

ORIGINAL ARTICLE

Two-step biliary external stent removal after living donor liver transplantation

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Summary

Biliary stenting plays an important role in living donor liver transplantation (LDLT) as the rate of biliary complication is higher in LDLT than in diseased donor whole LT. We use a 2-mm tube for stenting at the biliary anastomosis, externalize it through the lower common bile duct, and fistulize it using duodenal serosa. After 3 months without biliary complications ensured by a cholangiogram, the stent tube is removed in a two-step manner, allowing bile to drain under a fluoroscope. The incidence of local peritonitis was lower, and the hospital stay was shorter with the two-step procedure. We herein report on the method of the two-step removal and its efficacy.

Introduction

Biliary stenting plays an important role in living donor liver transplantation (LDLT) as the rate of biliary complication is higher in LDLT than in deceased donor whole LT [1,2]. Therefore, we use an external biliary stent. However, the incidence of biliary peritonitis after biliary drain removal is reported to range from 7.6% to 37.3%, which cause extra morbidity to LDLT recipients [3–6]. We herein report the method of two-step removal of biliary stent and its efficacy to reduce the incidence of bile peritonitis.

Patients and methods

Between August 2000 and December 2006, we performed 41 adult-to-adult LDLTs, of which 31 were duct-to-duct biliary reconstruction with a tube splint at the anastomotic site (21 right lobe graft, one posterior sector graft, nine left lobe graft). Only during April 2003 and March 2005, tube free biliary reconstruction was performed in 10 patients because of the policy of an operator during the period. Retrospective analysis was conducted using a chart review.

In Fig. 1, our method of placing biliary external stenting was shown. For a tube splint, we used a chloride vinyl tube 2 mm in diameter, originally used for retrograde transhepatic biliary drainage. It is equipped with a malleable metallic dull-tipped splint at one end. Prior to duct-to-duct biliary anastomosis, the metallic splint of the tube was inserted from the lumen of the recipient's side of the hepatic duct and externalized through the upper edge of the duodenum. Subsequently, duct-to-duct anastomosis was performed with interrupted sutures of 6-0 biodegradable monofilament polydioxanone suture, and the tube was placed inside the graft intrahepatic bile duct for decompression and splinting. After the placement, the externalized site of the common bile duct (CBD) was treated with a purse-string suture using 6-0 PDS-II. In addition, using the serosa of the duodenum, a Witzel-type fistula was made with a running suture with 4-0 biodegradable monofilament polydioxanone suture.

When the splint was removed, usually at 3 months after LDLT, the following two methods were used. A one-step removal method was performed in 11 patients until March 2003. After confirming negative for biliary complications using cholangiogram, the stent tube was removed at the bed side on the next day. In contrast, a

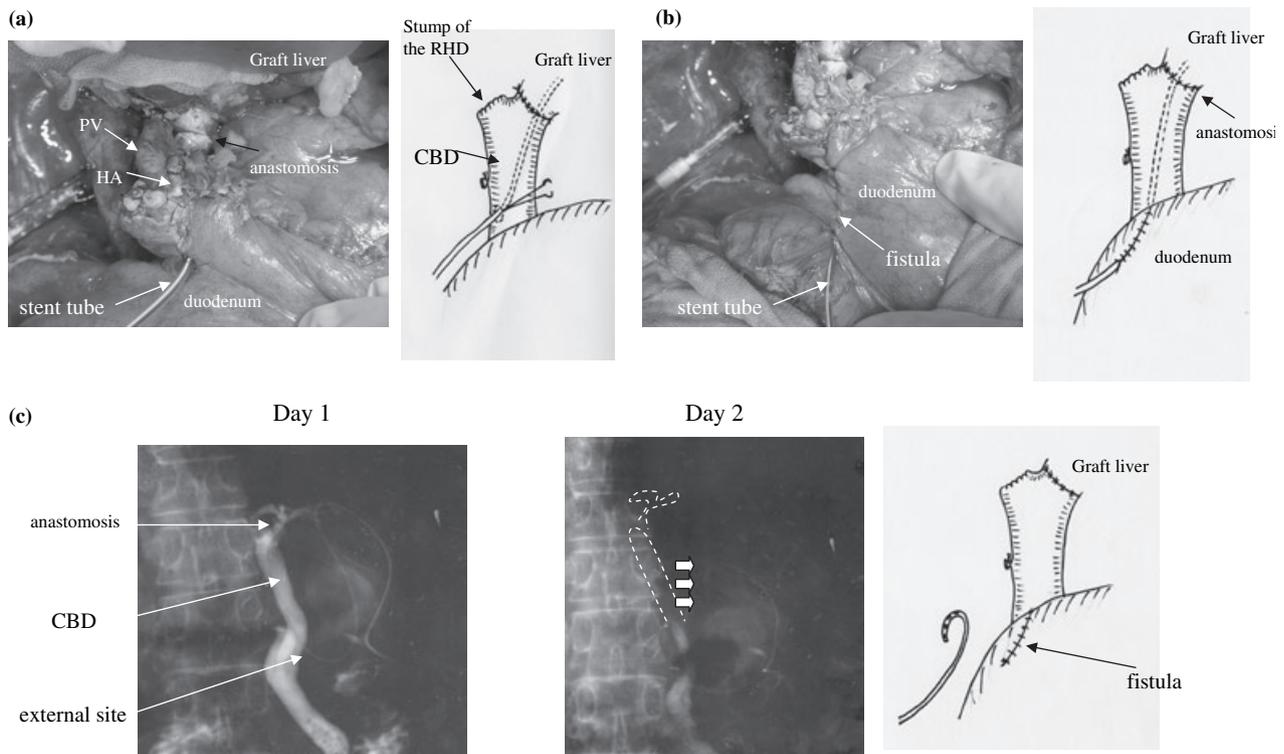


Figure 1 Method of biliary splinting and its two-step removal. (a) Two millimetres of tube is externalized from the lower common bile duct (CBD) just above the duodenum and stabilized with purse-string suture. PV: portal vein, HA: hepatic artery. (b) Additional Witzel-type canalization is made using the serosa of the duodenum. (c) On day 1, a cholangiogram is taken to ensure the lack of biliary complications after which the tube stent is partially withdrawn under X-ray and on day 2, the tube is withdrawn completely from the canal. Arrow indicates a tip of the tube stent outside of the CBD.

two-step removal method was performed in the other 20 patients between April 2003 and December 2006. After confirming negativity for biliary complications under cholangiogram, the stent was removed only up to the outside of the tract made by Witzel's canalization under X-ray. This could be recognized from the move of the tube under fluoroscope. Then we waited, usually 1 day, until leakage through the tract ceased. When no bile leak was confirmed, the splint was removed at the bedside, and patients were discharged. All data are expressed as median value with ranges. Statistical analysis was *P* with Mann-Whitney *U*-test for continuous values and chi-squared test for categorical values. Statistical difference was defined as a *P*-value of <0.05. The STATVIEW 5.0 software (Abacus Concepts, Berkeley, CA, USA) was used for all statistical analysis.

Results

Biliary complications are less frequent with tube stenting when compared with that without a stent (with stent 6/31, without stent 5/10).

Table 1. Results of two-step removal.

	Re-operation	Local peritonitis (%)	Duration of admission
One-step removal (<i>n</i> = 11)	None	3 (27.2)	Median 7 (3–28)
Two-step removal (<i>n</i> = 20)	None	0 (0)*	Median 4 (3–9)*

**P* < 0.05 vs. one-step removal.

In Table 1, the results of two-step removal of the biliary external stent are shown. Using the two-step removal, no local peritonitis was experienced. In the one-step removal group, there were three cases (27.2%) of local peritonitis related to tube removal, and the mean hospital stay was 7 (3–28) days. Conservative treatment with antibiotics and fasting was prescribed, and there was no death related to the tube removal. In the two-step group, no complications occurred (*P* = 0.014), and the mean hospital stay was 4 (3–9) days (*P* = 0.028). After the first step removal in the two-step group, the median amounts of

bile drained by the tube on days 2 and 3 were 50 ml (range 0–299) and 0 ml (0–18) respectively.

Discussion

There have been a few reports on T-tube removal after whole-liver deceased donor liver transplantation [3–6]. However, no report is available on the removal of external biliary stents after LDLT. Herein, we propose a two-step removal of the stent and show its efficacy.

In the first step, the tube is removed up until the outlet of the canal made with the duodenal serosa under X-ray to allow slight leakage to be drained; this step results in decreased incidence of biliary local peritonitis. Only after complete drainage, the tube was finally removed, at the bed side as the second step. The mean hospital stay became shorter with the two-step procedure. This procedure was originally introduced in relation to C-tube removal after a CBD exploration procedure for stone disease in the CBD [7]. Surprisingly in one of our cases, 299 ml of bile was drained through the stent tube on the first day, with practically no drainage on the second day.

Management of biliary peritonitis after bile drain removal varies according to the degree of peritonitis. If it is local peritonitis, it could be treated conservatively with fasting, antibiotics and analgesia. If massive panperitonitis occurs, it could be indicated for a new drainage placement by either percutaneous intervention or relaparotomy.

However, regardless of the degree, bile peritonitis is usually associated with severe pain and fever. Therefore, we proposed one extra day placement of withdrawn splint for such symptoms to reduce.

Efficacy of stenting at anastomosis in LDLT is still controversial. Some facility uses it routinely, while some not [8,9]. It needs to be determined by a prospective randomized study. At present, we feel it safe to anastomose tiny ducts with ensuring the patency of the anastomosis using stent. And, if stent tube is placed at all, we believe that our method to remove is useful to reduce complications.

In conclusion, the two-step removal of the biliary external stent tube is safe and allows reduction of morbidity after biliary stent removal in LDLT recipients.

Authorship

SE, YT and TK designed the study. SE, MT and MH performed the study and collected the data. SE and YT analyzed the data. SE, YT and TK wrote the paper.

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