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Research Article

Kankaria Index a Useful Tool for Safe Laparoscopic Cholecystectomy.

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Abstract

Introduction: *Cholecystectomy is one of the most performed surgeries, with bile duct injury being the most feared complication.* ***Objective:*** *to characterize the essential elements in the prevention of bile duct injuries during cholecystectomy according to the access used.* ***Methods:*** *a bibliographic review was carried out in PubMed/Medline with the words: Biliary tract injury, methods for cholecystectomy, prevention of bile duct injury, published between 2010 and 2023. Studies with more than 40 cases, comparative or no, in the English, Spanish, Portuguese languages. The variables studied were: tristructure method, visualization of Rouviere's groove, Lord Ganesha's sign.* ***Results:*** *no randomized trials were found. In addition to a group of studies that compare the Rouviere groove, Lord Ganesha's sign, Strasberg's critical view, tristructure identification, Budde and Calot triangle, and others that compare the results between different studies where there was a change in strategy were included. Most of the studies are retrospective.* ***Conclusions****: Despite the existence of all the elements previously exposed, bile duct injuries are still significant among surgical services. Where the identification and visualization of these methods, strategies and tools in a group can prevent injuries of the bile duct.*

Keywords: *Bile duct injury, prevention, safe cholecystectomy.*

Introduction

Cholecystectomy is one of the most frequently performed surgical interventions, with more than 60,000 operations per year in Japan and 750,000 in the United States. (1,2) The most feared complication, both in open cholecystectomy (AC) and in Laparoscopic cystectomy (LC) is iatrogenic bile duct injury (LIVB). Its incidence is 0.4-0.6% in the laparoscopic approach, which is 2-3 times higher than the incidence in the open approach. (1,2,3,4) Furthermore, LIVB represent significant morbidity and mortality, requiring complex and expensive treatments. (1,2,4) The cost increases by 126% when surgical treatment is required compared to a laparoscopic cholecystectomy, the incidence of which increases mortality by 8.8% over an uneventful surgery. Bile duct injuries can occur for multiple reasons, with iatrogenic bile duct injuries being the most common. They are complex clinical situations produced in apparently healthy patients that are associated with

significant morbidity and low but not negligible mortality. (1.4)

Bile duct injuries (BLI) are not decreasing despite the completion of the learning curve, the development of greater skills and experience, and the improvement of the optics of endoscopic equipment. Injuries are even reported in experienced surgeons with more than 200 endoscopic procedures and more than 30 years of work. We can mention that in the United States alone, nearly 2,000 new cases are reported per year. (2,3) It is somewhat difficult to obtain figures on the real incidence of bile duct injuries due to negligence on the part of surgeons and sometimes they are deliberately hidden from medical records and reported as anatomical anomalies. On the other hand, this feared complication is mostly treated in other institutions specialized in this type of surgery. Since surgeons are reluctant to publish their own complications and since they are treated in tertiary centers, the true magnitude of the problem remains uncertain. Based on the above, we pose the following question. Is the Kankaria index a tool by which we can guide ourselves to achieve the prevention of bile duct injuries during cholecystectomy?

Methods

A bibliographic review was carried out based on the consultation of scientific articles related to the topic (2010-2024). The information sources consulted were Pubmed, Ebsco and SciELO. The full text version was obtained through open access in Pubmed, HINARI and through open access. The information was analyzed and selected in accordance with the theme and declared objectives and was processed using computerized means.

Development

Kankaria Index: It is a prospective study conducted in the surgery department of Jaipur hospital India. The protagonists of this study were Dr. Kankaria et al 17. The objective to be achieved with this study was to design a ten-point strategy to achieve a safe endoscopic cholecystectomy.

Once he was clear about the objective he intended to achieve, Kankaria only needed to create a strategy to achieve it, and to do so he decided to use as materials and methods a total of 8,000 patients who were analyzed prospectively during the decade from 2007 to 2017. The age range of The study participants were 2 years old, the youngest and the oldest 109, of the total number of people, 63.5% were women.

Most patients were admitted for an elective procedure. Patients with symptoms of acute cholecystitis were operated on within 2-3 days of presentation or 6 weeks after resolution of symptoms. A detailed history of symptom onset, duration, and progression was taken. Patients were adequately investigated with routine blood tests including complete blood count, liver function test, kidney function test, serum electrolytes, HIV, bleeding time, PT INR clotting time studies. Serum amylase lipase was also performed to rule out pancreatitis

and serum alkaline phosphatase to rule out biliary obstruction. Imaging studies such as ultrasound were performed. In some doubtful cases, retrograde endoscopic cholangiopancreotography and computed tomography were performed to look for other pathology.

Patients were monitored postoperatively for hospital stay, postoperative pain, nausea, vomiting, oral ingestion, and other complications.

10-point strategy: A 10-point protocol was developed to perform laparoscopic cholecystectomy based on the visible anatomy upon entering the abdomen, points were assigned as shown in Table 1. After creating the pneumoperitoneum and placing the the camera, an adequate inspection of the peritoneal cavity was carried out to rule out other pathology. The remaining ports were then placed and the patient was placed in a slight right lateral position with the head up. The GB fossa was inspected after removing or retracting the omentum and intestine from the fossa. 1. The first thing that was examined was the Common Bile Duct. If it was correctly visualized, 3 points were assigned, hoping that the surgery would be safe. If it was not displayed, no points were assigned. The reason for not visualizing was the presence of adhesions. If the Common Bile Duct was visualized after dissection of the adhesion, 3 points were awarded. Based on ease of dissection, adhesions were divided into minimal adhesions and dense adhesions. 2. Next in the procedure was the Rouviere sulcus, if dissection above the Rouviere sulcus was possible, 1 point was awarded. If the Rouviere sulcus was not visible due to adhesions or absence, but safe dissection was possible by holding the infundibulum/Hartman's pouch, 1 point was also awarded. 3. While holding the infundibulum/Hartman's pouch, the anatomy of the cystic duct and artery and Calot's triangle were assessed. The presence of aberrant artery or variation in the cystic duct and artery was confirmed. If 2 structures were seen entering GB at the inspection, 1 point was assigned. If there were variations in anatomy or if 2 structures were not clearly seen either due to adherence or variation, no point was assigned. 4.

After confirming the above parameters, the dissection of Calot's triangle was started. Anterior dissection was initiated first in most patients in this study to clear Calot's triangle. It included dissection around the cystic duct and cystic artery and ganglion while clearing the peritoneum and soft fibroadipose tissue around the duct and artery. Posterior dissection was followed in a similar manner to dissect the peritoneum and soft fibrofatty tissue to clear the duct and artery. If 2 structures free of fibrofatty tissue were clearly seen, Calot's triangle was considered clear and 2 points were assigned. If Calot's triangle was not cleared as described due to adhesions or anatomical variation, no points were assigned. 5. The posterior dissection extended further upward toward the cholecystic plate. As a general rule, 1/3 of the cholecystic plaque was removed in all patients and 2 points were assigned and if 1/3 of the cholecystic plaque was not removed, no points were assigned. 6. Following all the dissection mentioned above, a ruler was made to gently lift and pull the infundibulum to give it a look of Lord Ganesha or elephant head, seeing this sign 1 point was assigned. If the sign of Lord Ganesha was not

there due to adhesions or destruction of the Calot triangle, no point was assigned.

These 10 points were calculated collectively in all patients and 3 groups were formed. Group one with 1 to 4 points was considered a risky procedure, group 2 with 5 to 7 points was considered somewhat risky, and group 3 with 8 to 10 points was considered a safe procedure.

Table 1: Distribution of 10 points (Kankaria score)

Elements	Points
Common Bile Duct visualized	3
Dissection above Rouviere's groove	1
2 structures entering GB, duct and cystic artery exposed	1
Clear Calot triangle	2
1/3 of clarified cholecystic plate	2
Elephant head appearance	1
Total	10

Classification by groups according to points	Points
Unsafe cholecystectomy	1 to 4
Moderately safe cholecystectomy	5 to 7
Safe cholecystectomy	8 to 10

The trick to prevent bile duct injury during a cholecystectomy is with the use of work tools, use of techniques or methods for its dissection and change of strategy to prevent this much feared complication. There are multiple techniques for preventing bile duct injuries: use of a 30-degree chamber, avoiding the use of thermocoagulation near the main bile duct, meticulous dissection, and conversion to open surgery when anatomy is uncertain. With a weaker Delphi consensus, they consider that the use of 30-degree optics allows better exposure of the bile duct and could contribute to avoiding bile duct injuries, as well as bipolar electrocoagulation. Despite the elements set out above, bile duct injuries are still frequently reported, putting the patient-doctor relationship in danger for the patient who is concerned with his or her life or its quality, and for the doctor, a legal process or sanction is involved. by the medical college. Therefore, all care is insufficient when we face a bile duct, which is why we consider that it would be useful to incorporate the elements of the Kankaria index to perform a safe cholecystectomy.

Among the methods used we highlight:

Tristructure method and identification of the Budde and Calot triangle: we must identify during laparoscopic cholecystectomy: Cystic Duct (CC), common hepatic duct and common bile duct. Jean François Calot (1861-1944), French surgeon, his doctoral thesis was called “De la colcystectomy” and was completed in 1890; In it it describes an

isosceles triangle given by the cystic artery and duct at its upper and lower limits respectively, and by the hepatic duct medially. International anatomical terminology contemplates the existence of this triangle under the term “cystohepatic trigone”. Calot insisted that "the surgeon must work by sight and not by faith." In 1906, Budde described an anatomical triangle between the cystic duct, the hepatic duct and the liver, and called it the "bile duct triangle." It can be divided to the triangle described by Budde (Figure 1) in two sectors, one medial (Critical Triangle) and another lateral (Safety Triangle), its separation limit being a line that goes from the hepatocystic angle, passing through the birth of the cystic artery. and reaching the hepatic margin. The identification of the cystic triangle constitutes a universal method for safe cholecystectomy for both routes during a cholecystectomy present in the guide and score for the safety of this procedure. The biliary tree is represented by the “cystic lymph node” or Mascagni nodule, which is always found lateral to the biliary tree and should form the medial end point of dissection. (3,6,7) The above agrees with Algieri et al. (5), and they constitute principles of dissection during a cholecystectomy the Cuban school of surgery mentions in its work standards. Infundibular technique: consists of identifying the cystic duct as it joins the gallbladder infundibulum. It is the most used technique currently in most centers. In such cases, some surgeons prefer to perform the infundibular method to work very close to the infundibulum of the gallbladder, reducing the risk of biliary injury, but care should be taken with “occult cystic duct” syndrome which presents a deceptive appearance of a false infundibulum that tricks the surgeon into identifying the common bile duct as the CC. The “anterograde dissection or fundus first/dome-down technique” represents a form of dissection from the bottom of the gallbladder to the infundibulum away from the Calot triangle. In this way, the gallbladder is pedunculated by the cystic artery and the cystic duct, which can in turn be cut and divided, reducing the risk of biliary injuries. (9,10,11,12) It has the disadvantage of not preventing iatrogenic bile duct injury in patients with occult cystic duct syndrome. For this reason, different groups systematically recommend the use of intraoperative cholangiography (IOC) with this type of technique. (10,13)

Strasberg's Critical View Technique or safety: consists of the dissection and release of Calot's triangle until the artery and cystic duct are exposed and the base of the liver is exposed (Figure 2). Once this view is achieved, these structures can only correspond to the duct and the cystic artery (fig. 3). In cases of aberrant ducts or in cases of highly inflamed vesicles, exposure of the inner layer of the subserosa is suggested, optimizing the critical view. Strasberg et al. (14) reports that 80% of bile duct injuries are caused by premature and early interruption of the cystic duct without the identification and preparation of the anatomical structures having been completed.

Over the years, several methods have been proposed and described in the scientific literature to prevent iatrogenic bile duct injuries. The critical safety view (CVA) technique was introduced by Strasberg in 1995 and is considered the gold standard for performing a safe cholecystectomy with identification of biliary structures during dissection. Three criteria are required to achieve the critical safety view: 1) the hepatocystic triangle must be cleared of adipose tissue and fibrotic tissues; CBD and CHD should not be exposed; 2) the lower third of the gallbladder must be separated from the liver bed to expose the cystic plate; and 3) two and only two structures should be seen entering the gallbladder. In 2013, Sanford and Strasberg et al. (15) proposed photographic documentation of Strasberg's critical view in order to increase safety in laparoscopic cholecystectomy. This photodocumentation consists of qualifying the anterior and posterior vision of the critical safety vision using an established score, using the term “doublet view.” Obtaining a satisfactory safety critical

view is also part of other safe cholecystectomy programs, such as that implemented by the Society of American Gastrointestinal and Endoscopic Surgeons.(16)

In 2017, Strasberg et al.(14) noted that they had detected that, after 20 years, many surgeons have little understanding of the criteria required to achieve the critical safety vision, especially those who did not have training in implementing it in laparoscopic cholecystectomy during their residency, so they opt for simpler methods, such as the infundibular technique, which represents a greater risk of bile duct injury. Another obstacle mentioned is that when the critical safety vision is carried out, photographic documentation with the qualification of the "pair vision" is generally not carried out. Current evidence shows that with the implementation of critical safety vision the probability of iatrogenic bile duct injury is 0 to 0.03% and in a Japanese review from 0.77% it has decreased to 0.58 with its implementation. Applying the Delphi methodology, a recent work by the Turkish Hepato-bilio-pancreatic Surgery Association attempts to reach a consensus on bile duct injuries. They reach a consensus that it is necessary to achieve a critical vision of safety; if this is not achieved, laparoscopic cholecystectomy should not be continued and a partial cholecystectomy or conversion to open surgery may be performed. Therefore, failure to identify critical safety vision should alert the acting surgeon and systematically establish the following steps: 1) intraoperative pause and call a colleague. 2) use of cholangiography or intraoperative indocyanine green. 3) conversion or change of technique.

Visualization of the Sign of Lord Ganesha: This sign, also called the elephant's trunk or head (Figure 3), is another measure to prevent this feared complication and this sign is part of the union of the infundibular technique and Strasberg's critical view. . Ashok et al. (17) in his study he created a scoring system for safe cholecystectomy where the visualization of the sign of Lord Ganesha is part of this, granting 1 point when it is present, it constitutes one more tool in the arsenal for the prevention of bile duct injuries. . Tantia et al. (18) mention the visualization of the elephant trunk as an element to always take into account during a cholecystectomy and its non-visualization is associated with inability to adequately dissect Calot's triangle. Although this sign only contributes one point in this score, its non-visualization indicates an inadequate infundibular technique and critical safety vision, and may be associated with the possibility of an injury to the pathway without a change to an appropriate strategy. (19,20,21)

Visualization of Rouviere's sulcus: Different anatomical landmarks for cholecystectomy have been described: among them, in 1924, Henri Rouvière, French surgeon, this sulcus measures 2 to 5 cm long and is present on the lower surface of the right lobe of the liver, running to the right of the hepatic hilum (Fig. 4). It is easily visible in the majority (80%) of cases in which it remains open (partially or completely), and usually contains the right portal pedicle and identifies the sagittal plane of the main bile duct. During Laparoscopic Cholecystectomy, it is best seen when the neck of the gallbladder is retracted into the umbilical fissure. The dissection can safely begin in a triangle anterior and superior to the plane of the sulcus. It is essential that the surgeon knows the safe dissection zone to delineate the cystic duct and cystic artery. Looking at the fixed anatomical landmark (B-SAFE) will help the surgeon identify and remain in the safe dissection zone. These fixed anatomical landmarks include the bile duct and base of segment 4 (B), Rouviere's groove and segment 4 (S), hepatic artery (A), umbilical fissure (F), and enteric viscera (E), p. duodenum, pylorus. The Rouviere sulcus can now be defined in three simple terms: a deep sulcus, a cleft, or a scar. It is recommended by Lazarus et al. (22), Singh et al.(23), Cheruiyot et al.(24) and Al-Naser et al.(25) As a first step in laparoscopic cholecystectomy, the

surgeon must look for this reference point (either in of scar, cleft or royal groove) which will be the plane of the main bile duct, and therefore avoid any dissection below this point to eliminate any danger to the bile duct during surgery.(26,27)

Although the groove of Rouviere is increasingly mentioned as the first landmark to begin dissection during laparoscopic cholecystectomy to prevent bile duct injuries, the anatomy of the groove has not been described in clear and simple terms. With an increasing emphasis on patient safety in recent years, it is recommended to identify and follow some landmarks that can guide surgeons from where to start dissection by identifying the common bile duct (CBD) plane even earlier. before the dissection begins. A common landmark or landmark that is increasingly described in recent reports is the Rouviere groove. This sulcus, which was barely seen and described in the era of open surgery, is very clearly seen during laparoscopic cholecystectomy. Today the SR is an element present in the guidelines proposed by Wakabayashi et al. (2), Gupta et al.(8) and Barauskas et al.(19) in favor of a safe cholecystectomy, this dissection plane should never be violated which promotes adequate visualization of the critical safety vision, thus achieving a safe procedure.

Conclusions

The Kankaria index constitutes a valuable tool for services dedicated to laparoscopic surgery of the bile duct, providing already known elements but in an even more didactic way to evaluate the risks and early request help from a colleague or change strategy with its different modalities.

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