Intra-operative Fluorescent Cholangiography Using Indocyanin Green During Robotic Single Site Cholecystectomy

AUTHORS

N.C. Buchs,

M.E. Hagen,
F. Pugin,
MI. Volonte,

P. Bucher,

E. Schiffer,
P. Morel

JOURNAL
The International Journal of Medical Robotics and Computer Assisted Surgery

Background and study aims: Very recently, robotic single site cholecystectomy (RSSC) has been reported feasible and safe for selected cases. While an intra-operative cholangiography can be performed, data is scarce with respect to its use. Indocyanin green (ICG) has been shown to be a viable option to visualize biliary anatomy. Since the introduction of a new near infrared camera integrated to the da Vinci Si System (Intuitive Surgical, Sunnyvale, CA), the surgeon is able to assess the biliary anatomy by a non-invasive and non-ionizing method. This paper presents the first report of ICG imaging during a RSSC.

Patients and Methods: Twelve consecutive patients presenting symptomatic cholelithiasis were prospectively enrolled. They underwent RSSC approximately 45 minutes after intravenous administration of ICG (2.5 mg). The biliary anatomy was analyzed using a near infrared camera integrated to the robot before and after the robotic dissection.

Results: Eight women and four men underwent the procedure. There was a port addition in one case and no peri-operative complications. Mean operative time was 85 minutes (range: 57–125). The cystic, common bile and common hepatic ducts were recognized by fluorescence imaging before the dissection in 91.7%, 50%, and 33.3% of patients, respectively. At least one structure was visualized in 100% of patients. After the completion of Calot's triangle dissection, the cystic, common bile, and common hepatic ducts were recognized in 100%, 83.3%, and 66.7% of cases respectively.

Conclusions: RSSC using ICG for biliary tree fluorescence imaging can be performed safely. Fluorescent cholangiography enabled real-time identification of the extra-hepatic biliary anatomy using a near infrared camera integrated to the robot. Its routine clinical use merits further investigations.

KEY POINTS:

1. During this preliminary prospective study, 12 consecutive patients presenting with symptomatic cholelithiasis underwent a robotic single site cholecystectomy using ICG to visualize the biliary anatomy.
2. During the dissection of Calot's triangle, visualization of the cystic duct and artery is recommended to achieve 'the critical view of safety', minimizing the risk of biliary injury.
   a) Intra-operative cholangiography has been advocated to allow an early recognition of a biliary tree lesion.
      i) Intra-operative cholangiography, however, can be difficult to accomplish using a standard single port approach and few surgeons routinely perform this examination during such a procedure.
3. The da Vinci Si HD vision system allows surgeons to view high-resolution near infrared (NIR) images of blood flow
   in vessels and micro-vessels, tissue and organ perfusion and biliary excretion in real-time during minimally invasive surgical procedures.
4. Before dissection of Calot's triangle:
   a) The cystic duct was seen in 91.7% of cases
   b) The common bile duct and common hepatic duct were recognized in 50% and 33.3% of cases, respectively
   c) The junction between the cystic duct and the common hepatic duct was seen in only 25% of patients
   d) At least one structure was visualized in 100% of the patients.

Intra-operative Fluorescent Cholangiography Using Indocyanin Green During Robotic Single Site Cholecystectomy

5. After completion of the dissection
   a) The cystic duct was seen in 100% of cases
   b) The common bile and common hepatic ducts were recognized in 83.3% and 66.7% of patients, respectively
   c) The junction between the cystic duct and the common hepatic duct was seen in 58.3% of cases
6. Expeditious detection of the main structures during the dissection of Calot's triangle, might speed up this critical phase by avoiding a biliary injury.

EndoCustomerSupport@stryker.com
1.408.754.2000 or 1.800.624.4422