Roux-en-y Hepaticojejunostomy Assisted by Robot after Bile Duct Injury: Case Report and Literature Review

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Abstract

Introduction: Roux-en-Y hepaticojejunostomy (RYHJ) by open approach is the standard therapy for the repair of iatrogenic bile duct injuries (IBDI). Laparoscopic and robotic surgery represent an alternative that offers the inherent benefits of minimal invasion, although it is a highly demanding challenge due to the complexity in the dissection and in the bilioenteric anastomosis, therefore it’s use has been limited.

Clinical case: A 41-year-old female patient underwent a laparoscopic cholecystectomy for chronic cholecystitis, complicated with Strasber E3 type IBDI. The initial management was a laparoscopy in order to evacuate the bilioperitoneum and place drains. 22 days after the cholecystectomy, a RYHJ robotic assisted was performed, without transoperative complications. During her evolution, laparoscopy was required for hemostasis due to bleeding from a port wound on the skin. She also presented a biliary leak on day 8 with low debit, spontaneously remitting at day 12. At 6 months of follow-up she is asymptomatic with normal liver function tests.

Discussion: Although day to day minimally invasive surgery displaces the open approach in various surgical procedures, the RYHJ has shown a limited evolution. The few reports so far are encouraging, with functional results comparable to the open approach but with the benefits of minimal invasion, however the level of evidence is still very low and its real role has yet to be defined.

INTRODUCTION

Since the first cholecystectomy performed by Karl Langenbuch in 1882, this has become the most performed surgical procedure by the general surgeon in the western world. Major lesions of the bile duct are a devastating complication, with an incidence of 0.06% to 1.09% [1-7], a mortality of 4.6% before any reconstruction attempt [8] and 2% subsequent to this [9]. Its prognosis depends on the level of the lesion, the experience of the surgeon performing the repair and the coexistence of vascular lesions, with a probability of long-term success of the cases repaired in specialized reference centers of 90%, and 17 % in non-specialized centers [10].

It is considered that the RYHJ by open approach is the standard therapy for the major lesions of the bile duct. Although laparoscopy offers the benefits of minimal invasiveness, it is a highly challenging procedure due to multiple limitations, particularly the use of rigid instruments that greatly complicate such a complex anastomosis.

The robot-assisted approach has emerged as a modification of conventional laparoscopic surgery with more sophisticated technological resources, with much more favorable and comfortable ergonomics for the surgeon, and facilitated execution in complex surgical procedures [11].

The experience in minimally invasive surgery for biliary tract in the context of IBDI is very limited, and the majority of reported cases of RYHJ are due to choledochal cysts.

CASE PRESENTATION

A 41-year-old female patient underwent a laparoscopic cholecystectomy due to a chronic cholecytitis, complicated with an IBDI type E3 with bilioperitoneum. The injury was not adviced, thus no abdominal drainage was placed. The patient evolved with jaundice, suspecting aIBDI and confirming by magnetic resonance. She was underwent a laparoscopy to evacuate free bile fluid and place drains. Twenty-four days after cholecystectomy, a RYHJ robotic assisted was performed, without transoperative complications. During her evolution, laparoscopy was required for hemostasis due to bleeding from a port wound on the skin. She also presented a biliary leak on day 8 with low debit, spontaneously remitting at day 12. At 6 months of follow-up she is asymptomatic with normal liver function tests.

Five ports were used with a cephalic docking. As expected,
there are firm adhesions of the greater omentum and colon to the biliary stump, which were easily separated with blunt dissection, cutting and with energy use. Later, the amputated hepatic duct was observed at the confluence level, and a RYHJ (Hepp-Couinad procedure) with a partial hepatotomy was performed with a 3-0 monocrylcontinuous suture (Figure 1), without complications or incidents. The total surgical time was 330 minutes, console time 310 minutes and 50ml bleeding. Her postoperative evolution was with bleeding through the penrose drainage, requiring a new laparoscopic exploration finding the wound of the port on the right flank as the origin. On postoperative day 8 presented a biliary leak that resolved spontaneously on day 12. She was discharged due to improvement with a hospital stay of 13 days after the RYHJ. At 6 months of follow-up the patient is clinically asymptomatic, anicteric, with liver function tests without cholestasis (McDonald A).

**DISCUSSION**

The RYHJ represents the best therapeutic alternative in the face of a complex injury of the bile duct, and until now the open approach is the standard therapy.

It is considered that a bilioenteric anastomosis of good quality is one that is free of tension, with a wide diameter, with the appropriate suture, made in healthy bile ducts (without fibrosis) and well perfused [12]. These are the objectives that must be present regardless of the approach used. The standard surgical technique for the repair of these lesions consists of a RYHJ, with an anastomosis at the level of the confluence of the hepatic ducts and taking advantage of the semi-horizontal direction of the left hepatic duct to expand it and achieve a wider anastomosis. Occasionally a section of the hepatic parenchyma that covers the left hepatic duct may be required to facilitate the procedure.

In the past, the use of stents through the anastomosis was considered a routine practice, but it is currently preferred only when unhealthy (ie, ischemic, scarred) and small ducts (< 4 mm) are found [13].

Minimally invasive surgery offers indisputable benefits in multiple gastrointestinal surgical procedures, such as reduction in blood loss, postoperative pain, ileus time, length of hospitalization, cardiopulmonary complications, better quality of life and cosmetic improvement [14]. However, the complexity of the RYHJ has limited its use, therefore the experience is reduced to a few case reports. Robotic technology maintains the benefits of minimal invasion, but offers to overcome the limitations of laparoscopic surgery in highly complex surgeries [15].

The greatest experience of RYHJ treated by minimal invasion is obtained from the resection of choledochal cysts (CC), where it has been proven to be associated with less blood loss, less time to recover the peristalsis, shorter time of postoperative fasting, less need for place drainage and shorter hospital stay compared to the open approach, with similar functional results and no difference in perioperative morbidity [16,17], even in low volume centers [12], in such a way that some groups have proposed it as the first choice approach [18]. On the other hand, Lee and cols [19] in a retrospective review demonstrate superiority of the robotic approach over laparoscopy in terms of lower short-term morbidity (22% vs 0%) and lower biliary leak (14.3% vs 0%).

However, the RYHJ by IBDI represents a greater surgical challenge in comparison to the RYHJ by CC, due to a greater number of adhesions, smaller caliber of the bile duct and the possible association with vascular lesions; that’s why the experience in IBDI is even more limited.

Cuendis and cols [19], demonstrated the safety of laparoscopic RYHJ for IBDI in 29 patients, with an average surgical time of 240min, 200ml bleeding, biliary leakage 17.2%, reoperations 6.8%, mortality 0% and conversions to open surgery 0%. At 36 months of follow-up, only one case of bilioenteric stenosis was presented (3.4%). This is the highest volume of cases so far by laparoscopic approach, with results comparable to open surgery in large volume centers; out of this only reports of isolated cases can be found.

The first case of IBDI repaired by robotic assistance was published by Prasad et al. [21], in 2015. Subsequently, the first series of cases was reported by Guillianotti et al. [15], with 14 patients, and finally the largest casuistry so far has been published by Cuendis et al. [14], with 30 cases in 2018. Table 1 shows all the reports to the present of RYHJ assisted by robot secondary to LIVB.

It has been commented the lack of haptic perception as the main disadvantage of the robotic approach in biliary surgery [11]; in contrast, it is a fact that the ergonomics of the surgeon and the improved vision through a magnified image of extraordinary quality are the advantages over open surgery that are offered with robotic assistance, thus facilitating the fabrication of a high quality biloenteric anastomosis, besides the benefits of minimal invasion [21]. In addition, biliary repairs are an uncomfortable and difficult to access site for the open approach, resulting in a real challenge to get an adequate exposure, either through an assistant or requiring the use of automatic separation instruments. This difficulty is easily overcome with robotic technology, since it is possible to access the surgical site without difficulty, and a single surgeon can control the exposure to the surgical field comfortably as the evolution of the surgery demands.

One more factor to consider is the low availability of robotic technology in our environment (Latin America), resulting in a considerable limitation, with only 14 Da Vinci surgical systems in Mexico currently.

**CONCLUSIONS**

Recent papers with robotic approach have shown promising results equivalent to those obtained by open surgery, although
with follow-periods in the short and medium term. There are still no studies comparing open vs robotic or laparoscopic vs robotic approach in patients diagnosed with IBDI. The studies carried out on RYHJ by CC show an advantage with the robotic approach over open surgery as in laparoscopic surgery, although only in retrospective studies thus, the role of robotic surgery in RYHJ by IBID has yet to be defined, although it seems promising.

**REFERENCES**


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**Table 1:** Experience reported in RYHJ by robotic approach.

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Abbreviations: LHS: Leng Hospital Stay / NA: Not available