ANNALI ITALIANI DI CHIRURGIA

Digital Edition
e-publish on-line
ISSN 2239-253X
Direttore Nicola Picardi

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Ann Ital Chir, 2022; 11 - Nov. 24
pii: S2239253X2203818X
Online Epub

Giuseppe Palomba*, Vincenza Paola Dinuzzi**, Giuseppe Sorrentino*, Marianna Capuano*, Raffaele Basile*, Stefania Impero*, Francesca Pegoraro***, Giovanni Domenico De Palma*, Giovanni Aprea*

**Department of Clinical Medicine and Surgery, University of Naples, "Federico II", Naples, Italy*
***General and Oncology Surgery Department, Ospedale Giuseppe Fornaroli, Magenta, Milano, Italy*
****Division of Hepato-Biliary-Pancreatic, Minimally Invasive and Robotic Surgery and Kidney Transplantation, Department of Clinical Medicine and Surgery, Federico II University, Naples Italy*

Iatrogenic biliary leak treated by performing exploratory laparoscopic using indocyanine green (ICG) fluorescence. A case report and review of literature

INTRODUCTION: *Cholangiography with indocyanine green fluorescence (ICG) is increasingly used to visualize the bile duct anatomy during laparoscopic cholecystectomy. Biliary leaks are rare complications after laparoscopic cholecystectomy, result could be lethal. Lesion's site is not always visible. We present an interesting case of a patient with biloma due to an iatrogenic lesion of the biliary tract, treated in urgency using ICG fluorescence. To our knowledge, this is the only case in the literature.*
CASE PRESENTATION: *A 62-years-old patient after 7 days from laparoscopic cholecystectomy presented abdominal pain and fever. Blood tests showed an increase of inflammation indexes. Abdominal US and abdominal CT revealed a conspicuous right sub-hepatic fluid. We performed a laparoscopy using ICG fluorescence to find the biliary leak. Operative time of surgery was 60 min. There were no complications during this procedure.*
CONCLUSIONS: *ICG is a safe and effective procedure that enables real-time visualization of the biliary system. In some cases, it can also be used in urgent surgery, where the biliary anatomy is much more complex.*

KEY WORDS: Biloma, Indocyanine green fluorescence, Iatrogenic biliary leaks, Urgent surgery

Introduction

Cholangiography with indocyanine green fluorescence (ICG) is increasingly used to visualize the bile duct anatomy during laparoscopic cholecystectomy [1]. In literature use of ICG to value biliary leak is limited only to liver resections [2]. When laparoscopic cholecystectomy became "gold standard" for symptomatic cholelithiasis and acute cholecystitis treatment, different methods were suggested to avoid iatrogenic bile duct lesions [3]. These methods include laparoscopic ultrasonography, radiographic cholangiography, and fluorescent cholangiography. The identification of Calot's triangle is a key-point for a safety laparoscopic cholecystectomy and ICG cholangiography is a valid method for the identification of bile duct during surgery. Biliary leaks are rare complications after laparoscopic cholecystectomy, results could be lethal [3]. The site of these lesions is not always visible [3]. We present a case of a patient with biloma due to an iatrogenic lesion of the biliary tract, treated in urgency using ICG fluorescence.

Pervenuto in Redazione Marzo 2022. Accettato per la pubblicazione Maggio 2022
Correspondence to: Giuseppe Palomba, MD, Department of Clinical Medicine and Surgery, Federico II, University of Naples, Italy, Sergio Pansini 5 - 80131 Naples, Italy (e-mail: giuseppepalomba3@virgilio.it)

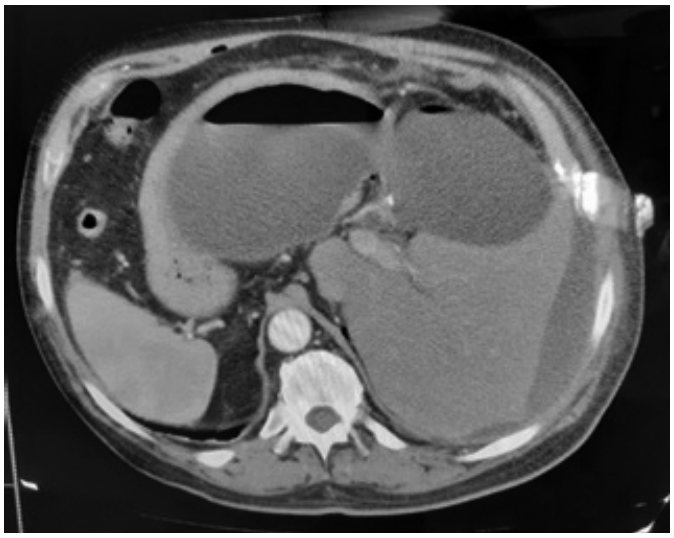

Fig. 1: Abdominal CT showed a 9.5x9 cm right sub-hepatic fluid collection compressing the stomach.

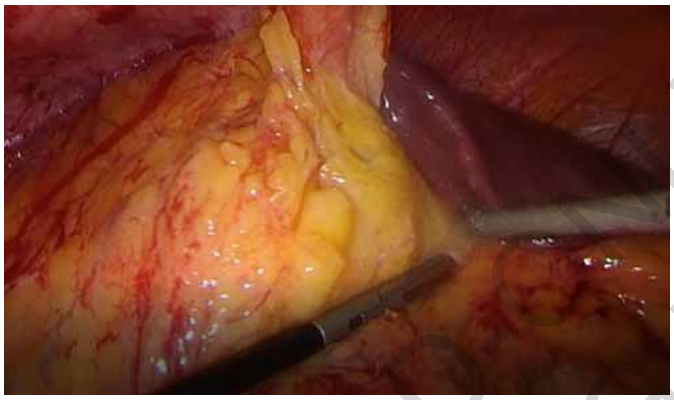

Fig. 2: The omentum was tenaciously attached to the anterior hepatic margin.

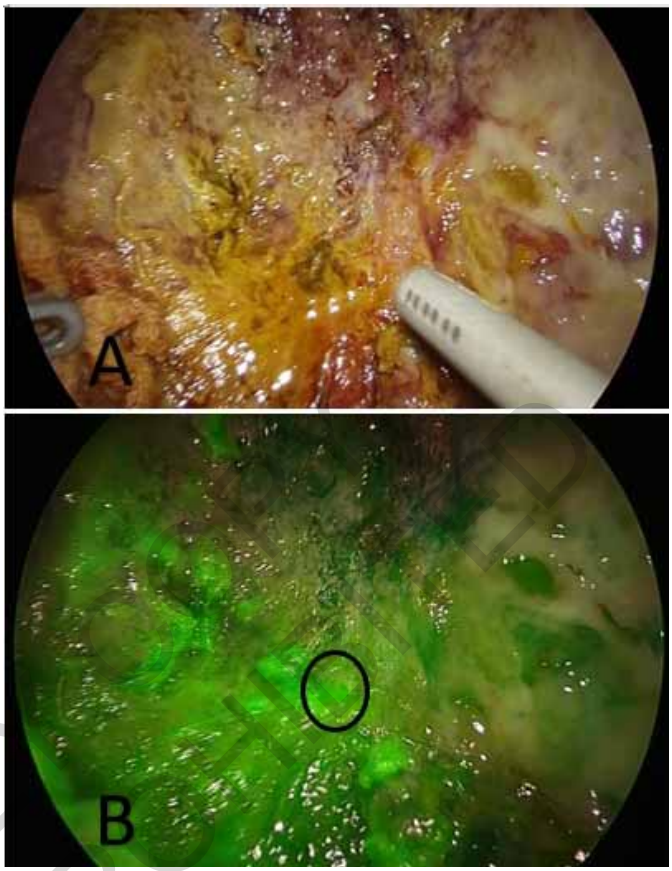

Fig. 3: A) This image shows the liver bed prior to the administration of the ICG. B) After administration of indocyanine green was possible to show biliary leak (within the circle).

Case Presentation

A 62-years-old patient after 7 days from laparoscopic cholecystectomy showed nausea, abdominal pain with fever (39 °C). Blood tests showed an increase of inflammation indexes (White blood cells: 28,80 x 10^3/uL and C- reactive protein: 85 mg/L, total bilirubin: 1.61 mg/dL, direct bilirubin: 0,86 mg/dL). Abdominal US and abdominal CT revealed a 9.5x9 cm right sub-hepatic fluid collection communicating with another 13x11 cm collection compressing the stomach (Fig. 1). We performed an exploratory laparoscopy placing the trocars in the same positions of previous surgery. We found inflammatory adhesions and a big biloma. Adhesiolysis was performed between hepatic margin and tenaciously adherent omentum (Fig. 2). Identified the surgical site by removing the biloma capsule became hard to found location of the biliary leak, only after administration of indocyanine green (0.5 mg/kg) disclose (Fig. 3). The leak was repaired with PROLENE stitches 3/0 then placed TachoSil® on the suture and last stage an under-hepatic drainage. An endoscopic retrograde cholangio-pancreatography (ERCP) with papillary sphincterotomy was performed on the third postoperative day. Operative time of surgery and ERCP were 60 and 30 minutes, respectively. There were no complications during procedures. Postoperative course was regular. The drainage removed in seventh postoperative day after US and the patient discharged in tenth postoperative day.

Discussion

Bile duct injuries (BDIs) are dangerous complications of cholecystectomy, occurred more often since the introduction and widespread adoption of laparoscopy (0.4-1.5% of cases) compared to open cholecystectomy (0,2-0,3% of cases) [4]. BDIs are surgical challenge associated with significant postoperative sequelae for the patient in terms of morbidity, mortality (up to 3.5%), and long-term quality of life. BDIs occurring during cholecystectomy are complex and require prompt identification and management. Currently, there is a wide spectrum of interventions used for the management of BDI with dif-

ferent degrees of invasiveness, ranging from computed tomography (CT)-guided drainage to various endoscopic and surgical techniques [5]. Risk factors for bile duct injuries during cholecystectomy are surgeon related (lack of experience, Intraoperative bleeding, misidentification of biliary anatomy, lack of recognition of anatomical biliary tree variations, wrong dissection plane, Improper interpretation of IOC, Residual of common bile duct stones) and patient related (empyema, acute and chronic cholecystitis, long standing recurrent disease, porcelain gallbladder, obesity, previous surgery, intrahepatic gallbladder) [6]. The BDIs are divided into minor or major injuries. Minor BDIs include injuries caused by electrocautery burns or a partial cut from dissection. They can typically be repaired with sutures and placement of abdominal drainages. Major BDIs require complex reconstruction with a Roux-en-Y hepaticojejunostomy. To help in the intraoperative detection and classification of BDI can be used intraoperative ultrasonography (IOUS), intraoperative cholangiography (IOC), and ICG-C. ICG-C provides real-time imaging of the extrahepatic biliary tract during LC and represents a noninvasive, quick, safe, and easy-to-apply tool [7]. Fluorescent cholangiography (FC) is a novel approach, which offers real-time intraoperative imaging of the biliary anatomy. This technique has been developed in ophthalmology, neurosurgery, thoracic surgery, colorectal surgery, hepatobiliary surgery, and endocrine surgery [8-12]. The first intraoperative use of FC in humans was described by Ishizawa et al [13] in 2010. The method involves the administration of indocyanine green (ICG) by either intrabiliary injection or intravenous injection 30 min before surgery. ICG binds to proteins present in bile and is excreted exclusively by the liver when administered intravenously. The excitation of protein-bound ICG by near-infrared light causes it to fluoresce, thereby delineating components of the biliary system for the surgeon. Fluorescence and imaging are achieved through a system consisting of a small control unit, a charge-coupled device camera, a xenon light source, and a 10 mm laparoscope containing specially coated lenses that transmit near-infrared light. A recent meta-analysis of 19 studies including 772 patients explored the potential of ICG-C to identify biliary structures during LC [14]. Four studies compared the use of ICG-C to IOC in 215 patients and found no significant differences for cystic duct, common bile duct, or common hepatic duct visualization. A recent survey involving 3411 surgeons (with an average of 16.1 years of practice) highlighted how the use of adjuncts such IOC, ICG-C, or intraoperative ultrasound, either routinely or selectively during difficult cholecystectomies, is not significantly associated with a lower risk of BDIs [15]. It is important to emphasize that factors such as geographic distance between facilities, equipment, expertise, and logistics, vary significantly between institutions. Some authors proposed that in cases of suspected BDI, asking the opinion of another surgeon (physically or virtually) may be an easy, effective, and inexpensive alternative to IOC [16]. ICG has more advantages than IOC; the first technique doesn't use X-ray but requires only a preoperative ICG injection and the fluorescent images of biliary tract are obtained in real time. The risk of adverse reactions to the ICG injection is very small (about 0,003% at doses exceeding 0,5 mg/kg) [17].
There are some studies in the literature that describe the use of ICG fluorescence to prevent biliary leaks after hepatectomy [18,19]. To our knowledge, there are no reports in the literature cases of repairing an iatrogenic biliary leak after laparoscopic cholecystectomy with the help of ICG, so ours should be the first.

Conclusions

ICG, already used in hepatic surgery, is a safe and effective procedure that allows real-time visualization of the biliary system. For these reasons, this novel procedure may become standard practice to prevent BDI during LC. In addition, it can be useful to the surgeon even in an emergency surgery, where biliary anatomy may be altered. However, future clinical studies are needed to evaluate the impact of this method on adverse events and patient outcome.

Riassunto

Le lesioni iatrogene delle vie biliari rappresentano una rara ma temibile complicanza della colecistectomia laparoscopica. In questo lavoro, presentato durante il 39° congresso nazionale ACOI e selezionato per un premio, riportiamo il caso di un paziente con un voluminoso biloma insorto dopo colecistectomia laparoscopica, trattato chirurgicamente con l'ausilio del verde di indocianina.
Il paziente si presentava presso la nostra struttura sette giorni dall'intervento con nausea, dolore addominale e febbre. L'ecografia e la TC addominali mostravano una voluminosa raccolta in loggia colecistica. Durante una laparoscopia esplorativa eseguita in urgenza, il leak sul letto epatico è stato evidenziato e riparato dopo la somministrazione del verde di indocianina. Il decorso postoperatorio è stato regolare e il paziente dimesso in decima giornata. In conclusione, l'ICG, già utilizzato in chirurgia epatica per prevenire e identificare lesioni biliari, potrebbe costituire un valido supporto anche nella gestione di tali complicanze insorte tardivamente post-colecistectomia.

Refereces

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