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## Editorial

### Role of Video-assisted Laparoscopy in the Management of Iatrogenic Bile Duct Injuries<sup>☆</sup>

#### *Papel de la video laparoscopia en el manejo de lesiones quirúrgicas de la vía biliar*



#### Introduction

Due to its medical and legal implications, iatrogenic bile duct injury (IBDI) continues to be one of the complications feared most by both general surgeons and surgical specialists.<sup>1,2</sup>

After the initial rise in its incidence with the advent of laparoscopy, IBDI rates have progressively declined in recent decades, and in some series they are now comparable to the historical rates of open cholecystectomies. Today, the incidence of IBDI ranges from 0.2 to 0.3% at referral hospitals.<sup>1–3</sup>

We must realize that IBDI is a complication that always has and always will accompany cholecystectomy. The main objectives for its management are: to minimize its incidence; to increase intraoperative diagnosis and treatment by trained surgeons; and to achieve excellent long-term repair results.<sup>1,3</sup>

The significant morbidity of IBDI means that these lesions are of great importance, and they are always among the most relevant issues in surgical practice. In their evolution, they can lead to sepsis, liver failure and even patient death. Therefore, these complications should be treated ideally from onset at high-volume referral centers, where all therapeutic options are available, among them video-assisted laparoscopy.<sup>1–5</sup>

We will divide the following editorial into 3 sections, each dealing with different aspects of video-assisted laparoscopy: 1) intraoperative management of IBDI; 2) postoperative management of IBDI; and 3) deferred treatment of IBDI.

#### Intraoperative Management of Iatrogenic Bile Duct Injuries

The most relevant prognostic factor when defining the prognosis of IBDI is whether the damage was identified during surgery or not. Repair during the operation itself is associated with a higher rate of long-term effectiveness, lower morbidity and lower healthcare costs, as well as a lower litigation rate. In fact, there are studies that compared the quality of life between cholecystectomies with IBDI and intraoperative repair versus cholecystectomies with no complications, finding no statistically significant differences. The intraoperative detection of IBDI presents great variability, ranging from 15 to 89% depending on the series analyzed.<sup>1,3,6–8</sup>

We believe it is relevant to mention the impact of intraoperative cholangiography (IOC) at this point. Even though population studies have shown that IOC decreases the incidence of injuries, we consider that its most important role is to diagnose injuries during surgery, avoid progression of the damage and define its intraoperative treatment, thus decreasing the morbidity and mortality of IBDI. In our experience, we had 23 IBDI out of a total of 15,473 cholecystectomies performed (0.14%), and 21 of them (91%) were satisfactorily identified and treated intraoperatively.<sup>1,3</sup>

As for intraoperative repair in cases where there was no thermal mechanism of biliary injury and the tissues to be repaired are vital and have correct blood supply, partial divisions should be sutured either with or without placement of external biliary drainage or stents, depending on the extension. In cases of complete bile duct division, we

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recommend end-to-end suture with external biliary drainage or stents.<sup>1,3,7</sup>

In contrast, if there is associated thermal damage, we are faced with a situation where it is very difficult to establish the magnitude and extent of the injury, and where the surgeon's experience in repairing IBDI is of utmost importance. If no experienced surgeon is available for the repair, we recommend placing an external biliary drain with subphrenic drain tubes, followed by prompt referral to a specialized hospital. This last point is perhaps the most relevant of all: when there is no experience in IBDI repair, no further dissection of the bile duct or ligation are recommended. The objective in this situation must be to avoid 3 serious complications: choleperitoneum, biloma and cholangitis. This is achieved by performing a thorough washing and placing the drains as described ('place drains and leave').<sup>1,3,7,8</sup>

If a specialized surgeon is available, we recommend performing a proximal resection of the bile duct of several centimeters to ensure vitality in the biliary end and reconstruction with a Roux-en-Y hepaticojejunal anastomosis, using delicate sutures (7/0) and under magnification as we routinely do in biliary reconstructions during liver transplantation.<sup>7,8</sup>

The repair approach may be laparoscopic or open, depending on the surgeon's experience, characteristics of the injury and patient condition. In our own series mentioned previously, we decided to convert to open surgery for repair in 11 cases (52%), while repairing 10 cases (48%) laparoscopically, which demonstrates the usefulness of this approach in the repair of IBDI. In 81% of the cases, the surgeon who repaired the injury was not the surgeon who caused it. This avoids the emotional component that weighs on the surgeon who caused the injury, a fact that can distort subsequent decision-making and the final evolution of the case.

## Postoperative Management of Iatrogenic Bile Duct Injuries

Depending on the time of diagnosis and the general patient and local tissue conditions, different therapeutic possibilities will be considered.

In the case of early diagnosis, when the general condition of the patient is adequate and the tissues are not very compromised, all the concepts described in the previous section will be applied.<sup>7</sup>

On the other hand, if the patient's general condition is compromised and the diagnosis is made late, the therapeutic strategy will be different. Once an IBDI becomes established, the management of cholangitis, biloma and choleperitoneum is of utmost importance, as they can lead the patient to sepsis, organ failure and death. This, the approach will vary depending on the patient's clinical state.<sup>7,9</sup>

In the case of cholangitis, percutaneous or endoscopic drainage of the bile duct achieve initial control in most cases. For localized intra-abdominal collections ('bilomas'), percutaneous drainage is the solution.<sup>7,9</sup>

The appearance of choleperitoneum leads to the need for re-operation. It should be noted that it usually presents with serious symptoms, which should not be minimized and require quick action.<sup>7</sup>

In our experience, the laparoscopic approach of postoperative choleperitoneum due to IBDI is of choice. Its early application determines less patient deterioration at the time of the exploration, as well as less use of complementary diagnostic imaging methods, making laparoscopy a cost-efficient procedure for the management of patients with postoperative complications.<sup>5,7</sup>

The laparoscopic approach allows for correct peritoneal lavage. It also makes a new cholangiography possible, which is essential to delimit the biliary anatomy and rule out causes of bile duct hypertension (residual lithiasis). With this approach, the site of the biliary leak can be identified and small IBDI repairs can be performed. However, we should clarify that, to our understanding, this procedure is not the time to definitively repair the IBDI.<sup>5,7</sup>

During the operation, the entire abdominal cavity should be thoroughly washed in order to control the septic state of the patient. Then, the site of the bile leak should be found, while also inspecting the duodenum and small intestine, as injuries to these organs often present similar symptoms.<sup>5,7</sup>

If there is a small injury at the level of the cystic, common hepatic or common bile ducts, lavage and drainage are often the only interventions needed to repair the lesion, accompanied by endoscopic papillotomy in order to reduce intraluminal pressure. In this manner, the definitive resolution of symptoms will often be observed.<sup>5,7</sup>

## Deferred Repair of Bile Duct Injuries

For the ideal repair of an IBDI, 3 factors are necessary: a patient in good general condition (not infected and well-nourished), tissues in good condition, and a surgeon with experience in hepatobiliary and pancreatic (HBP) surgery.<sup>7,9,10</sup>

The best time to make deferred repair is a controversial issue. Ideally, there are 3 different moments in which it is possible: 1) early – up until 7 days after the damage has occurred; 2) intermediate – after 7 days and up to 6 weeks; and 3) late – after more than 6 weeks. The best results in terms of morbidity and resolution of symptoms have been seen in the early and late groups, making these 2 the best times to perform the repair.<sup>9,11,12</sup>

Regarding the type of approach to be carried out, although laparotomy is the most frequent approach for the definitive resolution of IBDI, laparoscopy has presented increasingly better results in different series and is gaining ground in the management of IBDI. The choice of this route will fundamentally depend on the type of injury and the experience of the surgeon. The ideal biliodigestive anastomosis is Roux-en-Y hepaticojejunal anastomosis. The laparoscopic approach is indicated preferably for the elective management of lesions, with a bile duct of adequate caliber, when the regional anatomy exposure allows and the surgeon has experience in advanced laparoscopic surgery and in the management of laparoscopic suture and knotting techniques.<sup>1-5,13</sup>

Biliary repair with robotic surgery has shown good results in several series, due in large part to the greater range of movements that the robot provides compared to laparoscopy. The cost-effectiveness of this approach has yet to be defined. It

will become more promising as robotic surgery gains more ground and becomes more economically accessible.<sup>13</sup>

Complex injuries with compromise of the confluence and those with associated vascular lesions or multiple previous attempts at repair should be treated using the open approach. Patients with these injuries should be treated exclusively by HPB referral units with extensive experience, very good results and high rates of resolution. Liver resection may sometimes be required for treatment. Laparoscopic liver resections have recently been described for the resolution of IBDI, providing very good short-term results.<sup>11,12</sup>

## Summary

Video-assisted laparoscopy plays a growing role at 3 stages during the management of IBDI: 1) during intraoperative identification and repair; 2) during the management of postoperative choleperitoneum; and 3) during delayed biliary repair.

This approach has shown very good long-term results in several international publications, with the perioperative advantages of the minimally invasive approach.

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