Biliary Tract Reconstruction: Autologous Rectus Sheat Graft in The Repair of Common Bile Duct Defects: An Experimental Study

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***Objectives*: Common bile duct (CBD) injuries cause significant morbidity and mortality. CBD injuries can be repaired by various approaches. In biliary tract reconstruction for CBD defect, we used a graft which we obtained from the posterior sheat of the rectus muscle.**
***Method:* This experimental study was carried out on eight street dogs. A tissue fragment was excised from the posterior sheat of the rectus muscle together with the fascia transversalis and peritoneum. A tube of fascia graft was wrapped around an FG G feeding tube.**
***Results:* Anastomotic insufficiency was determined in one dog who died on the thirteenth day. The fascial graft gained an appearance similar to bile duct in other dogs. Blood biochemical parameters were normal.**
***Conclusion:* We concluded that fascia graft can be used in repair of CBD defect as an alternative method.**

Key words: *Biliary defect, fascial graft, reconstruction.*

Common bile duct (CBD) injuries after open and laparoscopic cholecystectomies cause significant morbidity and mortality. CBD injuries have been reported to occur after 0.2 % of open and 0.38 % of laparoscopic cholecystectomies (1,2). CBD injuries can be repaired by various approaches, including primary suturing with a T-tube drainage, choledoco-choledocostomy with a T-tube drainage, choledoco-duodenostomy and choledoco-jejunostomy. However, large defects or resection of the CBD require advanced surgical techniques. In this study, we evaluated the effectiveness of autologous rectus muscle sheat graft and stent application to repair large defects of the CBD, using a canine model.

Material and Method

This investigation conforms the " Guide for the Care and Use of Laboratory Animals " published by the U. S. National Institutes of Heath (NIH publication No: 86-23, revised 1985). The experiment was carried out on eight dogs of which 4 were male and 4 female, aged between 2-5 years and weighing 15-20 kgs. Blood was taken before the first operation for biochemical tests. Anesthesia was performed using Ketamin 20 mg/kg and Xylazine Hydrochloride (Rompun) 3.5 mg/kg intramusculary. Ketamin was re-administered (5mg/kg) during long lasting operations on the second hour. The laparatomies were performed by median approach under sterile conditions.

A tissue fragment (4x2 cm) was excised from the posterior sheat of the rectus muscle together with the fascia transversalis and peritoneum. A channel in which the peritoneum lie was created by folding this tissue around an FG G feeding tube (Fig. 1). The CBD was exposed and 2.5 - 3 cm supraduodenal part of main bile duct was resected. One end of the stent was introduced into the proximal end of the CBD and the other end was inserted into the distal end (Fig. 2). The proximal end of the stent was fixed to CBD with prolene suture to prevent it from passing into the intestine.

Blood biochemistry was also screened by taking blood

Table. I: Preoperative and postoperative blood biochemistry analysis.

Parameters	Normal value	Preoperative value	Postoperative Days 7	15	25	35
Total Bilirubin mg/dl	0.1- 0.6	0.2±0.01	0.3±0.02	0.4±0.01	0.4±0.01	0.5±0.02
Direct Bilirubin mg/dl	0.06-0.12	0.09±0.01	0.1±0.02	0.1±0.02	0.09±0.02	0.1±0.01
Indirect Bilirubin mg/dl	0.04-0.5	0.05±0.02	0.09±0.01	0.12±0.02	0.15±0.01	0.15±0.02
SGOT U/L	0-40	35±3	35±2	38±3	39±3	41±2
SGPT U/L	4-66	45±2	42±3	48±5	65±7	59±6
Alcaline Phosphatase	0-88	65±7	67±6	85±7	90±8	80±9
LDH U/L	100	60±5	80±7	85±6	87±7	85±8

SGOT: Serum glutamic oxaloacetic transaminase, SGPT: Serum glutamic pyruvate transaminase, LDH: Lactate dehidrogenase.

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samples on postoperative days (PODs) 7, 15, 25 and 35. On postoperative day (POD) 45, a re-laparotomy was performed through the previous incision site. It confirmed healing of the anastomosis and the absence of biliary leakage. The stent was kept in situ. The autologous rectus sheat graft + stent, including both ends of the anastomosis was removed and a liver biopsy was taken again for histopathological examination. Materials were fixed in 10% buffered formalin, paraffin - embedded and stained with hematoxylin - eosin.

Antibiotics were given to all dogs for seven days beginning with the operation day.

Results

One dog died on the 13th day due to disruption of anastomosis and subsequent biliary peritonitis. No complication was observed on other 7 dogs during the follow-up period. No leakage from the anastomosis was detected in any of the dogs during the re-laparotomy on the 45th day. The liver biopsy samples taken from these animals were histopathologically normal. Rectus sheat graft was also examined histopathologically, which revealed that although the graft had gained an appearance similar to bile duct, the inner surface of the graft was not completely covered with biliary tract epithelium after 45 days (Fig.3).

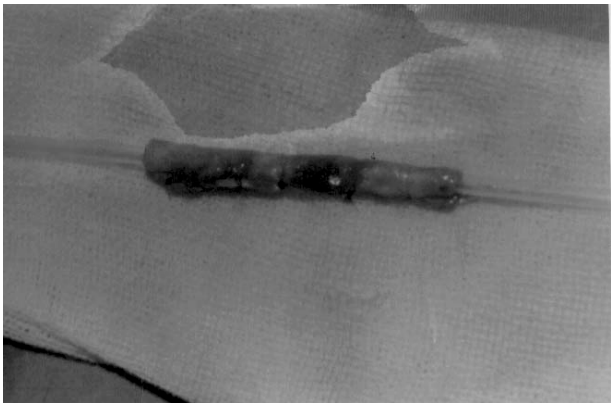

Figure 1 : The fascia tube around the stent

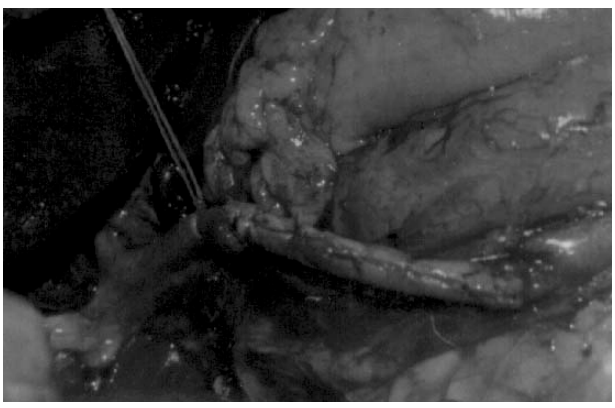

Figure 2 : The final appearance of the operation site.

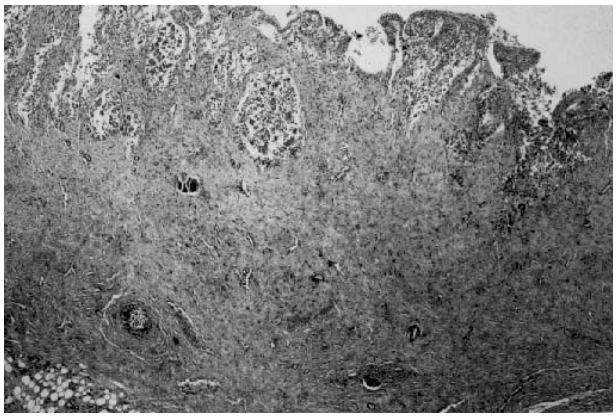

Figure 3 : The graft was epithelialized in this area (Hematoxylin eosin, X10).

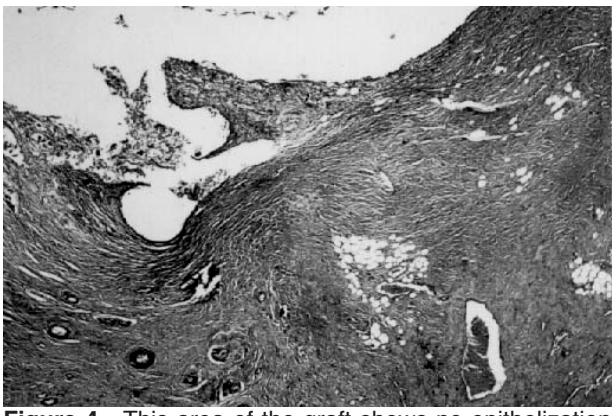

Figure 4 : This area of the graft shows no epithelization and has fibrosis and chronic inflammatory reaction (Hematoxylin eosin, X10).

The wall of the graft showed fibrosis and patchy chronic inflammatory reaction in the inner surface (Fig. 4). The biochemical composition of the blood of surviving dogs was normal. Table 1 shows the results of biochemical analyses performed preoperatively and on PODs 7, 15, 25, and 35.

Discussion

Bile duct defects, a cause of morbidity and mortality after cholecystectomy, present a great challenge to surgeons. Although a number of different operations are currently employed, some alternative treatments have been tried experimentally or in clinical practice, such as repairing the defect using pedicled small intestine, autologous venous and arterial graft, peritoneal graft, the cyctic duct and gallbladder (3-11). We used the posterior sheat of the rectus muscle, fascia transversalis and peritoneum by funneling it over a stent to create a channel to repair the bile duct defect. The stent was used to prevent cholestasis and secure the anastomosis.

Changes in blood biochemistry in the early postoperative period have been reported in the literature (3,5,7,8). However there are also reports indicating no change, as in our study that revealed normal values on PODs 7, 15, 25, and 35 (4,11). This may be attributed to the preven-

tion of cholestasis by stent application.

In accordance with other studies , no changes in liver biopsies were observed. Although cholestasis could be expected in the long term, as often seen following the insertion of biliary drainage catheters, it was not observed during the early follow up period in this study. If cholestasis did occur, irrigation, removal or replacement of the stent by endoscopic retrograde cholangiopancreaticography would be required. Our early data are promising, however, further studies are required to obtain more reliable results.

Some studies revealed that when a transplanted vein or an intestinal segment bridging was used, the biliary epithelial development occured as in our study (Fig. 3).

We believe that the fascial graft was kept alive by plasmatic imbibition during the first 48 h, and that vascularization occured by inoculation afterwards in a similar way as for free skin grafts.

In conclusion, our findings indicate that fascial grafts and stents could be used as an alternative method of treatment for repairing CBD injuries.

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