

CASE REPORT

How to avoid iatrogenic injuries of the biliary tract in urgent surgery? The use of indocyanine green is an alternative

*¿Cómo evitar lesiones iatrogénicas de vía biliar en cirugía urgente de vesícula?
El uso de verde de indocianina es una alternativa*

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Abstract

Iatrogenic bile duct injury is a rare complication, although feared due to its morbidity and mortality. In urgent surgeries, its incidence can be doubled, so in selected cases we must assess the use of resources such as indocyanine green to minimize the risk of biliary or arterial lesions by allowing the correct identification of the structures. We present the case of a 57-year-old patient with acute cholecystitis who underwent laparoscopic cholecystectomy. Given the difficulty in differentiating structures in Calot's triangle, the decision was made to use indocyanine green, which identifies a very short cystic duct, thus avoiding iatrogenic bile duct injury.

Keywords: Indocyanine green. Iatrogenic injury. Bile duct.

Resumen

La lesión iatrogénica de vía biliar es una complicación infrecuente, aunque temida por su morbimortalidad. En cirugías urgentes, su incidencia puede duplicarse, por lo que en casos seleccionados debemos valorar la utilización de recursos como el verde de indocianina para minimizar el riesgo de lesiones biliares o arteriales, al permitir una correcta identificación de las estructuras. Presentamos el caso de una paciente de 57 años con colecistitis aguda a la que realizamos colecistectomía laparoscópica. Ante la dificultad en la diferenciación de estructuras en el triángulo de Calot, se decidió utilizar verde de indocianina, que identificó un conducto cístico muy corto, evitando así una lesión iatrogénica de vía biliar.

Palabras clave: Verde indocianina. Lesión iatrogénica. Vía biliar.

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Date of reception: 12-09-2021

Date of acceptance: 05-11-2021

DOI: 10.24875/CIRUE.M21000735

Cir Cir (Eng). 2023;91(5):694-696

Contents available at PubMed

www.cirugiaycirujanos.com

Introduction

Iatrogenic bile duct injury (IBDI) is a rare complication (0.4% up to 0.6%), but we must consider its consequences, as well as morbidity and mortality. Additionally, in some cases, repairing it requires the presence of a surgical team with extensive experience in hepatobiliary surgery. In emergency surgery, the incidence of complications is up to 2 times higher according to some series, partly due to the frequently surrounding inflammation that hinders the correct visualization of the structures and the identification of anatomical anomalies (10% up to 15%), as well as the vascular and biliary elements that define the critical view proposed by Strasberg in 1995. Avoiding IBDI has been challenging since the introduction of laparoscopic cholecystectomy as the reference technique in the management of vesicular diseases. Throughout the years, different strategies have been established for performing safe laparoscopic cholecystectomy, the culmination of which is the Delphi consensus, proposing several measures in the form of objectives for performing risk-reducing surgery.^{1,2} According to some studies, the introduction of the use of fluorescence cholangiography with indocyanine green in recent years has been an advancement in the improvement of bile duct identification, with fewer risks and less technical difficulty vs traditional intraoperative cholangiography, thus representing a procedure practically free of adverse events, safe, reproducible, and cost-effective.³

Case report

A 57-year-old woman presented to the clinic with a 4-day history of right hypochondrial abdominal pain. Lab test results showed a significant elevation of acute phase reactants and cholestasis enzymes within normal ranges. The ultrasound performed revealed the presence of acute calculous cholecystitis. In light of these findings, we decided to perform a laparoscopic cholecystectomy. Once pneumoperitoneum was successfully achieved with a 12 mmHg Hasson trocar, multiple epiploic adhesions to the gallbladder bed and significant tissue friability were noticed. After maneuvers to expose Calot's triangle, proper visualization of the cystic duct was not achieved, whose insertion into the biliary tract appeared very proximal. Therefore, 0.25 mg/kg of indocyanine green was instilled intravenously, which allowed us to visualize the biliary anatomy correctly, revealing a short cystic duct and thus avoiding clipping the bile duct (Fig. 1).

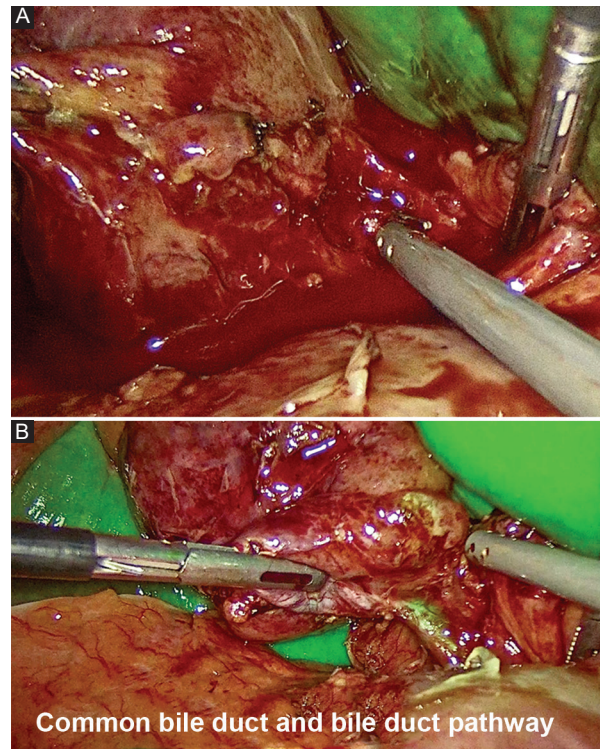


Figure 1. **A:** inflammation in Calot's triangle, with associated difficulty in structure identification. At this moment, indocyanine green is being administered, so initial hepatic uptake can be observed. **B:** the liver and bile duct can be seen through green fluorescence. The clamp on the left holds the gallbladder piece, at the tip of which lies the short cystic duct, draining into the bile duct close to the gallbladder. Its correct differentiation allows for selective clipping of the cystic duct, thus avoiding iatrogenic injury to the biliary tract.

Additionally, emergency laparoscopic cholecystectomy could be completed with greater ease and clarity in the gallbladder bed, as in this case, it was partially embedded without a clear dissection boundary between the liver parenchyma and its posterior wall (Fig. 2).

Discussion

The emergence of laparoscopic cholecystectomy and its imposition on open surgery due to its benefits regarding postoperative recovery and pain, within the framework of minimally invasive surgery, have made it the go-to technique in scheduled and emergency surgery for lithiasic cholecystopathy. Although, fortunately, IBDI is a rare entity, it occurs more frequently when the laparoscopic approach is used.¹ The most common cause of IBDI is the incorrect identification of the structures comprising Calot and Buddet's triangle, along with taking the cystic duct for the common bile duct, as well as the presence of anatomical

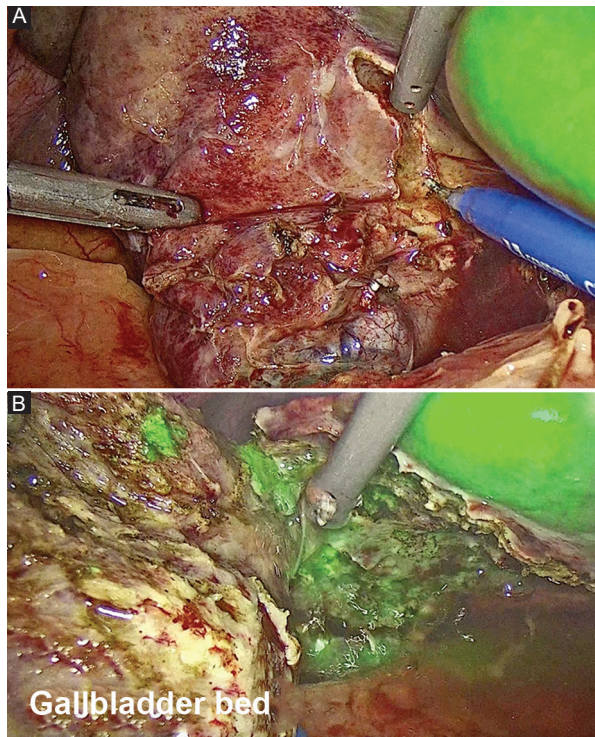


Figure 2. A: false plane of separation between the gallbladder and the liver, with bleeding after dissection due to the fusion of both planes. B: the gallbladder bed in the liver is shown here, which captures the indocyanine green, thus allowing the separation of both planes in the dissection of the gallbladder wall, which is found to be disorganized.

variants that occur in considerable rates (up to 20%).² Currently, laparoscopic cholecystectomy is indicated for acute cholecystitis since, despite the higher rate of IBDI, it has been associated with greater benefit vs the open approach. Obtaining the critical view is the safest method to avoid or reduce the risk of IBDI.³ In the 2017 Delphi consensus conference, the Japanese group of Iwashita^{4,5} established the steps that should be followed to avoid bile duct injuries, among these: 1) the importance of performing effective gallbladder traction; 2) always obtaining the critical view and identifying Calot's triangle; 3) avoiding thermal injuries by reducing the use of excessive coagulation; and 4) avoiding blind clipping in cases of unidentified bleeding, opting for compression first until identification. In some Dutch reference centers, documentation is systematized through photography or video showing the attainment of such hepatocystic triangle view before clipping.⁶ Since the key point is the correct identification of the structures, in recent years, the use of fluorescein has been established in the context of hepatobiliary surgery. Indocyanine green is a pigment with an affinity for bile proteins, to which it binds, and

its excretion is biliary. These characteristics allow it to identify bile flow and hepatic perfusion through near-infrared light sources, reaching peak fluorescence 15 minutes after its administration.

Its use in emergency surgery is not yet standardized, although it is a available and reproducible resource given its low cost, rapid biliary excretion, and high availability.^{3,7} Regarding spending, IBDI is associated with significant morbidity and mortality rates, which represents, in addition to a high health care spending, an increased mortality of up to 8%, which in a benign condition can be considered unacceptable.

Funding

None declared.

Conflicts of interest

None declared.

Ethical disclosures

Protection of human and animal subjects. The authors declare that no experiments were performed on humans or animals for this study.

Confidentiality of data. The authors declare that they have followed the protocols of their work center on the publication of patient data.

Right to privacy and informed consent. The authors have obtained the written informed consent of the patients or subjects mentioned in the article. The corresponding author is in possession of this document.

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