Role of T-tube in CBD exploration Revisited

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Abstract :

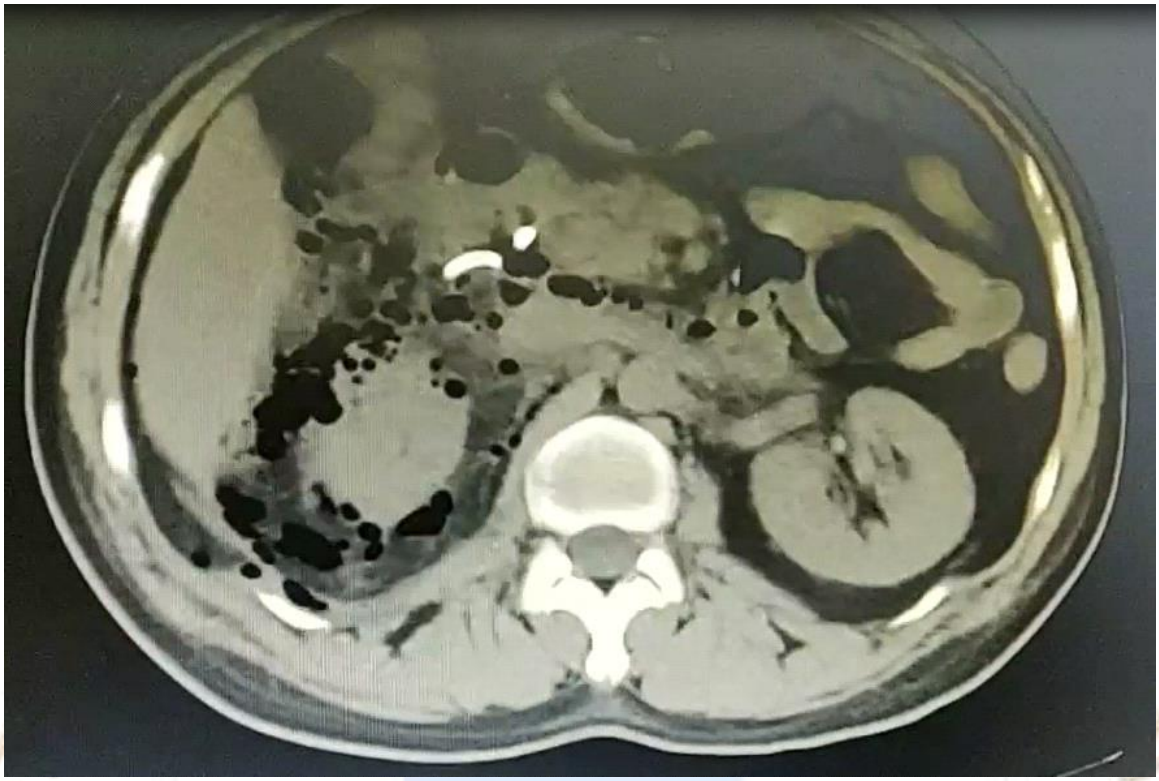
ERCP induced CBD perforation during calculi removal from CBD is uncommon. We present one such scenario and how it was managed in the acute setting and how it was followed up and its long term sequelae. In the acute setting, CBD exploration and clearing of CBD along with T-tube was placed to tide over the crisis. Post operative course was uneventful

Introduction :

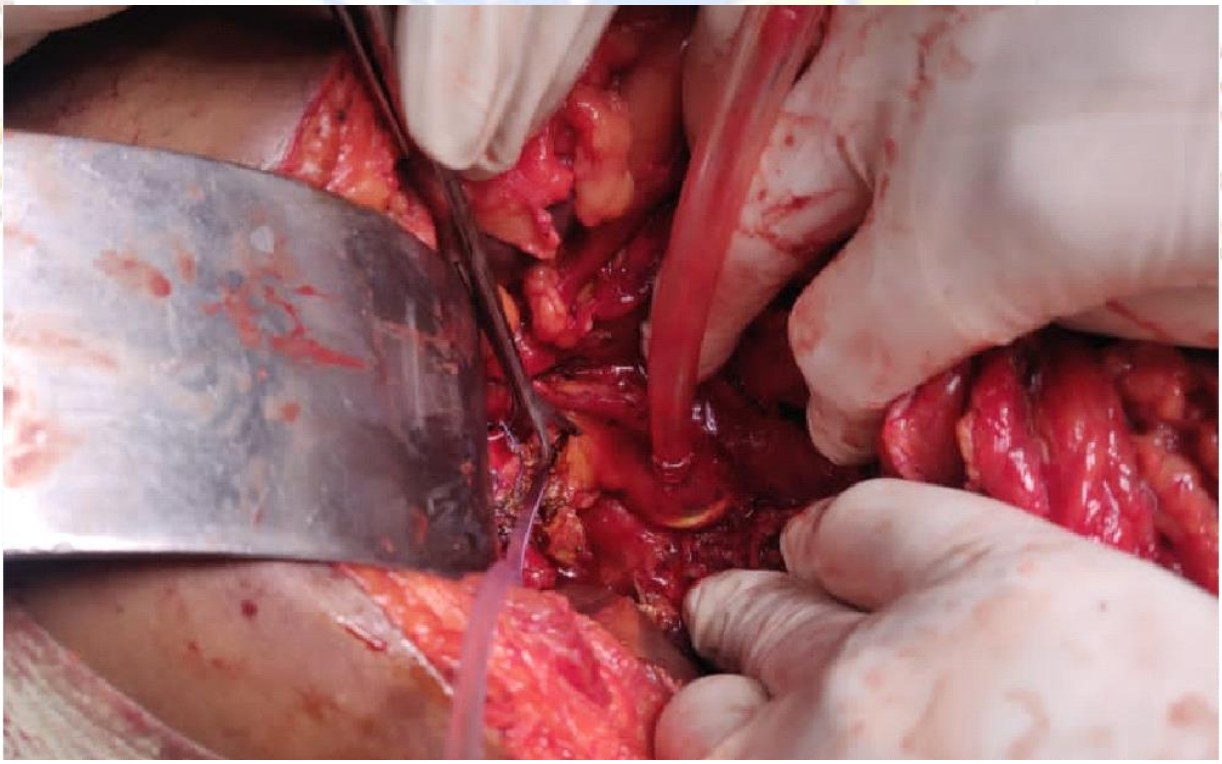
Management of CBD calculi using ERCP based stone clearance followed by Laparoscopic Cholecystectomy is a standard practice all over the world. Upfront Laparoscopic CBD exploration is also a feasible option in centres where ERCP facilities/expertise is not available. Newer endoscopic techniques including laser, lithotripsy can facilitate removal of large calculi from CBD. However in a minority of cases, the calculi might be impacted or there might be a CBD stricture which precludes safe removal of calculi by endoscopic techniques. It is important to identify such scenarios and abandon endoscopic methods in favor of Surgical methods early in the procedure. There have been instances when persisting with endoscopic methods have resulted in complications causing morbidity and even mortality. In this case report we present one such patient who had CBD calculi and an attempt at ERCP calculi removal was tried. A concomitant CBD stricture was identified. CBD calculi were not amenable for retrieval and a CBD stent insertion was attempted. Stent was not able to negotiate the stricture. In the process , the CBD was perforated resulting in fever, tachycardia, pain abdomen, sepsis.

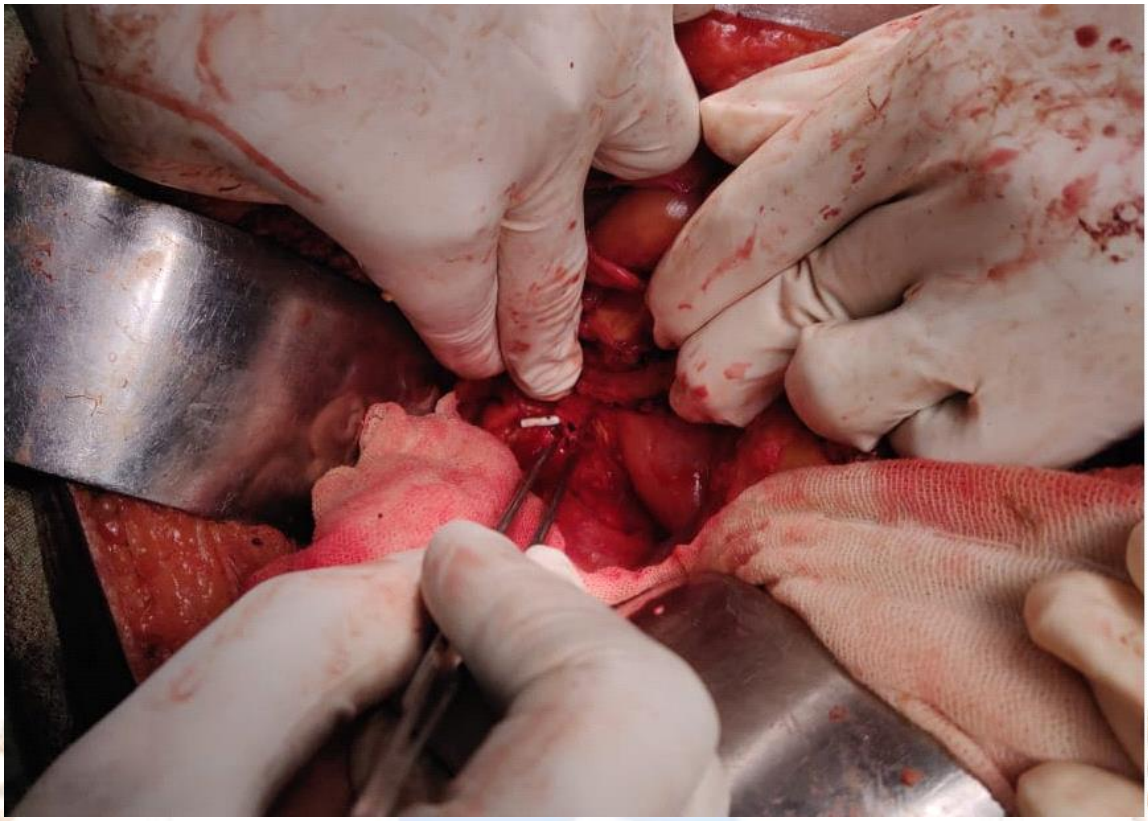
Case:

48 year old male patient presented to hospital with pain abdomen ,fever and jaundice. Evaluation showed a large CBD calculi with distal CBD stricture. CBD cannulation was not possible. A precut sphincterotomy was done. Post procedure patient had pain abdomen and tachycardia. Evaluation showed features of perforation peritonitis. Patient was referred to our hospital 3 days after the procedure for further management. Patient was resuscitated with Intravenous Fluids , antibiotics and was kept nil per os. CECT abdomen revealed gas in the retroperitoneum and also pneumoperitoneum. Patient was not responding to antibiotics and fever, jaundice persisted and pain abdomen increased in severity , although classic guarding or rigidity was not observed. In view of his deteriorating clinical condition it was decided to go for exploratory laparotomy.



Open right subcostal incision with extension to the left side across midline . A falciform ligament flap was fashioned for possible butrressing at the end of procedure. Intraoperatively there was minimal contamination of the general peritoneal cavity, with bile noted in the region of duodenum. Kocher's maneuver was done, but was difficult due to adhesions. There was no rent noted in the duodenum. During Kocherisation, the supraduodenal CBD was identified and the stent was visible outside the CBD. This was Type III Stapfer Injury .





Cholecystectomy was planned. Gall bladder was mobilized by Fundus first method, calot's triangle was fused. Cystic artery could not be separately visualized. CBD calculi could be palpated.The calculi were impacted and could not be mobilized superiorly. Preoperatively there was suspicion of Mirizzi syndrome. An incision was made in the hartmann pouch and extended across the CBD . But no calculi noted in the Hartmann pouch. The Choledochotomy was extended inferiorly towards the calculi. Black calculi approximately 2cm in size with sludge was extracted. An infant feeding tube 10fr was used to flush the CBD and remove sludge and other particulate matter. The previously placed stent was also removed. After removal of calculi the CBD was palpated and no more calculi was noted. Ideally a Cholangiogram or choledochoscopy should have been done to confirm complete clearance , and the presence of distal stricture ,but due to unavailability could not be done.

The CBD was thickened and surrounding tissues were friable. In view of these findings and the general condition of the patient, a definitive drainage procedure was not undertaken and a 16fr T-tube was placed in the CBD and brought out of the right hypochondrium. Vicryl 3/0 was used to close the CBD around T-tube. Peritoneal lavage was done with warm normal saline and the falciform flap was used to buttress the CBD around T- tube and also to pack the space created after Kocherisation . A large bore drain was placed in the Right subhepatic space.

In view of the dense duodenal adhesions and the difficult Kocherisation , patient was expected to be kept nil by mouth in the post operative period and hence for nutritional reasons a feeding jejunostomy was done.

Postoperative course was uneventful with fever subsiding along with tachycardia. Feeding from the jejunostomy tube was started from the 2nd postoperative day after resolution of ileus. Patient tolerated the feeds well. The drain did not show any bile leak. T tube output was around 400 ml bile/day on average. Patient passed cholic stools. Liver function tests were normal on serial monitoring. An oral contrast study was done on 7th postoperative day to rule out any duodenal rents. There was no rent in the duodenum and patient was started on oral feeds. T Tube was removed after 3 weeks after performing a T tube Cholangiogram which showed no leak.

Discussion :

T-tube drainage used to be standard practice after surgical choledocholithotomy, but there is now tendency in some centers to close the common bile duct (CBD) primarily. The recommendation for T-tube drainage was based on the premise that it provides postoperative decompression of the CBD should outflow obstruction occur, it allows for postoperative radiological visualisation of the CBD, and it provides a potential route for extraction of any retained stones(1). However, the role of T-tube drainage has been questioned. Continuous external drainage of bile can lead to fluid, electrolyte, and nutritional disturbances . T-tube drainage after choledochotomy is associated with an increased incidence of cholangitis and wound sepsis. Significant bile leak after T-tube removal can occur in 1–30% of cases . External loss of bile through the T-tube may lead to slow wound healing, anorexia,

and constipation (post-choledochostomy acidotic syndrome). Complications, such as dislodgement, fracture of the tube, encrustation, difficulty in removal, and duct stricture also have been described . Indwelling T-tubes are uncomfortable, require continuous management, and restrict the patient's activity

because of risk of dislodgement . The incidence of recurrent stones may be greater after T-tube drainage because the tube acts as a foreign body(1).The Laparoscopic surgeons also are not in favor of using T-Tube. The advent of ERCP also has reduced the risk of retained CBD stones.

On the other hand the proponents of T tube argue that it allows spasm or edema of sphincter to settle after the trauma of the exploration. Failure to drain the duct may result in build up of pressure in the extrahepatic ductal system, leading to leakage or disruption of duct closure with biliary peritonitis. Other described reasons for its use are detection and subsequent treatment of retained stone through the tube tract(1).

In order to solve the problem of biliary decompression and also to avoid T tube many surgeons shifted to internal stent placement after CBD exploration. The biliary stent is a safe alternative to the T-tube as a biliary decompression method following an open CBD exploration(2). 7fr to 10fr stents have been used . Infant feeding tubes also can be used as biliary stents(3). These stents are usually removed 1month after surgery. Liver function tests is done as a screening method to document absence or resolution of obstructive pattern of LFT. Radiograph is done to confirm the presence of the stent since distal migration of biliary plastic stents has been reported in 3–6% of cases(4).

But this would entail another endoscopic procedure to remove the stent , while a T – tube removal would be an outpatient procedure . Nevertheless there can be problems of removal if it was inserted incorrectly to begin with . So let us review some basics about T-tubes and their insertion.

T-tube materials:

T - Tubes can be made of different materials like latex, silicone, red rubber, and polyvinyl chloride (PVC). PVC is very inert, causing the least tissue reaction with a lack of tissue tract formation, making it the least favorable material for T tube placement purposes. Silicon has many favorable physical properties, but it can disintegrate with poor handling making it not a practical option for long-term placement. Latex has the desired properties to be the most commonly used. Red rubber is an alternative if latex cannot be used or is not available.(5)

T-tube Size and Shape:

Shape of T with a shorter transverse part (20 cm) that stays inside the CBD (after trimming) and a long longitudinal part (60 cm) that extends from the middle of the transverse part to an end that connects with a drainage bag. This portion extends from the CBD to outside the abdominal cavity. It comes with different circumference sizes (10, 12, 14, 16, 18 Fr).

Insertion:

The transverse segment is trimmed to a shorter length of 2 to 4 cm to minimize the risk of the leak and also would be cut longitudinally to make a cutting surface with a semi-circular pattern. An additional wedge cut at the confluence point of the transverse and longitudinal segments is made. The chosen site of choledochotomy is the common bile duct segment between the cystic duct junction and the duodenal lateral border. This is the accessible site of surgery. Upon T tube placement and closure of the choledochotomy, the tube is passed in the shortest distance to the anterior abdominal wall, then through the abdominal to the skin surface in the right upper quadrant.((5). Choledochotomy site closure around the tube exit should be done cautiously to avoid any tension. A 3-0 or 4-0 absorbable suture would be used to close the site. Consequently, the T-tube would be flushed to double-check both the complete tube patency and to exclude any leakage.

Management of tube post-op:

Drain output is measured daily. The character of bile drained is noted. In case of suspicion of infection bile culture and sensitivity is sent. In case of sudden drop in the output, the tube is flushed and aspirated to clear any debris under cover of antibiotics.

Removal of T Tube:

It is considered safe to remove latex T-tubes at 7–10 days. However, other authors prefer to leave latex T-tubes in for 21 days. Little evidence exists to suggest any benefit from a longer period of time. Studies have shown no benefit in terms of fibrosis from leaving a latex T-tube in place for 6–12 weeks. (6)Hence it is better to remove after 3 weeks. (6).Usually a T tube cholangiogram is done before removal of T tube(7).

Perforations after ERCP:

Studies have shown certain high risk features of Endoscopic Perforations. Need for precut sphincterotomy, cannulation failure, duodenal diverticula, resections of ampullary or bile duct adenomas or an assessment by the endoscopist of a "difficult" procedure. Other surogate markers include - bleeding, the decision to leave a protecting pancreatic stent, early termination of the procedure, and the duration of the procedure. Cases considered "difficult" by the endoscopists appeared as one of the most significant risk factors (8)

Clinical parameters like abdominal pain and distention had a much higher yield than laboratory tests. Laboratory tests are neither sensitive nor specific for the diagnosis of Endoscopic Perforations. All symptomatic patients at risk for Endoscopic Perforations should be promptly assessed by CT with oral contrast.(8)

Post ERCP perforations are classified based on Stapfer System.(9)

Type I injury - Occur at the lateral or the medial duodenal wall remote from the ampulla. Caused by acute angulation of the endoscope.

Type II injury - Peri-Vaterian . Injuries near the ampulla consequent to a precut sphincterotomy.

Type III injury - Occur in the distal common bile duct (CBD) . Secondary to wire manipulation or basket instrumentation during stone retrieval.

Type IV injury - Reveal retroperitoneal air and result from insufflation during ERCP.(9)

The European Society of Gastrointestinal Endoscopy indications for operative management include severe peritonitis, considerable extravasation of contrast material on imaging, failure of conservative treatment resulting in sepsis and fluid collections. Existence of intra-abdominal free air or fluid should warrant serious consideration of operative intervention (7).

Type I and Type II injuries are usually managed by surgical intervention. Type III and Type IV injuries are usually managed by conservative management (9).

Conservative management includes broad-spectrum intravenous antibiotics, nasogastric drainage, and in some cases the institution of total parenteral nutrition.(9)

Surgical Management of Perforations after ERCP:

A Systematic review of management of Duodenal perforations after ERCP had observed the following surgical modalities of treatment(10).

Stapfer type I injuries:

Early surgical treatment (<24 h from ERCP)

- Duodenal suture with or without omentopexy (94%)

- With more complex injuries a stapled pyloric exclusion with gastroenterostomy with a retrograde jejunostomy and a feeding jejunostomy (6%)(10)

Late surgical treatment (>24 h from ERCP) the interventions performed were complex.

- Duodenal suture with or without omentopexy associated with stapled pyloric exclusion and gastroenterostomy.
- Retrograde jejunostomy to decompress the duodenum.
- Tube duodenostomy.
- Whipple's operation.

Stapfer type II injuries:

- Kocher manoeuvre and drains placed in retroduodenal space (since no duodenal injury was found).
- CBD exploration, with Kehr T tube.
- Duodenal suture with or without omentopexy with stapled pyloric exclusion and gastroenterostomy.

Stapfer type III injuries:

- Bile duct exploration and Kehr tube (T-tube drainage) placement.
- Hepaticojejunostomy.

Stapfer type IV injuries:

- Bile duct exploration and Kehr tube (T-tube drainage) placement with Duodenal suture.

The most common type of injuries were type II injuries. These perforations occur when the sphincterotomy extends beyond the intra-mural portion of the bile or pancreatic duct. Sometimes on exploration no lesion is found , this can be Type IV injury where the perforation is a microperforation due to sphincterotomy with gas insufflation causing a large amount of retroperitoneal gas. Presumably there is a flap type lesion that allows insufflated gas to track extra-luminally but then does not leak enteric or bilious contents after completion of the ERCP. (10)

Conclusion:

T tubes still have a role to play in CBD exploration in the current scenario in spite of the almost universal use of CBD stents. In an emergency setting of CBD perforation especially after ERCP, T tubes can be lifesaving. They are available in most surgical institutes and easily inserted after taking certain precautions. CBD perforations after ERCP are rare. Close communication with the endoscopist is necessary and to abandon the procedure if difficult would be prudent. If suspicion of a perforation, a CT scan with oral contrast should be done to look for pneumoperitoneum or intra-abdominal collection or major contrast extravasation. Any of the above findings coupled with a deteriorating patient condition is an indication for Surgery. Depending on the intraoperative findings surgical procedures are tailored. Mortality rates are less when the decision for early surgery <24 hours were taken as compared to late surgery > 24 hours(10).

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