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Effectiveness of a barbed suture in the repair of bile duct injury during laparoscopic cholecystectomy: Report of two cases

Yusuke Takahashi*, Naoyuki Yokoyama, Natsumi Matsuzawa, Daisuke Sato, Tetsuya Otani

Department of Digestive Surgery, Niigata City Hospital, Niigata, 950-1197, Japan

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ABSTRACT

INTRODUCTION: Bile duct injury during laparoscopic cholecystectomy occurs in rare cases. We report two cases using barbed suture for repair in bile duct injury during laparoscopic cholecystectomies.
PRESENTATION OF CASES: The first patient was a 73-year-old woman who underwent elective laparoscopic cholecystectomy for cholecystolithiasis. When the gallbladder was dissected from the bed, bile spillage was observed and an injured small bile duct was detected. The bile duct could not be managed using a titanium clip. The second patient was an 83-year-old woman who underwent emergent laparoscopic cholecystectomy for gallbladder torsion. After the gallbladder was dissected from the bed, bile spillage was observed. In both cases, a running suture, of absorbable monofilament 3-0 barbed suture, was used to laparoscopically repair the injuries.
DISCUSSION: Laparoscopic repair of a bile duct injury is technically challenging, especially in the gallbladder bed where suturing is very difficult because of the tangential approach and the risk of additional liver laceration. Barbed sutures have the benefit of being knotless, thus, performing a running suture is not difficult, even in laparoscopic procedures. Further, absorbable and monofilament threads are generally better suited for biliary surgery, compared with non-absorbable and braided sutures, because of the potential association of the other types of materials with bile duct stone and stricture formation.
CONCLUSION: We believe that the V-Loc™ device is an effective and appropriate option for bile duct injuries that occur during laparoscopic cholecystectomies, particularly around the gallbladder bed, and it is especially useful for surgeons unfamiliar with intracorporeal knot tying.

1. Introduction

While bile duct injuries (BDIs) that occur during laparoscopic cholecystectomies (LCs) are rare, they are a potentially serious complication. They have an incidence of approximately 0.4–1.3% [1,2]. When BDIs become apparent intraoperatively, repair should be performed laparoscopically or during conversion to open surgery. Laparoscopic repair is often difficult. In general, absorbable monofilament threads are preferable in the repair of BDIs because non-absorbable and braided suture materials may serve as the nidus for the formation of bile duct stones and biliary strictures [3,4].

Recently, knotless, barbed sutures have been used in various laparoscopic and open surgeries; however, their use in BDIs has not been reported. This report describes the use of an absorbable, barbed suture material in the repair of a BDI that was discovered on the hepatic surface of the gallbladder bed during LC.

2. Presentation of cases

2.1. Case 1

A 73-year-old woman undergoing postoperative breast cancer treatment was found to have asymptomatic gallbladder and common bile duct stones on computed tomography (CT). After endoscopic sphincterotomy for choledocholithiasis, without any evident anatomical variation of the biliary tract in the endoscopic retrograde cholangiography, the patient underwent elective LC for cholecystolithiasis (Fig. 1).

Intraoperative cholangiography of the cystic duct did not reveal any common bile duct stones, BDI, or aberrant bile ducts.

During dissection of the gallbladder from the gallbladder bed, and after transection of the cystic duct and artery, bile spillage, without bleeding, was observed on the hepatic surface on the right side of the gallbladder body and an injured small bile duct with a

Abbreviations: BDI, bile duct injury; LC, laparoscopic cholecystectomy; CT, computed tomography.

* Corresponding author at: Niigata City Hospital, Department of Digestive Surgery, 7-463 Shumoku, Chuo-ku Niigata City, 950-1197, Japan.
E-mail address: niigata.takahashi@hosp.niigata.niigata.jp (Y. Takahashi).

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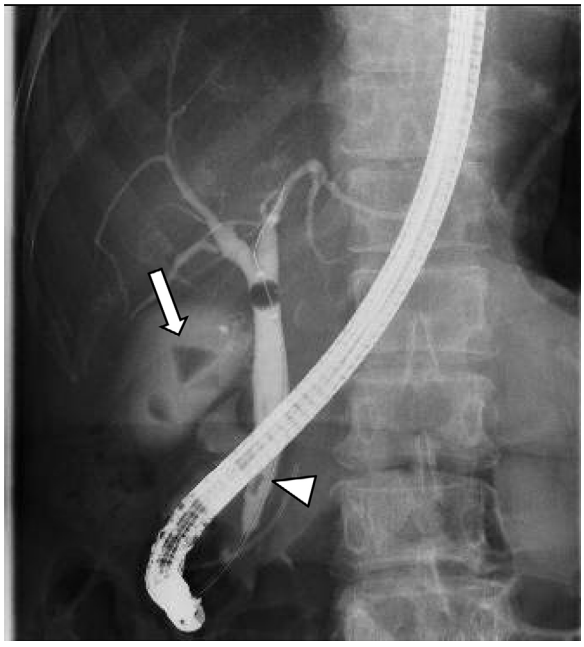

Fig. 1. Endoscopic retrograde cholangiography showed gallbladder stone (arrow), and common bile duct stones (arrow head). Anatomical variations of the biliary tract were not evident.

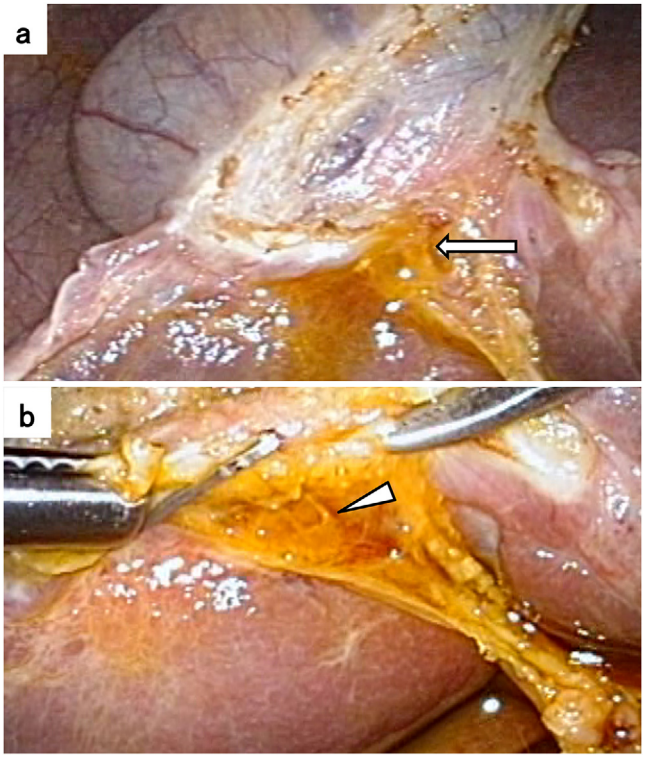

Fig. 2. Intraoperative findings: a) Bile spillage (arrow) was present in the gallbladder bed during gallbladder dissection, b) The injured small bile duct was evident (arrow head). Repair using a titanium clip was unsuccessful.

diameter of about 1 mm was detected (Fig. 2a,b). We considered performing cholangiography from the injured bile duct; however, the bile duct was too thin and narrow to perform cholangiography. We initially tried to repair the injury using a titanium clip. However, the clip could not fully close the injured bile duct owing to limited maneuverability. Moreover, we were concerned that a non-absorbable foreign body such as a titanium clip could be the nidus for future stone formation. Thereafter, we attempted to laparoscopically suture the small bile duct using a running suture involving an absorbable, 3-0 barbed suture (V-Loc™) (Fig. 3a). The needle was inserted about 5 mm from the bile spillage, and an anchor was made through the loop at the tail of the material. A running suture from the anchor over the bile spillage point was performed, and an additional running suture back to the anchor was performed. Consequently, nine total passes of the needles across the injured bile duct were performed, and the material was cut without tying a knot. Following the repair, cessation of bile spillage was visually confirmed (Fig. 3b). The needle handling was performed so that the parenchyma of the liver was not injured. The operation was completed following placement of a drain below the gallbladder bed. The total repair time (suturing time) was 18 min.

Postoperative bile leakage was not observed, and blood tests did not detect liver dysfunction or biliary stasis. The drain was removed three days after surgery, and the patient was discharged on the following day, without further complications. Routine clinical follow-ups for the patient's breast cancer surgery, including the CT performed ten months after surgery, have not revealed any signs of biliary leakage or stasis.

2.2. Case 2

An 83-year-old woman with the chief complaint of fever and lumber pain was transferred to our hospital. Abdominal CT showed findings of acute cholecystitis and gallbladder torsion with hemorrhagic necrosis and without gallbladder stones. Therefore, we performed emergent LC.

Intraoperative cholangiography was not performed owing to emergent LC and no evidence of gallbladder stones in the preoperative abdominal CT scan. During the dissection of the gallbladder from the bed, following release of the gallbladder torsion and transection of the cystic duct and artery, bile spillage without bleeding from the upper side of the gallbladder bed was observed (Fig. 4). 3-0 V-Loc™ was used laparoscopically for the repair of BDI, as in case 1. Following a running suture involving four passes of the needle across the bile spillage point, bile spillage ceased (Fig. 5). The operation was completed after drain placement below the liver. The total repair time (suturing time) was 14 min.

The drain was removed three days after surgery. She was discharged 14 days after surgery without any complication. Magnetic resonance cholangiopancreatography performed two months after surgery revealed no evidence of bile leakage or biloma.

3. Discussion

In both cases, during LC, we repaired BDIs at the gallbladder bed using an absorbable 3-0 barbed suture (V-Loc™). BDIs during LCs are relatively rare, but occasionally lead to life-threatening complications. The injured bile duct was observed during dissection using laparoscopic coagulating shears in both cases; therefore, these injuries might be due to thermal injury. Moreover, each bile spillage was observed with the absence of bleeding, suggesting that the injured small bile duct was not part of the Glisson system. Rather, it might have been a Type 3 or 4 subvesical bile duct, according to the reported classification system or liver parenchyma itself, particularly in case 2 [5]. When a BDI is confirmed during LC, repair is mandatory. However, laparoscopic repair is technically challenging, especially in the gallbladder bed where suturing is very difficult because of the tangential approach and the risk of additional liver laceration. Hence, according to the 12th Nationwide Survey of Endoscopic Surgery in Japan, more than half of the BDI cases observed during LCs were repaired during conversion to open surgery [6].