

# The Management of Residual Bile Duct Calculi

by HUSSEIN BIN MOHAMED SALLEH

MB.BS. (Adelaide); F.R.C.S. (Edinburgh):

A.M. (Malaysia)

Consultant Surgeon and Head

Surgical Unit 3, General Hospital

Kuala Lumpur

After any operation on the gall bladder or bile passages, there is always the possibility of a residual stone, that is, a retained stone which had been overlooked or a recurrent stone which had formed later. It is a serious complication due to the potential development of ascending cholangitis with subsequent liver damage. In the hands of even the most experienced biliary-tract surgeons, the incidence of retained stones after choledocholithotomy varies from 8% to 9% (SMITH et alii 1957) up to 16% to 25% (PRIBRAM 1947) of choledocholithotomies.

## PROPHYLAXIS

### COMMON BILE DUCT EXPLORATION

HAVARD (1960) has shown that the more often the common bile duct is explored, the lower is the incidence of residual stones. However, routine exploration of the common bile duct has its hazards, there being increased morbidity and mortality. BARTLETT and WADDELL (1958) reported a mortality rate of 0.6% after cholecystectomy alone whilst combined cholecystectomy and choledochotomy produced a 1.8% mortality rate. COLCOCK (1958) stated that there was a 0.9% mortality rate following cholecystectomy only and this increased to 1.1% with the addition of choledochotomy. The length of hospital stay is one of the factors contributing to morbidity after biliary surgery (SALLEH and BALASEGARAM, 1974) and the addition of choledochotomy to cholecystectomy certainly increases the time that the patient spends in hospital (NIENHUIS 1961).

The indications for exploring the common bile duct are now well standardised (ADAMS and STRANAHAN 1947; COLCOCK and PEREY 1964), namely:—

- (1) A present or past history of obstructive jaundice or biochemical evidence of such

- jaundice.
- (2) Frequent acute attacks of fever, chills or biliary colic.
- (3) Multiple stones in the gall bladder.
- (4) A dilated or thickened common bile duct.
- (5) "Dirty-looking or muddy" bile aspirated from the gall bladder or bile duct.
- (6) The patient has symptoms and signs of biliary tract pathology but the gall bladder appears and feels normal at operation.
- (7) The gall bladder is small and contracted.
- (8) Suspicious or unsatisfactory findings on palpation of the common bile duct.
- (9) Pancreatitis — acute or otherwise.

### CHOLANGIOGRAPHY

Intravenous cholangiography has only limited use as the resulting picture of the bile ducts is often rather vague, the finer details of the ducts being lacking. The procedure is contra-indicated if the serum bilirubin is 3 milligrams per 100 millilitres or more, denoting inability of the liver to excrete the dye into the bile in significant amounts. Moreover even if the serum bilirubin is less than 3 milligrams per 100 millilitres, there is a high incidence of non-visualisation of the bile ducts after intravenous cholangiography and BEARGIE et alii (1962) reported insufficient opacification of the bile ducts in 39% of such cases.

Percutaneous transhepatic cholangiography is useful only in those instances where the intra-hepatic bile ducts are so dilated that they can be easily entered by a needle. A stone may be present in the common bile duct without producing dilatation of the intrahepatic ducts. Furthermore, there is the known danger of bile leakage resulting in biliary peritonitis with possible mortality after a successful percutaneous transhepatic cholangiogram in a patient with greatly increased intraductal biliary pressure.

Cholangiography is most useful when done pre-operatively before and after common bile duct exploration. Pre-exploratory operative cholangiography is more accurate than the accepted "clinical" indications for choledochotomy and should become a routine procedure in all biliary operations (LAWSON and GUNN 1970). Post-exploratory per-operative T-tube cholangiography is a less accurate procedure in visualising stones due to oedema and spasm following bouginage (GRIFFIN and WILD 1967) and the presence of intra-ductal air bubbles.

#### ASSOCIATED PROCEDURES

When there is much sludge and debris in the common bile duct and where there has been significant damage to the liver so that it is thought possible that matter will fall from the liver into the common bile duct, it is wise to consider some form of internal biliary drainage procedure. This will mean that residual stones are more likely to be discharged into the small intestine. The procedures available are sphincterotomy, choledochoduodenostomy and choledochojejunostomy.

#### SPHINCTEROTOMY

The advantages of this operation are that there is no anastomosis and bile passes along its normal route. However there is an increased possibility of ascending cholangitis since intra-duodenal pressures may be quite high (SMITH 1973). Further the pancreatic duct may be damaged during the operation. A potentially serious complication of sphincterotomy is acute pancreatitis (JOHNSON) and RAINS 1972). KEIGHLEY *et alii* (1969) reported that 56% of patients who underwent sphincterotomy or dilatation of the sphincter had significantly raised serum amylase levels post-operatively. When post-operative pancreatitis does occur, the mortality may go up to 77% (THOMPSON *et alii* 1957). In addition after a sphincterotomy, the patient may develop a leak from the duodenotomy incision.

#### CHOLEDOCHODUODENOSTOMY

In favour of this procedure is the resulting large stoma and the ease and speed of performance - particularly useful in poor risk patients. It has few immediate post-operative complications. A disadvantage of the operation is that there is an increased risk of ascending cholangitis since the intra-duodenal pressures may be quite high. Further, that part of the common bile duct between the stoma and the

ampulla of Vater may fill with food residue resulting in biliary calculi and ascending cholangitis (SMITH 1973).

CASE REPORT - Female, L.A.Y. Age 35 years. GIP No. 492/74. Admitted to General Hospital, Kuala Lumpur, on 10-4-74 with rapidly deepening jaundice and early liver failure. Emergency common bile duct decompression was performed on 11-4-74. At operation, there were multiple small liver abscesses and a huge common bile duct, 6 centimetres wide and containing about 100 millilitres of dirty looking bile under great pressure, was drained. 6 stones were quickly removed from the duct and 2 large branched stones removed from the left main hepatic bile duct by splitting the liver substance. Due to the extremely poor state of the patient no further time was lost in trying to remove other ductal stones which were present. A T-tube was inserted. On 16-5-74, when the patient's jaundice had disappeared and she was in a very good state of health, re-exploration of the bile ducts was performed to remove multiple stones which were shown on T-tube cholangiography after the first operation. Eight stones were removed and a choledochoduodenostomy was done (FIGURE 1).



## CHOLEDOCHOJEJUNOSTOMY

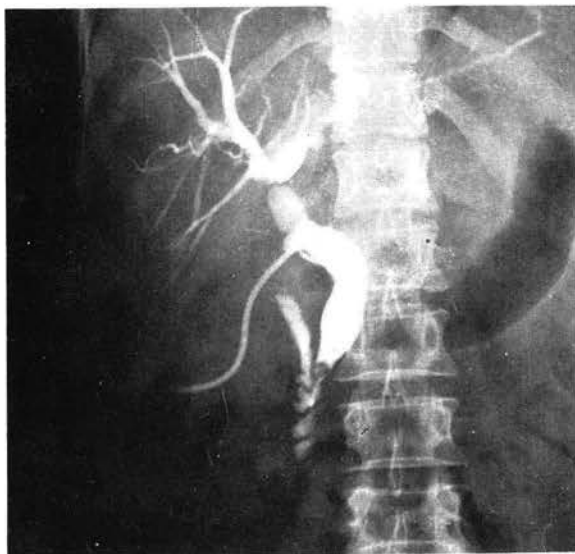
This may be performed either end-to-end ROUX-en-Y or end-to-side with entero-enteric anastomosis. The advantage of the operation is that the pressure within the lumen of the jejunal loop used for the anastomosis is minimal so that there is less risk of ascending cholangitis. The disadvantages of the procedure are that there are two anastomotic sites and it is a more difficult and slower operation so that it is usually not suitable for poor-risk patients. It is important to avoid excessive mobilisation of the common bile duct so that the blood supply of the duct near the anastomotic site is not compromised (ONG 1962).

## TREATMENT

### NON-OPERATIVE METHODS

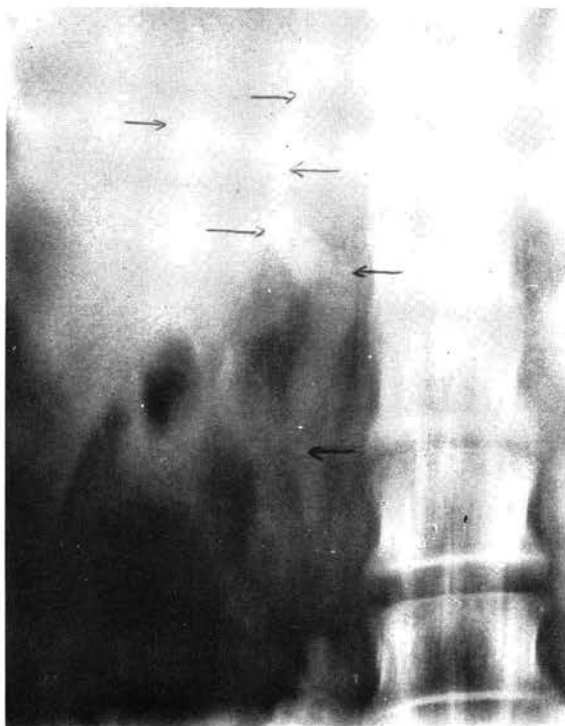
Since secondary choledocholithotomy is associated with an operative mortality of approximately 10% (THOMSON 1956), every other available non-operative procedure should be tried first in the management of residual stones. Early re-exploration to remove residual stones is fraught with danger (HUGHES 1955) and operative methods should not be tried for at least one month after the original operation (WAY et alii 1972). Four procedures are available, namely:—

- REMOVAL OF THE T-TUBE
- CHEMICAL DISSOLUTION
- FLUSHING
- INSTRUMENTAL MANIPULATION



REMOVAL OF T-TUBE—If the stone appears small on the T-tube cholangiogram and therefore seems likely to pass out on its own or if the patient is too ill to tolerate other procedures to remove it, including secondary lithotomy, then the T-tube is clamped for a week. If this does not lead to pain or jaundice or chills and rigors, then it is removed.

CASE REPORT — Female K.K. Age 34 years. GIP No. 1431/72. Admitted to General Hospital Kuala Lumpur on 22-11-72 with empyema gall bladder. She was operated upon on 23-11-72 when a large empyematous gall bladder together with three small common duct stones were removed. T-tube cholangiogram (FIGURE 2) done on the tenth day post-operatively showed a small stone in the lower end of common bile duct. Clamping the T-tube for seven days produced no complaints and it was then removed. She was re-admitted on 13-12-72 with chills, fever, rigors, jaundice and severe biliary colic which rapidly improved over the next 2 days. Intravenous cholangiogram (FIGURE 3) done on 27-3-74 was reported by the specialist radiologist as normal. Presumably the patient passed her biliary stone on the second admission to hospital.

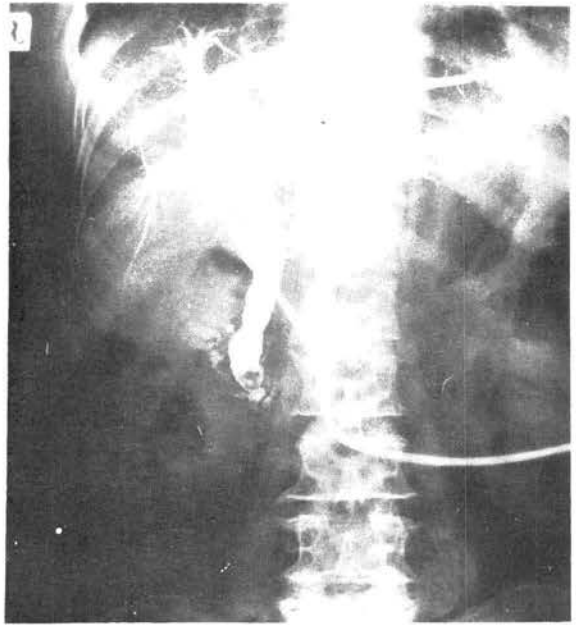


**CASE REPORT** - Very obese female ABHB. Age 48 years. Suffers severe diabetes and ischaemic heart disease. GIP No. 422/72. Admitted to the unit at General Hospital, Kuala Lumpur, on 28-3-74 with severe obstructive jaundice. The patient was operated upon on 4-4-74 as an emergency due to deepening jaundice and early liver failure. At operation, it was found that the liver was cirrhotic with multiple small abscesses and the gall bladder was inflamed. Cholecystectomy was done and a common bile duct stone removed. Due to the very poor general condition of the patient, very little time was spent in exploring the common bile duct. T-tube cholangiogram on the tenth day showed a large stone in the lower end of the common bile duct (FIGURE 4). Common bile duct flushing was attempted with no success and the patient complained of severe pain during the procedure. T-tube clamping produced no complaints, and it was removed. To-date she remains well.

**CHEMICAL DISSOLUTION** - WALKER (1891) was the first to do this successfully when he used ether topically through a cholecystostomy fistula to dissolve a stone. PRIBRAM (1947) achieved 100% success in 51 patients by injecting ether repeatedly through the T-tube and into the common bile duct to treat retained stones. BEST et alii (1953) found chloroform effective for dissolving cholesterol stones. GARDNER et alii (1971) instilled a heparin solution through the T-tube into the common bile duct and achieved some degree of success in removing retained calculi. They postulated that the suspension stability of particles in bile is increased by the addition of a highly negatively charged ion. Heparin supplies such an ion. COLE and HARRIDGE (1957) reported that in nine patients after bile salts were given orally daily for some weeks, retained stones disappeared. Possibly this was due to increased biliary flow or increased capacity of the bile to solubilise cholesterol. WAY et alii (1972) infused sodium cholates into the common bile duct via the T-tube and had some success in removing residual stones. It is theorised that one of the causes of cholesterol gall stone formation is an increase in the amount of cholesterol relative to bile salts and therefore cholesterol gall stones can be dissolved in micellar bile salt solutions.

**FLUSHING** - This was applied in a patient with retained common bile duct stones (FIGURES 8 and 9). The method used was that described by CATT et alii (1972). The flushing fluid consists of one litre of sterile normal saline containing 40 millilitres of 1% lignocaine and this is run through the T-tube into the common bile duct as rapidly as possible after the injection of 100 milligrams of buscopan (hyoscine N-butylbromide) intra-muscularly thirty minutes previously.

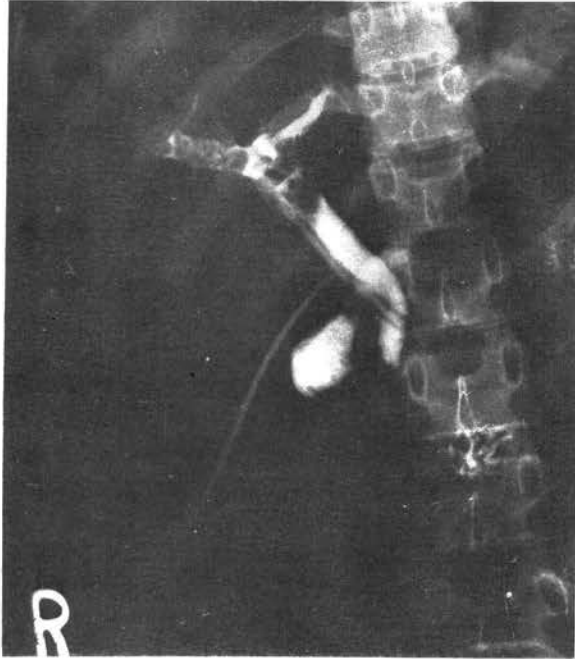
**INSTRUMENTAL MANIPULATION** - WAY et alii (1972) have successfully used the DORMIA ureteral stone basket under radiological control to extract retained common bile duct stones. This instrument was passed through the T-tube and into the common bile duct.



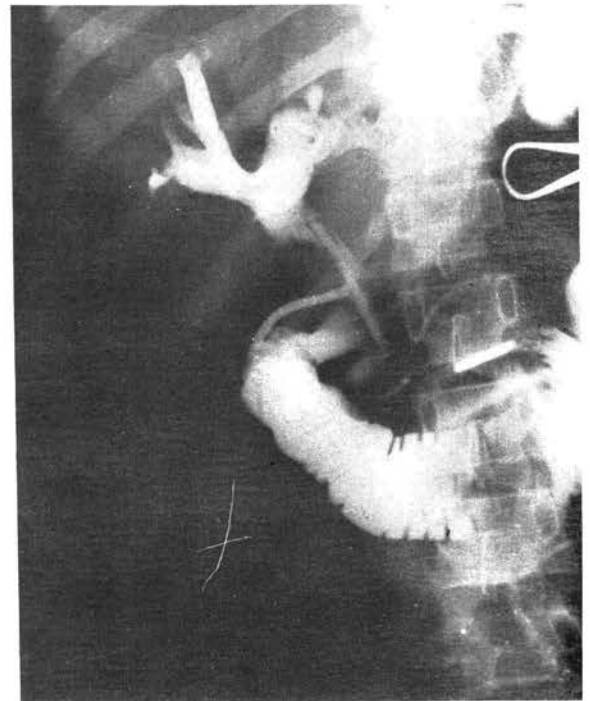
#### **OPERATION**

When all the above non-operative methods have been tried, and especially when in addition T-tube clamping produces complications due to the residual stone, secondary choledocholithotomy is required to remove the residual stone. It is essential that the T-tube be left in-situ so that it acts as a guide to the common bile duct at the second operation which is made difficult due to fibrous adhesions around the duct. In some cases where so many small and large stones have been

left behind at the original operation, it is pointless to try the non-operative methods and re-exploration of the common bile duct should be done one month later.



CASE REPORT - Female Y.A.E. Age 25 years. GIP No. 157/74 Admitted to General Hospital, Kuala Lumpur, on 2-2-74. Operated upon by another doctor on 6-2-74 when the gall bladder and three stones from the common bile duct were removed. Post-operative cholangiogram on the seventh day showed many residual stones in the common bile duct (FIGURE 5). On 13-3-74 that is just over one month after the first operation, secondary choledocholithoromy was performed yielding over a hundred small and large stones from the common bile duct (FIGURE 6). T-tube cholangiogram done per operatively was reported by the specialist radiologist as "normal - no stones seen", (FIGURE 7). Post-operative T-tube cholangiogram seven days later showed three stones in the right hepatic bile duct (FIGURE 8). These were flushed out by the method of CATT et alii (1973) using saline and lignocaine after a preliminary injection of buscopan (hyoscine N-butyl-bromide). The final T tube cholangiogram was normal (FIGURE 9). She remains well to-date.





#### SUMMARY

Residual stones in the extra-hepatic biliary ducts after bile duct exploration occur in a significant number of cases. The routine use of operative cholangiography in addition to the accepted "clinical indications" for exploring the common bile duct will reduce the incidence of residual stones. Secondary choledocholithotomy carries a definite mortality and usually should be performed only after all non-operative methods of removing residual stones have first been tried.

Illustrative cases operated upon by the author are reported

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#### LEGENDS

- FIGURE 1 - Patient L.A.Y. Choledochoduodenostomy done. Gas in biliary tree after drinking "Pepsi Cola"
- FIGURE 2 - Patient K.K. T-tube cholangiogram ten days after operation shows small stone in lower end common bile duct.
- FIGURE 3 - Patient K.K. Intravenous cholangiogram with tomography 16 months after operation shows no stone.
- FIGURE 4 - Patient A.B.H.B. T-tube cholangiogram 10 days post-operatively shows large stone in lower end common bile duct.
- FIGURE 5 - Patient Y.A.E. Cholangiogram seven days after first operation shows numerous stones in extrahepatic bile ducts.
- FIGURE 6 - Patient Y.A.E. More than 100 stones removed at the second operation.
- FIGURE 7 - Patient Y.A.E. Post-exploratory T-tube cholangiogram during second operation reported as "normal, no stones seen".
- FIGURE 8 - Patient Y.A.E. T-tube cholangiogram done seven days after second operation shows three stones in right hepatic duct.
- FIGURE 9 - Patient Y.A.E. T-tube cholangiogram after flushing is normal.