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Main bile duct injury (Strasberg E2) repair with Roux-en-Y bilio-enterostomy

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Key words: bile duct injury, bilio-enterostomy, Hepp-Couinaud maneuver

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Figure 1: introduction

The risk of bile duct injury during cholecystectomy has been reported to range from 0.2 to 0.9% [1,2]. We describe the technique of repair for type II (Bismuth) or E2 (Strasberg) bile duct injury, *i.e.* circumferential division of the main bile duct less than 2 cm from the superior biliary convergence without associated vascular injury [3,4]. Percutaneous bile duct drainage followed by bilio-enterostomy is one of the recommended strategies for this type of injury [5]. A Roux-en-Y bilio-enterostomy at the level of the superior biliary convergence after take-down of the hilar plate is the ideal solution for mucosa-to mucosa anastomosis in healthy tissues.

Figure 2: Repositioning the duodenum

The first step of the operation consists of re-establishment of the normal hepatic pedicle anatomy longitudinally, exposing the superior biliary confluence. After cholecystectomy, the duodenum often adheres to the inferior aspect of the liver, giving the impression that the bile duct injury is higher than in reality (**Figure 2.A**). The duodenum must be freed from the liver, which can be retracted cephalad by a retractor placed under its anterior margin (**Figure 2.B**). This dissection is achieved when the junction between the posterior border of the quadrate lobe and the hepatic pedicle becomes visible (**Figure 2.C**). These maneuvers were very well described in the Association Française de Chirurgie monograph published in 1981 [6].

Figure 3: Exposure of the liver hilum

The second step consists of re-establishment of the anatomy of the hepatic pedicle transversely by opening the gallbladder bed (**red arrow**) and, when it exists, dividing the parenchymal bridge between segments III and IV to expose the hepatic hilum (**red dotted line**).

Figure 4: Lowering the liver hilar plate

The Glissonian capsule should be incised at the junction between the posterior border of the quadrate lobe and the apex of the hepatic pedicle. This intra-parenchymal incision is only a few millimeters deep and extends several centimeters from the gallbladder bed to the base of the round ligament, providing good access to the superior aspect of the hilar plate (**Figure 4.A**). Retraction of the pedicle caudad combined with cephalad elevation of the inferior face of segment IV exposes the biliary convergence, which becomes progressively accessible to the surgeon as dissection progresses from back to front (**Figure 4.B**).

Figure 5: Assessment of the bile duct below and above the injury

Dissection of the hepatic pedicle exposes the lower component of the bile duct injury (divided common bile duct). The right hepatic artery should be identified and carefully preserved. Dissection of the hilar plate allows visualization of the superior aspect of the superior biliary convergence that moves forward by downward traction on the biliary stump. Once exposed, the superior convergence is punctured with an intradermal needle. Aspiration of clear biliary fluid is characteristic of biliary stasis.

Figure 6: Upper biliary structure preparation

The biliary convergence is opened with a venotome longitudinally along the left hepatic duct for at least 2 cm in virgin healthy tissues, after identification of the left hepatic artery. The patency of the upper bile ducts is checked (with an angled clamp, or with selective cholangiography, one orifice after the other).

Figure 7: Creation of the Roux-en-Y loop

A tension-free Roux-en-Y loop is brought up to the hepatic hilum, either on the right (anterior to the duodenum through the right mesocolon), or on the left (through the lesser omentum) [7]. The jejuno-jejunostomy should be at least 70 cm from the future bilio-jejunal anastomosis.

Figure 8: Confection of the bilio-enterostomy

The anastomosis is started by insertion of a posterior suture row (which facilitates exposure). It is important to ensure that these sutures do not include or close off any smaller biliary canals. The mucosa-to-mucosa end-to-side bilio-jejunostomy is performed with non-resorbable 5-0 interrupted sutures. The posterior layer is knotted intra-luminally (**Figure 8.A**) while the anterior layer is knotted on the outside (**Figure 8.B**).

Conclusion

The anastomosis can be tested intra-operatively by high-pressure injection of radio-opaque contrast medium or methylene blue, after clamping the loop near the anastomosis and puncture of the Roux-loop near the anastomosis with a thin catheter (a pre-inserted purse-string can be used to close the puncture hole). There is no need to drain the abdomen near the anastomosis in the absence of any intra-operative event or leak detected during the procedure. Some surgeons leave an internal trans-anastomotic drain. The patient is managed post-operatively according to enhanced recovery principles. If a nasogastric tube or bladder catheter was inserted intra-operatively, it should be removed before the patient leaves the operating room. The patient resumes nutrition the evening after surgery. All intravenous lines are removed on Day 1 and pain is managed with oral analgesics.

Immediate post-operative surveillance depends on clinical findings: pain, intestinal activity, jaundice, temperature. No laboratory tests or investigations are required before patient discharge, which is usually within 72 hours.

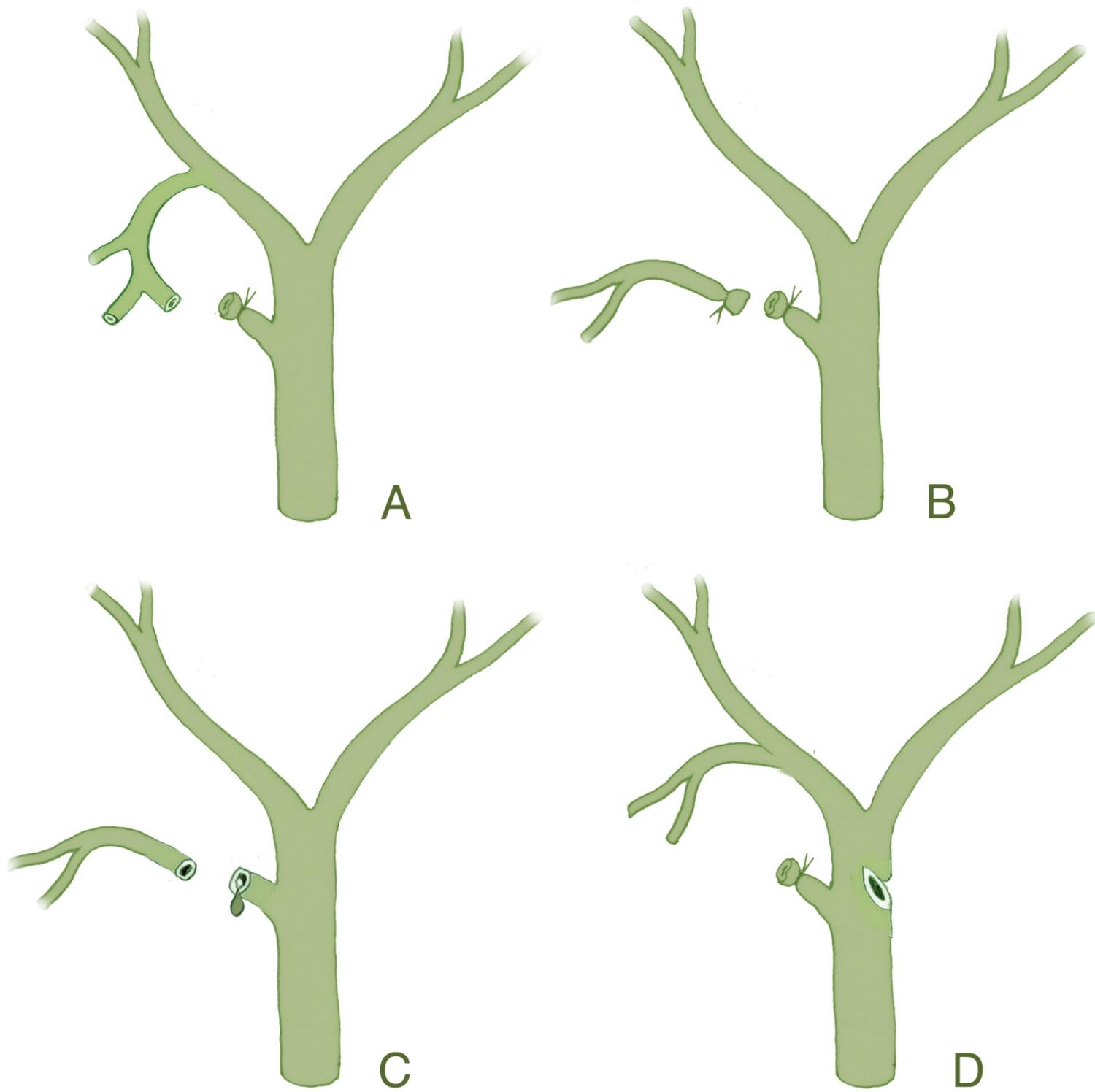
The patient is seen one month post-operatively with liver function tests to assure that the anastomosis is functioning correctly. Long-term follow-up with clinical, laboratory and imaging surveillance should be planned [8].

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Conflict of interest: none to report

Classification de Strasberg



Classification de Bismuth

