 31/5/45; slight filling. At bottom of gall-bladder many small stones clearly visible	(a) Not yet operated upon (b) Diagnosis made 20 months after resection	
4 A.v.B.	46	M.	July 1941; operation elsewhere	Long and typical case history. Heavy stomach bleeding; further data missing	Billroth II. Probably affluent loop attached to greater curvature	37 months	8/3/45 gall-bladder clearly visible. With patient in erect position, many stones visible, arranged in a horizontal layer in the mid-portion of the gall-bladder (swimming stones)	(a) 9/3/45 (b) 44 months	Gall-bladder not inflamed; conglomerates of mulberry-shaped stones
5 J.C.H.	40	M.	Sept., 1942	Skiagram showed crater in duodenal bulb	Polya-Balfour-Reichel. Affluent loop as above	7 months	12/11/43; not filled	(a) 4/1/44 (b) 17 months	Gall-bladder not inflamed; mulberry-shaped stones
6 A.H.	30	M.	15/10/43	" "	" "	28 months	No skiagram	(a) 20/2/46 (b) 28 months	" "

TABLE II

	Column 1		Column 2		Column 3		Column 4	Column 5
	A. Number of Cases of Stomach Resection on Account of Ulcer	Hospital Mortality	B. Number of Cases of Gall-bladder Extirpation on Account of Stones or Inflammation Without Stones*	Hospital Mortality	C. Stomach Resection and Gall-bladder Extirpation done simultaneously	Hospital Mortality	Cases of Peptic Ulcer and Gallstones occurring simultaneously. For some Reason Only Stomach Resection carried out†	Number of Cases of Gallstones perceived after Stomach Resection‡
1943 ..	68	0	45	1	0	0	—	—
1944 ..	40	0	44	0	3†	0	—	2
1945 ..	54	1	97	2	1	0	3	3‡
1946 ..	7	0	29	0	1	0	0	1
(1st quarter)								
Col. 3 . . .	5		5					6
Total ..	174	1	220	3	5	0	3	

Mortality of all the cases of resection (A + C = 174 patients), 0.57%.
 Mortality of all the cases of gall-bladder operation (B + C = 220 patients), 1.36%.
 * All the patients operated upon included (also bad cases with pancreatic necrosis and long-standing jaundice).
 † Inclusive of one case of ulcer perforation in an otherwise normal gall-bladder.
 ‡ In one of these cases no operation so far.
 § Cases of this column are included in column 1 only.
 || Cases of column 5 are included in columns 1 and 2.

Observations on Six Cases

Further observations are given in Table I. In none of these cases have we any exact knowledge of the state of the gall-bladder before stomach resection. There are, however, certain pointers to the improbability that any gallstones were present at the time of operation. Symptoms arose in all cases after periods of 6 to 37 months of freedom from pain. Patients Nos. 1, 3, 4, 5, and 6 said most decidedly that the nature of the pain was quite different from that

We can put forward important arguments (unpublished data) favouring the hypothesis that all gallstones, in our part of the country at any rate (i.e., North Brabant area of South Holland), originate as minute cholesterol particles, which aggregate to mulberry-shaped stones. All the stones found in our six patients belonged to these very young formations. This fact is in accordance with our supposition that these stones have originated only after the resection. That relief from pain followed cholecystectomy is very

strong evidence that the gallstones were the cause of symptoms in the five patients who were operated upon.

The diagnosis of cholelithiasis was entertained only after much hesitation in respect of our earliest patients. From Table I it appears that the gall-bladder was not visible in the skiagrams of three out of five photographed patients. Jaundice was always lacking at first. Further, after partial gastrectomy duodenal intubation (the findings of which manoeuvre we consider valuable) is no longer applicable as an aid to diagnosis. At first we thought that the altered gastric properties, after gastrectomy, might interfere with the resorption of the contrast medium from the intestine. Later it became clear to us that oral cholecystography, even after gastrectomy, is a reliable procedure, and that a gall-bladder which is not filled—certainly after the examination is repeated—is strong evidence of the presence of gallstones. Sassen and Wijnen (personal communication) came to a similar conclusion when they examined radiologically the gall-bladders of a number of patients who had been operated upon by the Billroth II method. Normal filling of the gall-bladder was found in the great majority. These examinations were conducted for the purposes of information on patients without symptoms.

In order to estimate the incidence of gallstone formation following gastric resection we compare, in Table II, those cases observed after gastric resection with all gastrectomies for ulcer and all cholecystectomies performed for stones or inflammation in corresponding years. The first impression, no doubt, is that gallstones are so often encountered during operations for ulcer that their occurrence after a resection is a mere coincidence. The simultaneous occurrence of ulcer and gallstones was observed seven times (Table II, columns 3 and 4), although this association was not systematically sought for in 1943 and 1944. Gallstones following resection were observed only on six occasions. It is emphasized that the stones found together with ulcer were on four occasions of an old or very old type, and small cholesterol stones were present on three occasions. In this respect already the two series in Table II differ. The proportion of males to females also differs. The comparison is made in Table III.

TABLE III.—Incidence of Gallstones After Gastric Resection :
the Sexes Compared

	Cases	Female	Male	Ratio
				F. : M.
Cholecystectomies on account of stones or inflammation	219	187	32	5.8 : 1
Resections on account of ulcer . . .	174	30	144	1 : 4.8
Gallstones ascertained some months after resection for peptic ulcer	6	2	4	1 : 2
Gallstones found during resection for peptic ulcer	7	6	1	6 : 1

As in normal experience, there was a female preponderance in gall-bladder operations, and men had the larger share in stomach resections. In the group where stones were found at operation for ulcer the male/female ratio corresponds to that for the cholecystectomy group. In the group of gallstones following resection the male element predominates, approaching the male/female ratio for resections. Although our series is a small one and by no means conclusive there is presumptive evidence that in the condition of gallstones following resection for gastric ulcer the resection itself may play a part. The evidence becomes all the more certain when we bear in mind that of 32 males operated upon for gallstones in 3½ years three had already had resection of the stomach. (Our fourth male patient has not yet been operated upon and has not been included in this computation.) One out of ten males undergoing cholecystectomy had therefore had a previous stomach

operation. This high occurrence rate also suggests that the gastric resection may predispose to cholelithiasis. Nor can it be maintained that one male in ten in this part of Holland undergoes gastric resection.

Discussion

There are five arguments in support of our view that resection of the stomach by the Billroth II technique may cause gallstones to develop: (1) the striking observation in the case of Mr. B.; (2) the evident discrepancy in the symptoms of our six patients (who developed gallstone complaints after resection) before and after the stomach operation; (3) the discovery of young stones exclusively; (4) the distribution of our cases between the sexes; (5) the fact that the gallstone symptoms always appeared shortly after the resection (6–37 months) may point in the same direction.

Even if this thesis is acceptable there are some problems still outstanding. It is not clear in what way the resection predisposes to gallstone formation. It is easy to visualize altered duodenal flow and pressure being reflected in the biliary system. Such alterations may explain the vague nature of the symptoms after many resections. It is possible that the precipitation of cholesterol is facilitated under the new conditions. If this hypothesis should be substantiated it would be interesting to know if there is any incidence of gallstones after the Billroth I type of operation.

It is especially important to know if the manner of attachment of the jejunal loop has any bearing on the formation of gallstones. Among the six cases under discussion the efferent loop was attached to the greater curvature on at least five occasions. This procedure has the advantage of virtually preventing pinching-off of the small intestine (Suren, 1941; Kummer, 1941). If, however, the manoeuvre should involve the bile ducts in abnormal conditions it is doubtful if it would be wise to continue to use it.

It is difficult to understand why cases with gallstones following resection have not before been published. There was no mention of such a condition in the literature at our disposal. The diagnosis is undoubtedly difficult unless its possibility is always considered. The symptoms in all our cases were of colic; but the localization was uncommon for biliary colic and only once was there any jaundice. All the patients were referred with the provisional diagnosis "stomach cramps." A striking instance in point was Case 6. Four weeks after gastrectomy (Oct. 15, 1943) this patient acquired a small post-incisional hernia which was symptomless. On Feb. 11, 1946, he had a violent attack of pain in the epigastrium. Strangulation of the hernia was suspected and he was sent to hospital. At the operation the gall-bladder was purposely inspected, and on finding that it was full of mulberry gallstones it was removed. We believe that more cases of gallstones following resection will be discovered if they are systematically investigated.

The history of another of our patients (P. v. E.) is illuminating in that gallstones were not found, although the symptoms he presented suggested that probably they were present. He was born on March 12, 1917, and had had medical treatment for duodenal ulcer in 1939 and 1940 and gastrectomy on March 19, 1941, when he was found to have "kissing" ulcers of the duodenal bulb. The operation was after Polya-Balfour-Reichel, the gastro-jejunal anastomosis being effected with efferent loop at the lesser curvature. On June 15, 1943, he reported as an out-patient with symptoms of epigastric pain which had been present for one and a half years. Skiagrams showed a normal resection stomach without ulcer and a gall-bladder with moderate filling and without stones. A trial breakfast showed free acid 14°, total acidity 20°. On March 13, 1945, the investigations were repeated because of violent attacks of pain after taking milk, cabbage, peas, and beans. A fractional

test meal revealed no free acid. There were no obvious abnormalities of the stomach and gall-bladder on x-ray examination. Dietetic treatment was given. On Feb. 23, 1946, he reported again at the out-patient department. He had been free from symptoms for seven months, but during the preceding few weeks he had renewed attacks of pain, mostly after milk and porridge. Once more there was no abnormality of the gall-bladder. He was completely free of symptoms after some days of complete rest and frequent small meals with little fat and without milk.

Conclusions

From a total of 220 extirpations of the gall-bladder and 174 resections of the stomach over a period of 3½ years it was observed that gallstones occurred on six occasions shortly after a resection. As a result we believe that it is necessary, when patients complain of pain after resection, to look for the cause in the gall-bladder rather than the anastomosis. Some arguments support the view that the Billroth II type of operation may further the formation of gallstones.

REFERENCES

Kingma, M. J. (1939). *Primary Stomach Resection after Perforated Peptic Ulcer* (Dutch). Van. Gorcum, Assen.
 Kummer, A. (1941). *Zbl. Chir.*, 68, 663.
 Stolte, J. B. (1942). *Manifest Gastric Haemorrhages and Their Treatment* (Dutch). Scheltema and Holkema, Amsterdam.
 Suren, Th. J. J. (1941). *Zbl. Chir.*, 68, 200.
 Wangenstein, O. H. (1944). *Minnesota Med.*, 27, 714.

DIATHERMY DISSECTION OF THE GALL-BLADDER

BY

R. J. McNEILL LOVE, M.S., F.R.C.S.
Surgeon, Royal Northern Hospital, London

Eight years ago I published, jointly, an illustrated article on Thorek's method of electrosurgical obliteration of the gall-bladder without drainage (Bailey and Love, 1939). Briefly, this entailed partial removal of the gall-bladder and coagulation by diathermy of the strip which was left *in situ* attached to the liver. The main advantage of this operation, as compared with the standard cholecystectomy, was that drainage was unnecessary. We reported a series of 129 consecutive and unselected cases with no mortality, and in only seven were there post-operative complications. These included four patients who developed infection of the abdominal wall, one whose wound broke down on the fourth day, and two cases of biliary fistula following drainage of the common bile duct. These fistulae eventually closed spontaneously. We mentioned that in some cases the gall-bladder possessed a more or less complete mesentery, so that it was possible to remove the entire organ without damage to the liver capsule. The gall-bladder bed was then coagulated with a diathermy button and the peritoneal edges were sutured over the exposed area. If the area was too wide to cover with peritoneum a detached piece of falciform ligament or an omental graft was sometimes tacked over the surface.

The very satisfactory results which followed the diathermy dissection of the gall-bladder in cases in which the organ was loosely attached to the liver prompted one to apply it as a routine in all cases suitable for a complete cholecystectomy. Exceptions are patients in whom a cholecystostomy is the more prudent measure, or occasionally the gall-bladder is so embedded in the liver that it is easier and safer to perform Thorek's operation.

Diathermy dissection of the gall-bladder is, as a rule, an easy operation, and differs from the standard cholecystectomy only in that, after identification and ligation

of the cystic duct and artery, a diathermy knife is used to divide the peritoneum on either side of the gall-bladder (Fig. 1). The viscus is then dissected from its bed with the diathermy knife, care being taken that the knife is applied to the gall-bladder rather than to the bed. Thus, Glisson's capsule is unlikely to be damaged, and subsequent seepage of bile and blood is reduced to a minimum. If necessary any raw areas from which bile or blood exudes are coagulated with a diathermy button (Fig. 2). During dissection of the gall-bladder from its bed a constant watch must be kept for the presence of a cholecysto-hepatic duct (Fig. 3). This is an uncommon anomaly—for example, Flint (1923), in his review of 200 cases of the anatomy of the bile ducts and vessels (in which only 69 followed the textbook description), did not record a case. Neuhoef and Bloomfield (1945) describe two cases in which the duct measured about 2 mm. in diameter. In one case it was unrecognized, and a fistula resulted which closed in forty-five days, and in the other the duct was recognized at operation and closed with a purse-string suture. When the surgeon is satisfied that the gall-bladder bed is dry the area is covered by approximation of the peritoneal flaps, reinforced, if necessary, with a graft of omentum or falciform ligament. The wound is then closed without drainage.

Excluding cases in which drainage of the common bile duct, or very occasionally the gall-bladder bed, was considered necessary, I have during the past 10 years operated on 332 cases of gallstones. The procedures adopted were: cholecystostomy, 18; Thorek's operation, 81; diathermy dissection, 233.

Cholecystostomy was advisable in some cases of empyema of the gall-bladder, or when the viscus was buried in adhesions so that anatomical dissection was impracticable, especially if the patient was obese. In these cases safe surgery resolved itself into removal of calculi and drainage of the gall-bladder.

Thorek's operation was performed when the biliary tract could be exposed, so that the cystic duct and artery could be ligated with safety. When a fibrotic and contracted gall-bladder is partially buried in the liver removal of part of the viscus, with coagulation of the embedded portion, entails less risk than a complete cholecystectomy. It should be mentioned, however, that many of the early

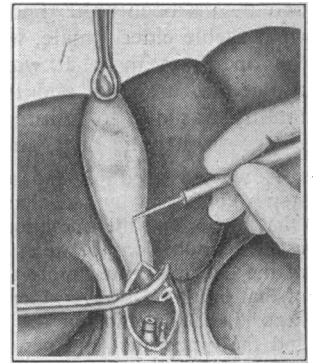


FIG. 1.—Division of the peritoneum with a diathermy knife in dissection of the gall-bladder.

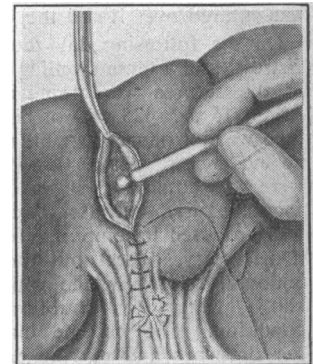


FIG. 2.—Coagulation of raw area with a diathermy button.

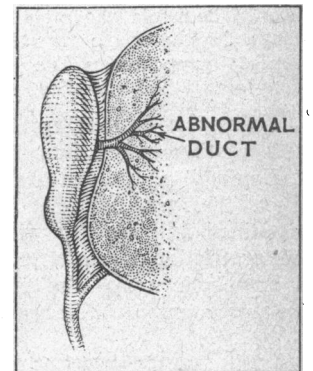


FIG. 3