W Technique for Biliary Anastomosis in Liver Transplantation

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Abstract

Biliary anastomoses in Orthotopic liver transplantation (OLT) are considered technically arduous and are accountable for the majority of OLT surgical complications. In this ‘How I do It’ article, we present a new biliary anastomosis technique. It has been performed in our service since 2011 in more than 300 liver transplants. In our series, 5.7% of the patients submitted to duct-to-duct anastomosis with a follow-up greater of 6 months developed biliary complications. Future studies should enhance this surgical technique, in order to minimize the OLT complications.

Keywords: Biliary Anastomosis; Liver Transplantation

Introduction

In the past several years, orthotopic liver transplantation (OLT) techniques have been greatly improved, dramatically reducing OLT mortality rates [1,2].

However, biliary anastomosis still remains the "Achilles' heel of OLT", being responsible for the majority of OLT surgical complications [2]. The complication rate for biliary anastomosis ranges from 6.5% to 15% and considerably impairs OLT results [2-4].

Biliary reconstruction during OLT is generally performed by end-to-end choledocho-choledochostomy (CC) or Roux-Y choledocho-jejunostomy (CRY). Both are considered standard techniques [5]. However, CC is the most commonly employed technique and is preferred for healthy patients, while CRY is usually used in patients with preexisting biliary tract disease or patients who have undergone a previous biliary tract surgery [2,6,7].

Biliary complications can be classified as bile leaks (early and late), bilomas, bile duct strictures (anastomotic and non-anastomotic) and bile duct filling defects and can also occur following vascular complications, such as ischemia. Biliary leaks and strictures are responsible for 70% of all biliary complications [3]. Although the pathogenesis of biliary stenosis is multifactorial, anastomotic stenosis is most closely associated with surgical technique, while non-anastomotic stenosis is generally associated with graft ischemia [8]. However, it is known that in most cases leaks and strictures occur at the site of anastomosis [2].

As previously described by Seiler et al. the classical end-to-end biliary anastomosis usually begins with a “6 o’clock” thread and finishes at “12 o’clock” [2]. Since OLT complications are frequently related to biliary anastomosis and the majority of these complications are associated with surgical technique OLT surgeons must improve their anastomosis skills to reduce the incidence of biliary complications [2-4,9].

Figure 1: (a) A 6-0 PDS suture is placed at the three o’clock and 9 o’clock extremities of the recipient and donor bile ducts. (b) The posterior wall of the bile duct is sewed from inside the lumen with a running suture until reaching the 9 o’clock end. (c) A running suture of 6-0 PDS is used for the anterior wall. (d) The posterior and anterior running sutures as well as the 9 o’clock suture are then tied up to complete the anastomosis.

This study shows that a new biliary anastomosis technique employed in our service since 2011 has improved our rate of complications related to anastomosis technique.
A 6-0 PDS suture is placed at the three o’clock and 9 o’clock extremities of the recipient and donor bile ducts (Figure 1a). The 3 o’clock suture is then tied up. A 3-0 silk tie is placed inside the nine o’clock suture, creating a loop, and then pulled up. A “w” figure is formed in the 9 o’clock suture. This keeps the two edges of the bile duct separated from each other. The posterior wall of the bile duct is sewed from inside the lumen with a running suture until reaching the 9 o’clock end (Figure 1b). A running suture of 6-0 PDS is used for the anterior wall (Figure 1c). The posterior and anterior running sutures as well as the 9 o’clock suture are then tied up to complete the anastomosis (Figure 1d).

Results

This technique has been employed in our service since 2011 in more than 300 liver transplants. The preferred biliary tract reconstruction technique is duct-to-duct anastomosis. Only 5.7% of the patients submitted to duct-to-duct anastomosis with a follow-up greater of 6 months developed biliary complications.

Discussion

For the classical technique, the literature reports rates of complications related to anastomosis ranging from 6.5% to 15% [2,3]. Seiler et al. described the classical end-to-end biliary anastomosis technique as follows [2]. Suturing begins at 6 o’clock with a 6.0 PDS and needles on both ends, and the thread is tied in its middle. The anastomosis is completed by sewing the ‘three o’clock’ and ‘nine o’clock’ circumference with a running suture technique and tying both ends of the threads together at ‘twelve o’clock.’ For both the classic technique and our technique, the ducts are first dorsally adapted. However, we prefer to start the anastomosis by placing the threads at ‘three o’clock’ and ‘nine o’clock’ to anchor the bile ducts and stably handle the structures.

In addition to the classical biliary anastomosis technique, another technique has been reported: the “parachute anastomosis.” In this technique, the sutures are not pulled immediately after the threads pass by the biliary wall [10]. It has been primarily employed in the cardiovascular surgery field [11]. In 2002, Yoshimi et al. began using this technique for biliary anastomosis [12]. The good short-term results encouraged the use of the parachute technique in cases of biliary anastomosis. However, this technique has some inconveniences. Excessive tension and rough manipulation can result in pulling the suture line through the biliary wall [10]. Additionally, when pulling the thread, it may not easily slide through the duct wall. Thus, a nerve hook may be necessary to help tighten the suture line; otherwise, the anastomosis may be loose [10].

The essential component of this novel anastomosis technique is to place the 3-0 silk tie inside the nine o’clock suture, the w-stay suture. This creates a loop and keeps the two edges of the bile ducts separated from each other. This step makes the closure simpler, by facilitating the view of the donor and recipient’s bile duct wall, allowing for safer handling and a more accurate placement of the stitches.

The use of a T-tube in OLT is controversial. Although some studies encourage its use, others favor the abandonment of the T-tube in OLT, affirming lower rates of complications [13-15]. In a meta-analysis, the authors pooled the outcomes of 1027 patients undergoing OLT performed by CC, with and without the use of a T-tube [16]. Both groups had equivalent outcomes for anastomotic bile leaks and fistulas and equivalent mortality rates due to biliary complications. However, the “without T-tube” group had fewer episodes of cholangitis and peritonitis and showed a trend of fewer overall biliary complications.

A recent study advocated that the use of a T-tube should be reserved to cases of risky anastomosis and for bile ducts of less than 7 mm in diameter, not as a routine technique for all OLT cases [17]. The biliary anastomosis technique described in our study does not require the use of a T-tube and can be employed even for cases of risky anastomosis and very small bile ducts. Thus, the use of the “w-technique” may reignite the discussion of the use of a T-tube in OLT, even for selected cases described by López-Andújar et al. [17]. In our series we did not use a T-tube.

There is a consensus that biliary ducts are difficult to manage. Because the biliary duct is particularly small, some authors have even suggested that microsurgical equipment should be used in OLT [18]. Fernández-Aguilar et al. also consider the necessity of having a biliary tutor on the surgical team [19]. Our technique does not change the biliary anastomosis main principles; rather, it is an improvement of the surgical management that aims to facilitate the anastomosis procedure for OLT surgeons.

Conclusion

Biliary anastomosis remains the “Achilles’ heel of OLT”, being responsible for the majority of complications related to this surgery. The main causes of OLT complications are related to the surgical technique employed; thus, improvements in anastomosis management are welcome. This study described a new technique of biliary anastomosis that mixed characteristics of the classical with the parachute anastomosis technique and increased the feasibility of anastomosis. The goal of this technique is to simplify the handling of the biliary duct as well as the overall view of the anastomosis to help OLT surgeons. Future studies should aim to further improve the technique described here, until biliary anastomasis is no longer the main cause of complications during OLT.

References