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Common Bile Duct Stones: A Therapeutic Challenge

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***Abstract*—** *Common bile duct stones (CBD) continue to pose the greatest challenge to the general surgeon. The morbidity associated with CBD stones is extremely high. Management of CBD calculi requires a systematic approach to keep the morbidity and mortality associated with this condition to a bare minimum. With the advent of advances in interventional endoscopy to manage CBD calculi, selecting the best approach is the biggest challenge. The article discusses the complexities underlying the pathophysiology and management of CBD calculi*.

***Keywords*—** *Common Bile Duct Stones Diagnosis Treatment Complications*.

I. INTRODUCTION

CBD stones are a complex disease which manifest in various forms. It may be associated with gall stone calculi or may be detected after a cholecystectomy operation. Primary CBD calculi, an entity by itself requires specialised treatment. [1, 2] A multidisciplinary approach is therefore necessary for treatment of CBD calculi irrespective of the mode of presentation.

II. PATHOPHYSIOLOGY

CBD calculi are classified as primary and secondary. Primary CBD calculi are relatively uncommon whereas secondary CBD calculi are commonly encountered posing both a diagnostic and therapeutic challenge. Primary CBD calculi are usually multiple and brownish in colour and are not associated with stones in the gall bladder. CBD stones developing 2 years after a cholecystectomy operation without any narrowing of the CBD are also classified as primary CBD calculi. Secondary CBD calculi originate from the gall bladder. [2, 3] Besides causing complications in the CBD, they also cause inflammation in the adjacent organs namely the pancreas. CBD calculi can present at anytime during their course of existence. Concomitant CBD calculi detected after cholecystectomy for gall bladder calculi may present as gall stone pancreatitis. Since there is a combined pathology, a specific algorithm is necessary for planning both diagnosis and management. CBD calculi generally causes a multitude of complications in the common bile duct. Biliary colic, obstructive jaundice, cholangitis, choledochoduodenal fistula and biliary fibrosis are the common complications. [4, 5] Gall stone pancreatitis and cholangitis are the most dangerous of these complications. CBD stones may also be associated with duodenal diverticuli. In the absence of gall bladder stones CBD calculi can be associated with recurrent pyogenic cholangitis due to infestation with parasites like Chlonorchis sinenses or Fasciola hepatica. Sphincter of oddi dysfunction, papillary stenosis and CBD stricture may also predispose to CBD calculi. Each group of CBD calculi are therefore heterogeneous in their pathogenesis and manifestation and require individualised treatment.

III. DIAGNOSIS

Biochemical studies: Diagnosis of CBD calculi usually commences with an elaborate biochemical workup. [6, 7] Liver function tests need to be performed at the first instance. Serum levels of total bilirubin, alkaline phosphatase (ALP), gama glutamyl transpeptidase (GGT), SGOT, SGPT need to be studied with great care. [1] As symptoms of CBD calculi are predominantly obstructive in nature, raised total bilirubin with predominantly direct component, ALP and GGT are diagnostic. If the patients presents late with cholangitis or multiple hepatic abscess, then one could expect raised SGOT and SGPT levels. Total bilirubin, ALP, GGT are predictive of CBD calculi in 25-45% cases. However, CBD calculi have been found to be present in 71% cases even with normal biochemical tests. Total bilirubin with raised direct component has the highest specificity, sensitivity and high positive predictive value for CBD calculi. However a multivariate analysis has shown that GGT, ALP, and total bilirubin are all independent predictors with GGT as the most powerful predictor. It is therefore a safe practice to perform all these tests in patients undergoing elective cholecystectomy in order to avoid missing out CBD calculi. [2, 4]

Ultrasound of the abdomen: USG Abdomen continues to be the preliminary diagnostic imaging procedure for gall stone disease. It is an excellent tool for gall bladder stones. However, the reliability in diagnosing CBD calculi is questionable. It has a sensitivity range of 25-58% and specificity of 68-91%. [1] A normal USG in conjunction with normal total bilirubin, ALP and GGT has a negative predictive value of 95%. Interpreting the test reports therefore requires great caution and care to avoid misdiagnosis. Drawback of USG is that USG cannot detect stones in the retro-duodenal pancreatic and intra-duodenal portion of common bile duct due to duodenal gas. An impacted stone may be diagnosed indirectly by the presence of significant dilatation.

MRCP: Advantages are that it is non invasive and gives valuable information of the pancreas and liver in a 3-Dimensional view which are extremely helpful in studying the extrahepatic biliary passages. A contrast enhanced MRCP adds to the diagnostic efficacy in CBD calculi. However, the only pitfall is that it cannot differentiate between stones,

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sludge, and mucus plugs. Stone size has a significant impact on MRCP findings. The sensitivity decreases according to the stone size. It has a sensitivity range of 67-100% for stones greater than 10mm in size, 89-94% for stones from 6mm to 10mm in size and 33-71% for stones less than 6mm in size.[6,8] MRCP findings are therefore extremely useful enabling the clinician to decide as to whether intervention is required and thereafter choosing the best therapeutic approach.[1,2]

ERCP: ERCP can detect 94% of CBD stones. It has a sensitivity of 94%, specificity of 96%, with diagnostic value of 96%. The advantage of ERCP over other investigations is that it is both diagnostic and therapeutic. [9]

Endoscopic Ultrasound: This is a rapidly evolving technique which has revolutionised diagnosis in upper GI tract disease. The intrahepatic and intraduodenal portion of CBD can be very well visualised. Differentiation from malignancy can be done with concomitant FNAC of suspicious lesions. A dilated CBD again continues to be a very important diagnostic sign. In particular, endoscopic ultrasound has a sensitivity of 95%, specificity of 98% and accuracy of 96%. [5, 7] It is therefore specifically important in diagnosing small stones in CBD

Contrast enhanced computed tomography (CECT): CECT has limited value in diagnosing CBD calculi. However confirming the diagnosis of a suspected malignancy is best done by CECT. Patients presenting with gastric outlet syndrome or duodenal diverticuli should be considered for CECT. [1]

Cholangiography: Intra operative cholangiography can be done in those patients who are undergoing laparoscopic or open cholecystectomy.[9] However, a proper pre-op assessment may preclude intra-op cholangiography. In certain centres it is a routine to perform intra-op cholangiography for all patients undergoing cholecystectomy. But in the Indian scenario this might not always be possible. Impacted stones which cannot be managed by ERCP and who have concomitant gall stones require cholangiography at the time of cholecystectomy. Intra-op cholangiography is best done through the cystic duct stump before clipping or ligation. If the result is positive, the patient will require a CBD exploration. [10] Majority of the patients can be treated successfully with endoscopic intervention irrespective of the timing of the diagnosis. Many a time's patients develop symptoms of obstructive jaundice or pancreatitis in the post-op period. This is usually attributed to a stone having slipped down into the CBD causing complications. ERCP is the investigation of choice in such cases as it is both diagnostic and therapeutic. Certain centres still practice IV Cholangiography. However, with the advent of advanced interventional procedures IV cholangiography is hardly done.

IV. Treatment

A number of factors decide the treatment of CBD calculi.[11] These include size of the stones, size of the common bile duct, post cholecystectomy status and location of stones. Multiple intrahepatic stones present with strictures and common bile duct stones associated with pathologies such as cholecystitis, pancreatitis and cirrhosis of the liver require judicious choice of treatment.

Non-Surgical treatment of CBD stones.

ERCP: ERCP has completely revolutionised the management of CBD calculi in expert hands. [12] Cannulation of CBD is seen in 98% cases with clearance ranging between 85-92%. Morbidity associated with it is 7% with mortality of 2%. Then main side effects of ERCP with intervention are cholangitis and pancreatitis. Sphincterotomy with stone extraction is the commonest procedure. Balloon catheters are preferred as impaction due to the basket is commonly seen. Sphincterotomy may be associated with bleeding, perforation and pancreatitis. In the event of severe impaction with failure to clear the stones, open choledocholithotomy is indicated.

Interventional radiology: These techniques are usually applicable in post cholecystectomy patients with retained CBD stones diagnosed by T tube cholangiography. The T-tube tract is dilated followed by passage of a flexible choledochoscope which enables direct visualisation of the stone along with clearance. Dissolution therapy has also been tried in such cases. However, the results are not promising. [1, 2]

ESWL: This comprises of fragmenting the stone with shock waves followed by evacuation of stone fragments endoscopically. [10] Complications include cholangitis and septicaemia.

Gall stone pancreatitis is a complicated condition which requires great surgical expertise. It is a safe practice to treat pancreatitis by an aggressive but conservative approach followed by intervention for CBD calculi which may be endoscopic or surgical.

Surgical exploration can be done either laparoscopically if expertise is available or by formal open approach.

Laparoscopic CBD Exploration: This procedure is usually done in centres where adequate expertise is available. A trans-cystic approach is useful in most cases. However, if the stones are impacted or too large, it is advisable to convert to open.[1]

Open CBD exploration: The main indications are dilated CBD with a previous history of cholangitis, jaundice, gall stone pancreatitis and palpable stones in the CBD. Placing a T-tube after CBD exploration is a safe practise as it prevents dehiscence of the sutured choleduodeno-lithotomy incision. It also enables adjunctive procedures to be performed in certain complicated situations. Biliary enteric anastomosis such as choledochoduodenostomy and sphincteroplasty are important adjunctive procedures necessary in certain situations. The indications for choledochoduodenostomy include multiple CBD stones, ampullary stenosis, impacted stones in the absence of pancreatitis and multiple intrahepatic calculi.

Contra-Indications include CBD calculi less than 2cm, perivaterian diverticulum and sclerosing cholangitis.

The indications for sphincteroplasty are multiple CBD calculi, recurrent CBD calculi, impacted CBD calculi and papillary stenosis with stones. Contra-Indications are long Strictures >15mm, perivaterian diverticulum and a duodenal wall or pancreas grossly inflamed. [1]

V. Conclusion

CBD calculi pose the biggest challenge to the general surgeon.

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Accurate diagnosis based on laboratory tests and imaging provide a safe road map for deciding the optimum therapeutic option.

Interventional therapeutic endoscopy has emerged as the treatment of choice for majority of cases.

Open surgery remains the only option for either a failed endoscopic attempt or complications arising from therapeutic endoscopy.

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