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## T-tube bridging for the management of biliary tree injuries

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### Summary

**Background:**

Injuries of the biliary tree, which mainly occur as a complication of laparoscopic cholecystectomy, are a potentially life threatening cause of high morbidity and mortality. The reported frequency of biliary injuries after laparoscopic cholecystectomy is from 0.5–0.8%. Such injuries may sometimes become too complicated for surgical repair. Presented here is the case of a patient with a major bile duct injury for whom bile duct continuity was achieved using a T-tube.

**Case Report:**

A 53-year-old man, who developed bile duct injury following a laparoscopic cholecystectomy performed in another center for cholelithiasis, was referred to our clinic. A Roux-en-Y hepaticojejunostomy was performed in the early postoperative period. However, ensuing anastomotic leakage prompted undoing of the hepaticojejunostomy followed by placement of a T-tube by which bile duct continuity was achieved.

**Conclusions:**

For injuries with tissue loss requiring external drainage, T-tube bridging offers a feasible option in that it provides bile duct continuity with biliary flow into the duodenum, as well as achieving external drainage, thus alleviating the need for further definitive surgery.

**key words:**

**iatrogenic bile duct injury • T-tube bridging • external and internal biliary drainage**

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## BACKGROUND

The vast majority of bile duct injuries (BDIs) are iatrogenic, mostly occurring as a result of laparoscopic cholecystectomy (0.5–0.8%). BDIs are usually diagnosed after surgery, although intraoperative recognition of biliary leakage, either by direct visualization or after intraoperative cholangiography, has been reported in 10–30% of cases [1]. BDIs may manifest as biliary obstruction, biliary leakage or as a combination of both.

A BDI should be suspected in patients who do not show improvement after surgery, and in patients with persisting symptoms such as abdominal pain, abdominal distention, nausea and vomiting [2]. Presented here is a case of a patient treated for an iatrogenic BDI inflicted in another center after laparoscopic cholecystectomy.

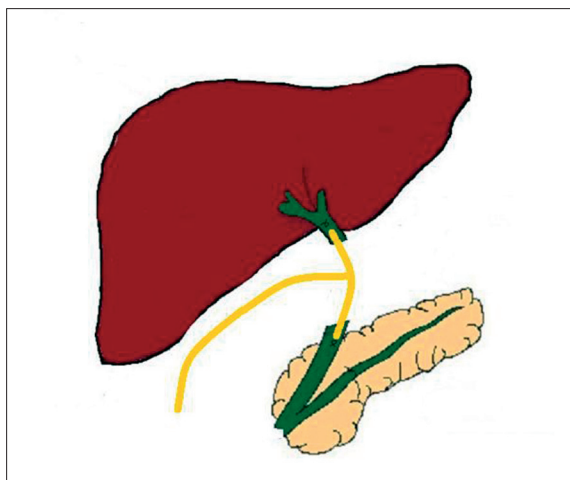
## CASE REPORT

A 53-year-old male patient underwent a laparoscopic cholecystectomy in another center for cholelithiasis. He was referred to our hospital 3 days following surgery, after developing progressive abdominal distention, abdominal pain, nausea and vomiting. Initial evaluation in the emergency department revealed the presence of generalized abdominal tenderness. Results of laboratory tests were unremarkable except for an elevated white blood cell count ( $12,000/\text{mm}^3$ ) and elevated serum levels of alkaline phosphatase (265 U/L), gamma glutamyl transferase (95 U/L), total and direct bilirubin (5.7 mg/dl and 3.6 mg/dl, respectively). Abdominal ultrasonography revealed the presence of circumscribed intraabdominal collection in the gallbladder bed ( $5 \times 4$  cm). With preliminary diagnosis of a BDI, the patient was admitted for surgery. BDI in the form of loss of tissue of the middle hepatic canal was observed (Strasberg type D). Absence of signs of sepsis or peritonitis prompted performance of a hepaticojejunostomy. However, 5 days later the patient became septic and was reoperated upon with a suspicion of anastomotic leakage from the hepaticojejunostomy. Widespread inflammatory and ischemic changes were observed, which prompted undoing of the anastomosis and resection of the affected jejunal segment. Bridging of the affected area of the bile duct was achieved by placing a T-tube, which provided bile duct continuity (Figure 1).

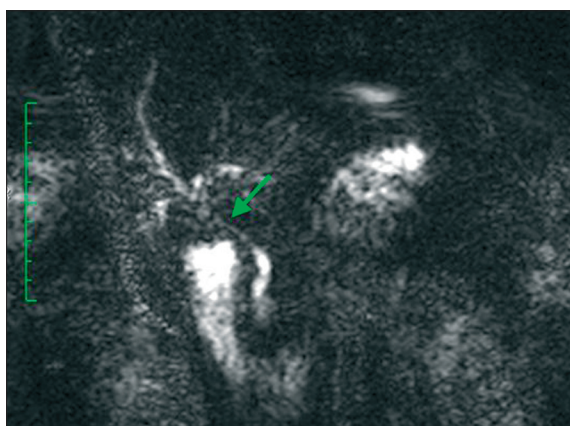
After showing marked improvement, the patient was discharged with the T-tube. Six months later, the tube was removed by ERCP followed by placement of a stent after balloon dilatation of the stenosis, which developed at the level of the hilum. After another 6 months, the placed stent was removed and no signs of stenosis were observed. Three years after surgery, the patient was doing well, without any abnormalities on serum biochemistry. No stenosis was observed on an MRCP (Figure 2).

## DISCUSSION

Laparoscopic cholecystectomy is associated with higher rates of BDI when compared to open cholecystectomy [3]. Known risk factors for the development of BDIs are obesity, advanced age, presence of adhesions from previous surgery, ongoing inflammation or infection, anatomical variations, and bleeding [4]. Technical difficulties due to at least one



**Figure 1.** Bile duct continuity was achieved after bridging with a T-tube.



**Figure 2.** MRCP performed 3 years after surgery showing fibrotic healing of the bile duct (green arrow) at the site of injury.

of the above mentioned factors are encountered in 70% of patients with BDIs [1]. The management of injuries depends on the site and the type of the injury. Available treatment options include T-tubes, primary repair, end-to-end anastomosis, choledochoduodenostomy and hepaticojejunostomy.

Early diagnosis, type of injury, and prompt identification of the presence of a concomitant vascular injury increase the likelihood of successful treatment. However, only 10–30% of BDIs are recognized during surgery [5]. Conversion to open surgery is warranted in the event of direct visualization of biliary leakage or confirmation of suspected leakage by intraoperative cholangiography. Repair of the injury should preferably be performed by an experienced hepatobiliary surgeon. This approach has been shown to reduce morbidity, duration of hospital stay, and cost [6].

As in our case, failure to show improvement during the early postoperative period, particularly in the presence of progressive abdominal distention, nausea, vomiting, fever and abdominal pain, should raise a suspicion of BDI. If an injury is recognized during the early postoperative period (<1 week), and the patient is stable with no signs of an intraabdominal infection, early repair may be warranted, depending on the type of injury [1]. Our patient was diagnosed early, and the absence of an intraabdominal infection or

generalized peritonitis prompted performance of a hepaticojejunostomy due to the observed tissue loss.

For injuries recognized in the late postoperative period, particularly in the presence of biliary peritonitis or sepsis, treatment should be targeted towards getting the systemic infection under control, and the most widely accepted approach is external biliary drainage rather than open surgery [7]. However, the presence of generalized peritonitis in our patient, due to anastomotic leakage, led to undoing of the anastomosis, followed by placement of a T-tube, thus achieving simultaneous internal bile duct continuity and external drainage. The subsequent development of fibrous tissue overlaying the T-tube helped maintain bile duct continuity even after removal of the T-tube, reduce the need for definitive surgery.

### CONCLUSIONS

For injuries with tissue loss requiring external drainage, T-tube bridging offers a feasible option in that it provides

bile duct continuity with biliary flow into the duodenum, as well as achieving external drainage. As in our patient, this method may even eliminate the need for definitive surgery.

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