

The Importance of Safe Cholecystectomy

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Abstract

Introduction: The laparoscopic cholecystectomy is the gold standard of treatment of gallstones. However, it also has raised of certain complications compared to open cholecystectomy. Bile duct injury is the most catastrophic complication after cholecystectomy. For that reason, improving the safety of cholecystectomy is a constant and important task.

Methods: A literature search in English has been performed in the MEDLINE, Embase, and Science Citation Index. A mini-review of the most relevant recommendations in safe cholecystectomy was carried out.

Results: One of the factors that predispose to bile duct injury is poor visibility of the structures in Calot's triangle. The critical view of safety has proven to be a helpful tool in improving the safety of the cholecystectomy. If the safety of cholecystectomy cannot be achieved through the critical view of safety, it is advisable to re-evaluate anatomical landmarks, re-explore Calot's triangle, and consider performing bail-out procedures.

Conclusion: Safety manoeuvres in laparoscopic cholecystectomy should be performed routinely. Ensuring good vision with critical safety vision is an important component in laparoscopic cholecystectomy. In case of not obtaining it, the bail-out procedures are a recommended option.

Keywords: *Laparoscopic Cholecystectomy; Bile Duct Injuries; Complications; Safe Cholecystectomy; Review*

Introduction

Gallstone disease affects 10% of the adult population in the United States, with a prevalence of 5.9 to 21.9% in the Western population. Because of this, cholecystectomy is the most-performed abdominal surgery worldwide [1,2]. The introduction of laparoscopic cholecystectomy (LC) brought different benefits such as decreased pain, and hospital stay, among others, and quickly became the gold standard for the treatment of gallstones disease. However, it also raised concerns about the increased incidence of certain complications compared to open cholecystectomy [3]. Bile duct injury (BDI) is undoubtedly the most catastrophic and severe complication after LC. After 25 years of implementing the LC, BDI continues to occur with a reported frequency from 0.3 to 0.6%, and up to 2,300 and 3,000, BDI's are reported just in the USA. This complication reduces the quality of life, increasing morbidity and mortality after LC [4-6].

However extra biliary complications are also reported with rates almost equally as BDI's and are also lethal. These complications are small bowel lacerations, colon perforations, liver hematomas, bleeding and duodenal perforations. The duodenal perforation after LC is reported in large series rates of 0.03 to 0.2%, and major complications are around 3% [7-10].

Focus on this problem in the last years have been developed guides and consensus to improve the safety of LC. Improving the safety and efficiency of LC has become crucial and valuable. It is so important to spread this information to enhance the efficiency of this procedure and improve the lives of our patients.

Materials and Methods

A literature search in English has been performed in the MEDLINE, Embase, and Science Citation Index databases for guidelines and consensus about safe cholecystectomy, published between January 2000 and February 2023. A mini-review of the most relevant recommendations in safe cholecystectomy was carried out. Search keywords included: bile duct injury, iatrogenic, cholecystectomy, prevention, safe cholecystectomy, and consensus.

Results

The most frequently recommended options and the greatest evidence in the improvement of laparoscopic cholecystectomy are presented here, according to the list of the most important consensus in the world in the last few years.

The method of entering the abdominal cavity must be based on the characteristics of each patient (obesity, adhesions, multiple surgeries, etc). The best practice recommendation for the number of ports is the use of multi-ports. In other words, the ports must allow correct triangulation and exposure of the gallbladder [11]. Two guidelines based on international consensus recommend the use of the multiport laparoscopic technique instead of the single port in LC. As well as reducing the number of ports, it must be based on the experience of each surgeon, and these techniques require specific training [11,12]. Based on the visualization and scopes used in LC, it is recommended whenever possible to use angled scopes from 30 to 45 degrees, to improve visualization and angulation [13].

One of the factors that predispose to BDI bile is poor visibility of the important structures of Calot's triangle, as well as confusing structures or not correctly identifying vital structures. To improve visibility several maneuvers can be useful and are recommended. The Tokyo guidelines recommend correct aspiration of the gallbladder with a needle in the case of excessive distension of Hartmann's pouch, this helps to reduce the obliteration of Calot's triangle. It is also important to adequately retract the gallbladder, this allows the opening of the dissection plane in the hepatocystic triangle. Another measure that is highly recommended is the dissection following landmarks. The main landmarks are the edge of hepatic segment 4 as well as the roof of Rouvier's sulcus. Following these manoeuvres, it is highly recommended to follow and ensure the correct performance of the critical view of safety. This manoeuvre ensures a clear visualization of the structures of the hepatocystic triangle [11,14]. Surgeons must be aware all the time of the different anatomical variations. Just as always consider risk factors such as Hartmann's pouch Stone, Mirizzi syndrome, and cyst duct stones [13,15].

Critical view of safety

The critical view of safety (CVS) has proven to be a helpful tool in improving the safety of the LC, as well as reducing the risk of presenting a BDI. Different consensus from the most recognized associations continue to recommend its use. The CVS is highly recommended to make a correct identification of the structures of the hepatocystic triangle, the cystic artery and the cystic duct [11-14,16]. The CVS must be performed correctly and requires different steps, as established by Strasberg, *et al.* [17,18]. This manoeuvre requires three important elements: (1) Clearly and thoroughly clean the surrounding fat between the hepatocystic triangle. (2) Expose the cystic plaque, one-third of the gallbladder, and separate it from the liver. (3) Only two structures should be seen entering the gallbladder, the cystic duct and the cystic artery. Once the manoeuvre is carried out, its documentation in the operative report is also recommended [11,13,14]. Surgeons

must be always aware of the different anatomical variations. Also consider risk factors such as Hartmann's pouch Stone, Mirizzi syndrome, and cyst duct stones [13,19, 20].

Bail-out procedures

If the safety of cholecystectomy cannot be achieved through the critical view of safety, it is advisable to re-evaluate anatomical landmarks, re-explore Calot's triangle, and widely consider performing bail-out procedures. These include subtotal cholecystectomy, fundus first technique, and open conversion [13,14].

Subtotal cholecystectomy

Subtotal cholecystectomy is an important procedure that should be considered in case of non-visualization of Calot's triangle to avoid serious damage to biliary and vascular structures. This procedure consists of removing most of the gallbladder wall, removing the gallstones, and ensuring closure of the cystic duct stump to prevent bile leak. There are two variants: fenestrating and reconstituting. The reconstituted variant consists of leaving a remaining stump. However, there is a 5% recurrence of gallstones and symptoms. The fenestrated variant that consists of leaving an open remnant from the internal part of the cystic duct, seems to be the most recommended and well-accepted [14,21].

Fundus first technique

This technique also called "dome down", "fundus first" and "fundus down", consists of separating the gallbladder first from the liver plate starting from the fundus, without necessarily visualizing Calot's triangle. This technique should be performed by dissecting the internal plate of the gallbladder to avoid vascular injury. It also requires an understanding of the anatomy of the cystic and hilar plate to avoid vascular injury and further bleeding. This technique is accepted technique when existing severe inflammation of the Calot's triangle [11,14].

Open conversion

Conversion to open surgery is an appropriate option as long as the surgeon has an adequate experience in this procedure. The lack of experience in this procedure makes this option unsafe. The conversion is recommended when there is excessive inflammation around the gallbladder, to ensure control of the safety of the structures, and bleeding control. In recent surgical education, this technique is not widely practiced, for this reason, it is an important experience in open cholecystectomy to avoid more complications [11,13,14].

In patients with doubts about the biliary anatomy or suspicion of bile duct injury during cholecystectomy, the use of intraoperative cholangiography (IOC) is recommended to mitigate the risk of BDI and early identification of bile duct injury [12]. However, the routine use of the IOC is controversial and increases intra-operative time [13].

These points are accepted recommendations from the world's most expert consensus in recent years. However, the process of improving the quality and safety of laparoscopic cholecystectomy is constant and permanent, to improve the quality of life of our patients. Undoubtedly, these maneuvers should be taught and disseminated to all surgeons in training, for their routine use.

Conclusion

Safety manoeuvres in laparoscopic cholecystectomy should be performed routinely. Ensuring good vision with critical safety vision is an important component in laparoscopic cholecystectomy. In case of not obtaining it, the bail-out procedures are a recommended option.

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