

OPERATIVE CHOLANGIOGRAPHY*

C. A. R. SCHULENBURG, M.D., M.Ch., F.R.C.S.

Pretoria

This study is based on 140 consecutive cases under my care of disease involving the biliary tract, operated on between October 1955 and March 1957. Operative cholangiography was performed in all cases. In addition, control or/and post-operative cholangiograms were taken in a further 12 cases, where operative X-ray was not found necessary.

Cholangiography at operation does not replace routine search for common-duct stones, and does not ignore the accepted indications for exploration of the common duct, which are the following:

1. History of, or presence of jaundice.
2. Dilatation of the common duct.
3. 'Gravel' in gall-bladder, with wide cystic duct.
4. Positive findings on palpation of common duct or pancreas.
5. Contracted gall-bladder, with wide common duct.

We have not used cholangio-manometry or the cholelithophone or the recently described biliary endoscope. Possibly pressure studies may be of value in cases of biliary colic in the absence of any obvious pathological condition ('dyskinesia').

TECHNIQUE

1. A suitable wooden tunnel for taking a 12 × 15 inch X-ray cassette is placed on the operating table in the required position.

2. A 12×15 inch cassette with stationary grid strapped on is slipped into the tunnel. The patient is positioned so that the right twelfth rib is in the middle of the cassette. The patient is rotated slightly onto his right side so as to project the bile ducts clear of the spine.

3. Laparotomy is performed, and all abdominal and pelvic organs palpated.

4. Dissection begins at the gall-bladder neck and the cystic duct is positively identified. The cystic artery is tied and divided at this stage if it can be identified. Two silk ligatures are passed round the cystic duct; the one nearer the gall-bladder is tied and the other kept loose. An opening is cut into the cystic duct between the ligatures. (If there is any difficulty in identifying the cystic duct, cholecystectomy proceeds from the fundus downwards, and only then, when the duct is identified, is cholangiography carried out.)

Meanwhile 20 c.c. of 35% Pyelosil has been drawn into a syringe, and an 8-inch length of polythene tubing attached via a well-fitting needle. Air-bubbles are excluded and the

end of the tube is now threaded into the cystic duct, the silk ligature being tied firmly over it.

5. All metal clips and instruments are removed, the X-ray apparatus wheeled into position, the dye injected and the exposure made. The anaesthetist provides for cessation of respiration by hyperventilation. (*Note:* a non-explosive anaesthetic must be used when radiographs are taken in the operating-room.)

6. Cholecystectomy is completed.

7. The common duct and the head of the pancreas are again inspected and palpated, and a decision regarding exploration of the common duct is tentatively made. By this time the X-ray plate is back for inspection, and is a further help towards this decision.

8. A normal cholangiogram (Fig. 1) shows a filled biliary tree with smooth contours and undilated, free flow of dye into duodenum, and no filling defects. The operation is completed if such is the case.

9. If an abnormality exists calling for opening of the common duct (Fig. 2), the operation proceeds in the usual manner, a T-tube is sewn in watertight, and a *control* cholangiogram is taken at this stage, again taking care to eliminate air-bubbles by a preliminary saline flush.

10. A routine post-operative cholangiogram is made on the 14th day in cases where a T-tube had been inserted (Fig. 3).

VARIATIONS OF TECHNIQUE

1. Cholecysto-cholangiography via a Foley catheter in the gall-bladder, used in cases of 'dyskinesia', and in association with manometry.

2. Direct injection of dye into the common duct by needle and syringe, used in post-cholecystectomy cases, and in cases where the ductal anatomy cannot be absolutely identified.

3. Frequently removal of the gall-bladder has to proceed from the fundus downwards; only after the cystic duct has been absolutely identified can the cholangiogram be taken.

4. Where the common duct is dilated, a larger amount of dye should be used, but it is wise to make one exposure after injecting 10 c.c. only, and another after injecting a further 10-20 c.c. This reduces the possibility that stones may be obscured by overfilling of the duct with dye.

5. When stones are palpated in the common duct, a primary cholangiogram is not required, but *control* at the end of the procedure is of great importance.

6. In common-duct strictures, the intra-hepatic biliary tree

* A paper submitted at the South African Medical Congress, Durban, September 1957.

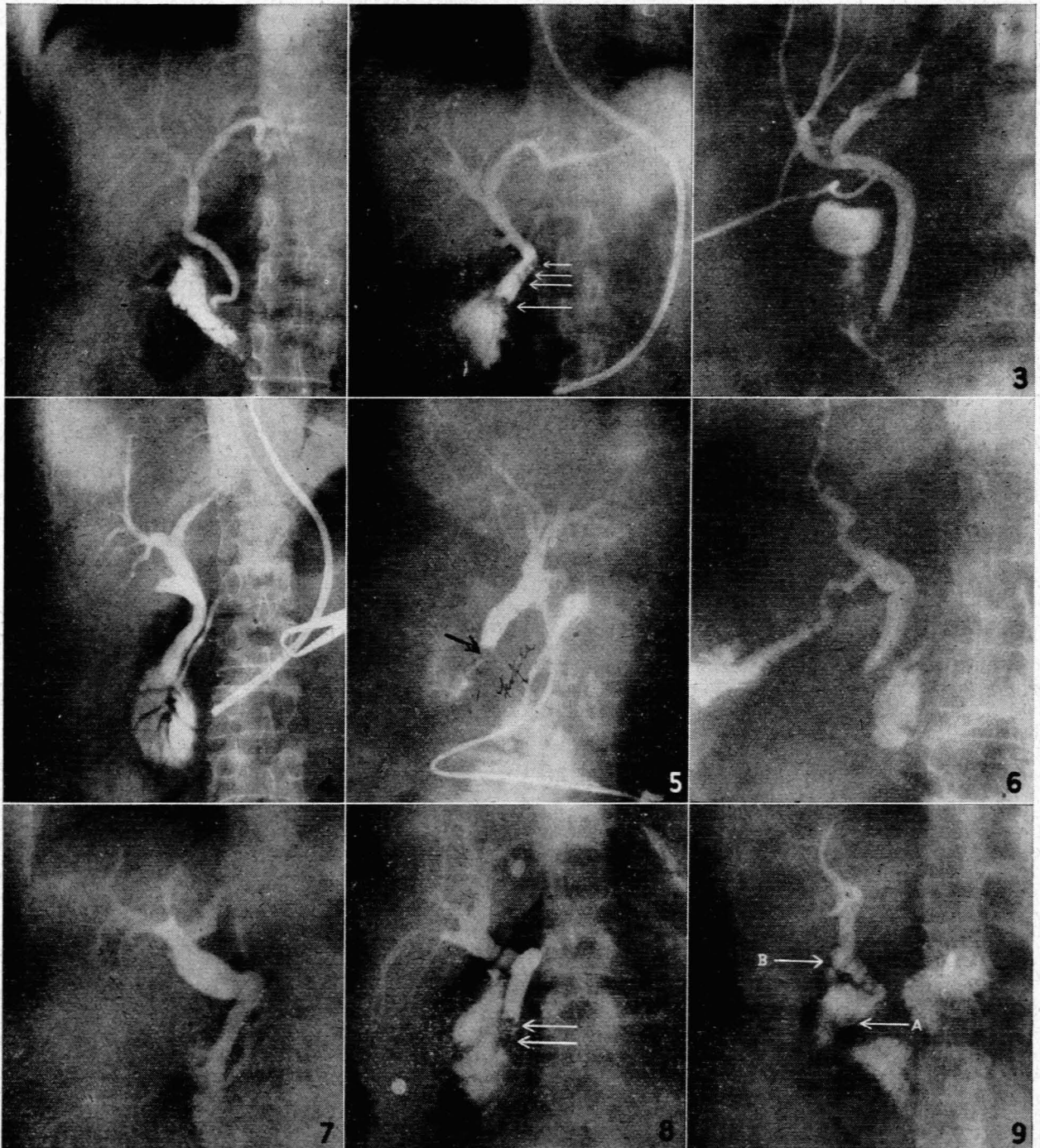


Fig. 1. Normal operative cholangiogram. Fig. 2. Multiple common-duct stones. Fig. 3. Normal post-operative cholangiogram. Fig. 4. Main pancreatic duct demonstrated. Fig. 5. Retained common-duct stone after operation elsewhere. Fig. 6. Cholecystocholangiogram showing anomaly of cystic duct entering duodenum at ampulla of Vater. Fig. 7. 'False negative'. Overfilled common duct fails to show 8 small stones. Fig. 8. Stones in common duct. No history of jaundice. Stones not palpable at operation. Fig. 9. Post-cholecystectomy syndrome. Stone in common duct (A) as well as large cystic-duct stump (B), containing stones.

frequently contains stones. Cholangiography is useful to confirm and control adequate removal.

DANGERS AND COMPLICATIONS

Only in one case have we experienced considerable bile leakage from needle-puncture of the common duct. No other complications have occurred. The following have been described:

1. Pancreatitis. This will only occur if sufficient pressure is used to rupture intrapancreatic ducts.
2. Cholangitis or liver damage due to the contrast medium or infection.
3. Sensitivity to iodine.
4. Radiation danger to personnel. This is negligible if members of the operating team stand well back from the table during the exposure.
5. Bile leakage from common-duct needle-puncture may be considerable. Drainage should always be provided.

RESULTS

Tables I-V indicate the more important findings in the present investigation.

TABLE I. NUMBER OF ABNORMAL FINDINGS

	Cases
Cholangiogram normal	90 (64%)
Cholangiogram abnormal	50 (36%)
Total	140
Pancreatic duct shown	15 (11%)

It appears significant that a high percentage of abnormality in relation to the common duct may be expected in a consecutive series of operations on the biliary tract.

Demonstration of the main pancreatic duct (Fig. 4) is of little significance unless it, as well as the common bile-duct, is dilated, indicating a stenotic papilla.

TABLE II. ANALYSIS OF ABNORMALITIES IN 50 CASES

	Cases
(a) Stones in common bile-duct	27
(b) Abnormal dilatation	7
(c) Dilatation due to cancer of pancreas	6
(d) Dilatation due to pancreatitis	3
(e) Unexplained abnormality in common duct	3
(f) Common-duct stricture	2
(g) Accessory hepatic duct	1
(h) Aneurysm of hepatic artery	1
Total	50

The 7 cases of 'abnormal dilatation' (b) included the 'false negatives' (described later) and cases of stenosis at the sphincter of Oddi.

'Unexplained abnormalities' (e) included filling defects, probably due to pancreatic nodules surrounding the common duct.

Two further common-duct strictures are included in (a), as there were stones above the stricture.

In (g) the cystic duct was seen to enter an accessory hepatic duct, which in turn joined the common hepatic duct. Without

the help of the radiograph this duct may have been traumatized (Fig. 10).

TABLE III. FALSE INTERPRETATIONS RELATING TO STONES
False Negative Radiographs—3 Cases (0.85%).

1. Underexposed radiograph
2. Blurred radiograph (breathing movements)
3. Overfilled common duct

False Positive Radiographs—3 Cases (0.85%).

1. Gas-bubbles in common duct
2. Gas-bubbles in common duct.
3. Unexplained shadow in common duct

In the 'false negatives', radiographic technique was at fault in two instances. In the overfilled duct, no stones were shown on X-ray, but 8 stones were removed from the duct (Fig. 7).

In the 'false positives', gas-bubbles are the greatest sources of error; every care should be taken to eliminate this in the technique.

Faulty conclusions may also be made when the biliary tree is incompletely filled, when the dye does not flow into the duodenum because of temporary spasm of the sphincter of Oddi, or when the patient is wrongly positioned.

TABLE IV. RELATION OF JAUNDICE TO RADIOGRAPHIC FINDINGS

	Cases
No History of Jaundice: (84 cases)	
Common-duct stones found	8
Common duct clear	76
History or Presence of Jaundice: (54 cases)	
Common-duct stones found	19
Common duct clear	23
Other causes found	12
Doubtful History of Jaundice: (2 cases)	
Common-duct stones found	Nil
Common duct clear	2
Total	140

It will be noted that the absence of a history of jaundice does not exclude the possibility of stones in the common duct (Fig. 8). Also, though the patient may have had jaundice previously, stones are not necessarily present in the common duct at the time of operation.

TABLE V. OPERATIVE CHOLANGIOGRAMS—140 CASES

	Cases
Stones not felt in common duct, but shown on X-ray ..	8
Stones not shown on X-ray, but found in common duct	3

The fact that stones may be present in the common duct, yet not be palpable, especially by the inexperienced, demonstrates the value of an operative cholangiogram in such a case (Fig. 8).

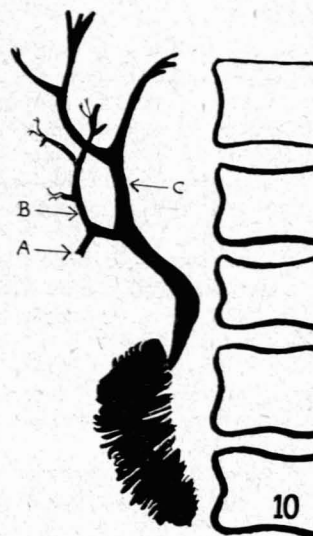


Fig. 10. Tracing of operative cholangiogram showing accessory hepatic duct at B. A indicates cystic-duct stump; C is the common hepatic duct.

DISCUSSION

A senior British surgeon has recently stated that operative cholangiography is 'only for the inexperienced and gadget-minded'. Frequently new procedures are accepted with reluctance by experienced men who have got on for many years without it. However, one would stress that operative cholangiography is a useful *additional* procedure to the well-recognized methods of searching for stones in the common duct.

It was inevitable that a biliary endoscope should be invented, and such an instrument has recently been described.

In many cases, stones will be discovered in the common bile-duct without help of X-rays. In a few cases stones not felt will be shown by X-rays, thus avoiding the mistake of leaving stones behind. It is alleged by some that forgotten stones will pass spontaneously; this probably only applies to very small stones.

Frequently a common duct packed with stones is encountered. How is one to be sure that every single stone has been removed? Control cholangiogram at the end of the operation is quite essential (Fig. 5).

Operative cholangiography can be of inestimable value in identifying anatomical structures. Often a duct is exposed in the gastro-hepatic omentum, and it may be impossible to identify it absolutely without the help of bouginage or contrast X-ray.

The discovery of an accessory hepatic duct on the X-ray will prevent damage to that structure (Fig. 10). Fig. 6 shows a case where the cystic duct ran a course parallel to the common duct right down to the ampulla of Vater!

Fig. 9 shows operative cholangiogram in a case of post-cholecystectomy biliary colic. There is a large cystic-duct stump, containing stones, and a common-duct stone.

A follow-up study on the present series of cases is necessary to establish further the value of operative cholangiography, and this will be undertaken in due course.

SUMMARY

1. The technique of operative cholangiography is described.
2. Possible dangers and complications are listed.
3. An analysis of 140 consecutive cases of operative cholangiography is presented.
4. We use operative cholangiography at every operation on the biliary tract, and can testify as follows:
 - (a) Very important information regarding pathology or abnormal anatomy in the biliary tree may be obtained.
 - (b) The team-work necessary is well organized at our general and private hospitals.
 - (c) Extra cost to the patient is small.
 - (d) There is no delay during the operation.
 - (e) Danger to the patient is negligible.
 - (f) It is essential that the procedure be performed accurately and with great care.

OPSOMMING

1. Die tegniek van operatiewe cholangiografie word beskryf.
2. Moontlike komplikasies en gevare word genoem.
3. 140 agtereenvolgende gevalle van operatiewe cholangiografie word hierbo ontleed.
4. Operatiewe cholangiografie is by ons 'n roetine by elke operasie op die galweë uitgevoer, en ons kan as volg rapporteer:
 - (a) Belangrike bevindings i.s. patologie of abnormale anatomie mag verkry word.
 - (b) Die spanwerk wat nodig is, is goed ge-organiseer by ons algemene en privaat hospitale.
 - (c) Koste verbonde aan die ondersoek, is gering.
 - (d) Die ondersoek verg min ekstra tyd gedurende operasie.
 - (e) Daar is min gevaar aan die ondersoek verbonde.
 - (f) Die ondersoek moet egter sorgvuldig en akkuraat uitgevoer word.