



Research Article

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Results of Multiple Biliary Ducts Anastomosis in Living Donor Liver Transplantation

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Abstract

Aim: To evaluate the results of multiple bile ducts anastomosis in living-donor liver transplantation.

Background: Biliary anastomosis is crucial in living donor liver transplantation to ensure physiologic bilioenteric continuity. Presence of multiple ducts in the graft is challenging in living donor transplantation era. Biliary strictures and bile leaks account for the majority of biliary complications after living donor liver transplantation.

Patients and Methods: The study was conducted in Liver Transplant Center, Chang Gung Memorial Hospital, Kaohsiung, Taiwan, during the period from March 2006 to June 2015. It included all patients who underwent living donor liver transplant and followed up regularly. The data was collected in predesigned Performa and managed statistically. P value < 0.01 was considered statistically significant.

Results: A Total of 964 (61.6% right graft, and 38.4% left graft) biliary reconstructions were performed in living donor liver transplant recipients (75.7% Single duct, and 24.3% multiple ducts). Post-transplant biliary complications were observed in 8.5% of patients in form of bile leak and biliary stricture in 3.2% and 5.3%, respectively. The difference when compared between the groups of single duct versus multiple ducts reconstruction it was statistically not significant, $p > 0.01$.

Conclusion: In living donor liver transplant, use of multiple as well as single duct reconstruction has almost same incidence of complications, so any of these methods can be used according to presence of ducts in the graft in living donor liver transplantation.

Keywords: Biliary reconstruction; Living donor liver transplantation (LDLT); Single duct; Multiple ducts; Biliary complications

Abbreviations: BCs: Biliary Complications; CC: Choledocho-Choledochostomy; CRY: Roux-Y choledochojejunostomy; DD: Duct-to-duct; LDLT: Living Donor Liver Transplantation; LT: Liver Transplantation; OLT: Orthotopic Liver Transplantation; SD: Standard Deviation; SPSS: Statistical Package for Social Sciences

Introduction

Liver transplantation (LT) is the optimal treatment for many patients with advanced liver disease [1]. In the past several years, Orthotopic Liver Transplantation (OLT) techniques have been greatly improved, dramatically reducing OLT mortality rates. However, biliary anastomosis still remains the "Achilles' heel of OLT", being responsible for the majority of OLT surgical complications [2].

Biliary complications delay post-OLT recovery, reduce quality of life, and may also reduce function and long-term survival of the allograft, which may necessitates re-transplantation [3]. After LT, approximately one third of patients are affected by biliary

tract complications and these result in significant morbidity and decreased patient survival [4]. These complications occur because of several anatomical and technical reasons [1].

In LDLT the small duct size and the devascularization of the bile ducts during hilar dissection of the graft are important risk factors for biliary complications [4]. Surgical techniques of biliary reconstruction play a major role in preventing complications postoperatively [3]. Although considerable progress has been achieved and the surgical techniques have been refined for living donor liver transplantation (LDLT), the incidence of biliary complications remains significant [5]. Biliary reconstruction during OLT is generally performed by end to- end Choledocho-

Choledochostomy (CC) or Roux-Y choledochojejunostomy (CRY) [2,5,6].

Duct-to-duct anastomosis of the biliary system is appropriate for adequate duct sizes, with advantages including preservation of the sphincter of Oddi, preservation of the bilioenteric physiology, a shorter operative time and allowing for endoscopic access to the biliary system, which is critical for treating biliary complications that may arise postoperatively [3,5].

The presence of multiple bile ducts in the graft has rarely been studied as a risk factor for biliary complication after liver transplantation [7]. Chan SC et al. [8] described a single hepatic duct is favored for a DD anastomosis. If two ducts are present, a DD anastomosis can still be used if the openings are less than 3 mm apart. In this case, the duct is modified to create a single orifice. If the distance is greater than 3 mm then two separate hepaticojejunostomies are performed using a Roux-en-Y loop. In other way Asonuma et al. [9], described using the recipient cystic duct for biliary reconstruction in right liver donor transplantation when two bile duct orifices were present.

The study aimed to compare the two types of biliary reconstruction, multiple bile ducts versus single duct in the term of postoperative complications in living-donor liver transplant.

Patients and Methods

Between March 22, 2006 and June 30, 2015, 959 recipients underwent LDLT at Kaohsiung Chang Gung Memorial Hospital, Kaohsiung, Taiwan. The study was approved by the institutional review board, and the requirement for informed consent was waived. All biliary reconstructions were performed with a microsurgical technique by a single micro surgeon. The classification of biliary reconstructions was based on the number of ducts in the graft, the manner in which these ducts were reconstructed (with or without ductoplasty), and the conduit (recipient duct or jejunum) used to reconstruct the biliary tree. Microsurgical biliary reconstruction was made using 6-0 prolene suture, interrupted posterior wall first and combined continue suture and interrupted tie method for anterior wall.

BCs, including leaks and strictures were addressed. Bile leakage was defined as the presence of bile material in a closed suction drain that persisted more than 7 days after transplantation or as the presence of a biloma around the area of the anastomosis. An anastomotic biliary stricture was defined as an intra hepatic biliary dilatation > 3 mm in the presence of a notable anastomotic narrowing, on the basis of symptoms, or on the basis of abnormal liver function tests. Jaundice, fever, or abdominal pain could be present with a bile leak or stricture. A biloma was diagnosed radiologically. As well the stricture was diagnosed and confirmed radiologically.

The collected data were spread on master sheet and managed statistically by SPSS computer package version 21. Numerical data were expressed as mean ± standard deviations (SD). Categorical

data were expressed as percentage and mean and compared between groups using Student t test and Fisher's exact test as appropriate. The confidence level was set at 99% CI and p values less than 0.01 were statistically considered significant.

Results

The study included 964 biliary reconstructions that were performed in 959 LDLT recipients (including 5 dual graft transplants); right graft, and left graft in 61.6% and 38.4%, respectively. Single duct reconstruction was carried out in 75.7%, and the remainder were underwent multiple duct reconstruction (Table 1).

Table 1: Number of ducts reconstructed in the recipients (n=964).

	Right graft	Left graft	Total
Graft no.	594 (61.6%)	370 (38.4%)	964
1 opening	388 (65.3%)	342 (92.4%)	730 (75.7%)
2 openings	190 (32.0%)	28 (7.3%)	218 (22.6%)
3 openings	16 (2.7%)	0	16 (1.7%)
Multiple openings	206 (34.7%)	28 (7.3%)	221 (24.3%)

(P < 0.0001)

The anastomoses technique was duct-to-duct and duct-to-jejunum in 81.35% and 18.65%, respectively. Complications were encountered in 8.4% of recipients; bile leak and biliary stricture in 3.1% and 5.3% respectively. The occurrence of such complications in groups of patients with single duct versus multiple ducts was 2.47% and 4.93% versus 11.3% and 18.46%, respectively. This difference between groups (single versus multiple ducts) was statistically insignificant as p > 0.01 (Table 2).

Table 2: Complications encountered in single versus multiple ducts (n=964).

	Single duct	Multiple ducts		P value
		Two ducts	Three ducts	
Graft no.	730 (75.7%)	218 (22.6%)	16 (1.7%)	-
Postoperative complication				
Leak	18 (2.47%)	11 (5.05%)	1 (6.25%)	0.041
Stricture	36 (4.93%)	13 (5.96%)	2 (12.50%)	0.379
Total	54 (7.40%)	24 (11.01%)	3 (18.75%)	0.047

* CI: 99%, p < 0.01 is considered statistically significant.

Discussion

Biliary complication is well recognized as a significant factor affecting patient/graft morbidity, and the procedure in the recipient has been fully discussed [10-12]. The reported incidence of biliary complications after LDLT differs considerably between centers. The overall incidence of biliary complications in living liver donors ranges from 0.4% to 67%, and the rates of biliary leaks and strictures range from 0% to 12.6% and from 0% to

5.8%, respectively [13-20]. The incidence of multiple bile ducts in the graft is high, up to 80% in previous reports [10,21].

In our earlier report of 177 series, the incidence of multiple bile ducts in the graft was 28.3% [20]. Biliary complications seemed to develop more frequently in graft with multiple bile ducts; however, this did not reach statistical significance in the present series. Similarly Kasahara et al. [22], reported that there was no significant difference in biliary complications among the number of bile ducts in the graft. But in contrary, several studies have indicated that multiple bile ducts in the graft are a risk factor for biliary complication in the recipient [23,24]. There has been no mortality related to biliary complications since 2006 when microsurgical reconstruction was adopted in our center. These findings strongly suggest that the microsurgical technique is capable of surmounting the difficulties due to presence of multiple ducts in the graft to prevent BCs.

The differences in the techniques employed by the micro surgeon when to perform biliary reconstruction could be associated with the decreasing number of BCs. These were crucial when we modified our MBR technique. Our technical experience has shown that the rate of BCs in LDLT can be reduced remarkably not only by preserving the blood supply of the biliary tree but also by planning the appropriate type of biliary reconstruction and properly aligning the anastomosis of the graft and recipient hepatic ducts. The latter objective is achieved through the modifications that have been instituted in our techniques.

Conclusion

From data presented here, biliary complications give the outward appearance of being to develop more frequently in graft with multiple bile duct; however, this did not seizing with an outstretched hand the level of statistical significance. So according to our experience from this study, use of single duct as well as multiple ducts anastomosis exhibit insignificant differences. The routine use of microsurgical biliary reconstruction capably surmounts the difficulties due to presence of multiple ducts within the graft in living donor liver transplantation. It is suggested that with more experience and continuing refinements of reconstruction technique might prove better outcomes in LDLT.

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