



# Value of the Robotic Platform in a Complex Cholecystectomy: A Case Report

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## Abstract

**Introduction:** Conversion rates for Laparoscopic Cholecystectomy (LC) still range from 1.9% to 15 % and are higher when it comes to acute cholecystitis. Preoperative risk factors for conversion to open (CTO) technique are: previous upper abdominal surgery, male gender, age over 65, high BMI and history of acute cholecystitis treated conservatively. Besides that, the reported incidence of iatrogenic bile duct injuries varies between 0, 1% and 0, 5%.

**Case Presentation:** 67-year-old male with a history of previous laparoscopic distal spleno-pancreatectomy complicated by severe pancreatitis, infected pseudocyst and colonic fistula. During this complex postoperative course he also developed acute cholecystitis with suspicion of rupture and pericholecystic abscess treated with a cholecystostomy tube. Months later, still with the cholecystostomy in place, we performed a robotic cholecystectomy, without intra- or post-operative complications.

**Conclusion:** The intrinsic advantages of the robotic platform and the use of Indocyanine green fluorescent cholangiography (ICG) could make dissection and identification of anatomy easier, thus possibly reducing the rates of CTO and biliary tract injuries. Robotic assisted surgery could be an option for complex cases of cholecystectomy. ICG is an additional tool that can help identify the cystic and common bile duct during the dissection of the Calot's triangle.

## OPEN ACCESS

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## Introduction

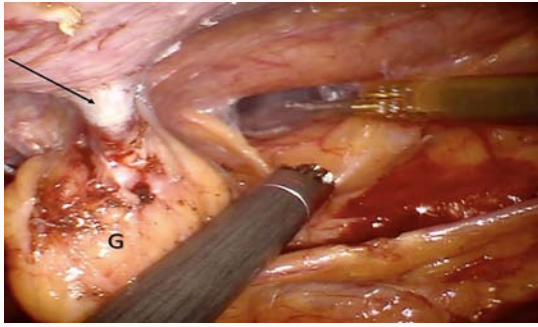
Laparoscopic cholecystectomy (LC) is the gold standard treatment for gallstone disease and is one of the most frequently performed procedures in general surgery. Conversion rates are still reported ranging from 1.9% to 15% [1,2] and they appear to be higher when considering acute cholecystitis [3,4]. Several studies [3,5,6] investigated preoperative risk factors related to conversion to open technique (CTO), among these, the most commonly accepted are: previous upper abdominal surgery, male gender, age over 65, high BMI and history of acute cholecystitis treated conservatively [3,5].

In a recently published study, Goonawardena et al. [7] reported that in 70% of the cases the decision to convert from laparoscopic to open procedure was due to difficult interpretation of anatomy because of inflammation and adhesions that made the dissection of the Calot's triangle challenging. Other common reasons of CTO are: open fistula to gastrointestinal tract or bowel injury, gangrenous cholecystitis, uncontrollable intraoperative bleeding and atypical anatomy [7].

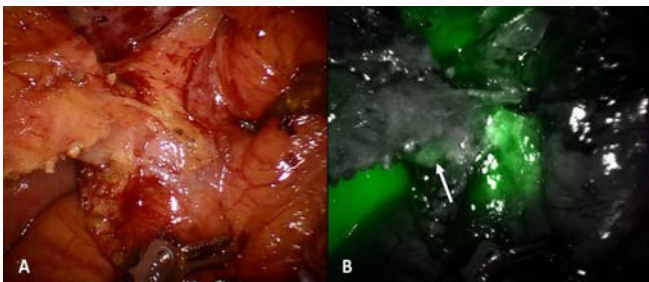
The reported incidence of iatrogenic bile duct injuries varies between 0, 1% and 0, 5% [8,9]. They represent the most feared complication of cholecystectomy and are associated with prolonged hospitalization, high morbidity, recurrent complications and can often require the patient to be referred to a tertiary center with a skilled hepatobiliary surgeon [8,10].

Several studies compared laparoscopic and robotic assisted cholecystectomy (RAC) [11,12]. Although comparable in terms of surgical outcomes and safety, some authors still find the costs of the daVinci surgical system prohibitive [11]. The robotic platform with its intrinsic advantages such as the endowristed instruments with 7 degrees of freedom and 3D vision, associated with indocyanine green fluorescent cholangiography (ICG) could be a powerful tool that can justify its role especially in challenging cholecystectomies.

We hereby report the case of a difficult cholecystectomy entirely performed in a minimally invasive fashion with the robotic platform.



**Figure 1:** Intraoperative picture showing massive adhesions sectioned with the Robotic Cautery Hook and the Cadiere forceps. The arrow points the cholecystostomy tube. **G:** Gallbladder.



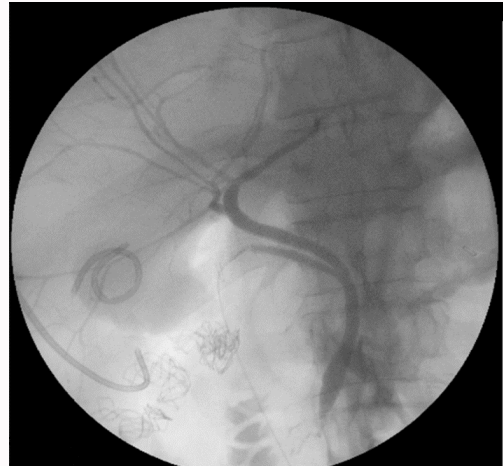
**Figure 2:** ICG evaluating the anatomy of the cystic duct. (A: White light, B: Near-infrared fluorescence ICG). The arrow points the cystic duct.

## Case Presentation

We present the case of a 67-year-old male that was referred to us for possible cholecystectomy. The patient underwent a laparoscopic distal spleno-pancreatectomy in July 2014, complicated by severe pancreatitis, infected pseudocyst and colonic fistula. He was treated for several months in a conservative manner with multiple abdominal drain placements and antibiotic therapy. During his postoperative course he also developed acute cholecystitis with suspicion of rupture and pericholecystic abscess. At that time, in consideration of the complex clinical picture, only a cholecystostomy tube was inserted to drain the gallbladder.

When he presented to us in December 2014, the cholecystostomy drain had been in place for 3 months with a major impact on the patient's quality of life. He had consulted several other doctors that, in the light of the hostile abdominal setting, were reluctant to perform surgery. We offered the option of a minimally invasive, robotic approach. A cholangiogram performed prior to surgery did not show any signs of obstruction in either the cystic duct or the common bile duct.

Intraoperatively, the procedure started with a diagnostic laparoscopy. The ports were placed under direct vision and the robotic system was docked, coming from the patient's head. The procedure started with careful adhesiolysis, detaching the omental and colonic adhesions (Figure 1). ICG was used in order to identify the cystic and common bile duct (Figure 2). The cystic duct was long and dilated. The cystic artery was clipped, allowing better control of the cystic duct. A Fogarty catheter (#4) was inserted in the cystic duct in order to clear the sludge. An intraoperative cholangiogram was negative for filling defects (Figure 3). The cystic duct was clipped and the gallbladder was detached from the liver bed. No drains were placed. The operative time was 100 minutes, including docking



**Figure 3:** Intraoperative cholangiogram with no evidence of filling defects.

time. The postoperative course was uneventful and the patient was discharged on postoperative day 2.

## Discussion

When faced with complex inflammation, with multiple adhesions that hinder a clear visualization of the anatomy, LC can be associated with higher rates of CTO [7]. This occurrence has proven to lead to increased overall morbidity, longer hospital stay, increased surgical site infection, increased reoperation rate and mortality [5].

Placement of a percutaneous cholecystostomy tube is considered a relatively safe option in critically ill patients presenting with acute cholecystitis [13,14]. Whether or not this procedure is associated with higher conversion rates when laparoscopic cholecystectomy is performed is still debated [15-17].

Our patient presented with several other risk factors for conversion: previous complicated upper abdominal surgery, male gender, age over 65 and previous episode of acute cholecystitis [7]. Nevertheless, with the assistance of the robotic platform, we were able to perform a difficult cholecystectomy in a minimally invasive way, without the need to convert and without any intra- or postoperative complications.

We performed an intraoperative cholangiogram (IOCG) to rule out the presence of common bile duct stones and ICG cholangiography to help us visualize and confirm the biliary anatomy. Routine performance of IOCG to avoid biliary tract injuries is still controversial. Several studies stated that it could have a protective effect [18], while others believe that the association is non-causal and the procedure only lengthens operative time [19,20]. We believe that IOCG should be reserved in cases with suspicion of choledocholithiasis and should not be performed routinely, since it is a time consuming procedure, with long learning curve and exposes the patient to radiations. In our department ICG has become standard practice; in a previously published study, were ported that ICG is a safe and effective procedure that can help identify at least one biliary structure in 99% of the cases, including emergency procedures for acute or gangrenous cholecystitis [21]. Fluorescence has minimal risks for the patient and doesn't significantly prolong operative time [22].

One of the major criticism leveled at the daVinci surgical system is about costs, especially regarding its use in general surgery procedures

that are commonly performed laparoscopically [23,24]. Several studies have already stated that RAC is more expensive than LC [11], even though we witnessed a reduction in costs in recent years [12]. In a recently published study, Bedeir et al. [25] Compared robotic single site cholecystectomy to conventional LC and found that the robotic approach was actually cheaper. The robotic system is definitely an expensive technique, but we believe that it can undoubtedly justify its role in difficult procedures that have high risk of conversion to open and of iatrogenic injury. These eventualities could result in reoperation and prolonged hospital stay, thus incrementing costs and distress for the patient. In our case, hospital stay was 1, 5 days.

## Conclusion

Robotic assisted surgery may be an option for complex cases of cholecystectomy. ICG is an additional tool that can help identify the cystic and common bile duct during the dissection of the Calot's triangle. The IOCG should be reserved for cases where there is a doubt of choledocholithiasis. The intrinsic advantages of the robotic technology, combined with the fluorescence scanning can offer a substantial advantage in the more challenging cases of cholecystectomy, thus possibly reducing conversion to open and iatrogenic bile duct injury rates.

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