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Original Research Article

Cystic vein: a guide for safer laparoscopic cholecystectomy

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ABSTRACT

Background: Major complications of laparoscopic cholecystectomy are bleeding and bile duct injury, and it is necessary to clearly identify structures endoscopically to keep bleeding and injury from occurring. The aim of this study was to depict the anatomic landmark in the Calots triangle, a vein (cystic vein), a constant feature which can help Laparoscopic surgeons to conduct a safe LC along with other precautions to be adopted.
Methods: A total of 100 patients (58 male, 42 female) who underwent cholecystectomy were examined preoperatively by clinically. The origin and number of cystic veins and their relationship with the Calot triangle was evaluated.
Results: The cystic veins were delineated intraoperatively in 80 of the 93 patients. The relationship between the cystic vein and the Calot triangle was identified in 80 (86.02%) of the 93 patients. One cystic vein was found in 53 (66.25%) patients, while multiple cystic veins were found in 27 (33.75%) patients. All these veins are above the cystic common bile duct junction.
Conclusion: The configuration of the cystic veins and their relationship in the Calot triangle with cystic artery and cystic duct can be identified intraoperatively and used as a guideline for safe laparoscopic cholecystectomy.

Keywords: Bile duct injury, Cystic vein, Laparoscopic cholecystectomy

INTRODUCTION

Laparoscopy cholecystectomy was first performed in 1989 and today is widely accepted as the gold standard for cholecystectomies.[1]

But over the period of time it was seen to have more bile duct injury rate than open procedure. The reported rate of laparoscopic bile duct injury ranges from 0.1-2.2% as opposed to the 0.1% for open cholecystectomies.[2,3] Thus various studies started to device methods to make laparoscopic cholecystectomy as safe as or more safe than open cholecystectomy. Various risk factors have been stated for these bile duct injuries but the common factor is the misidentification of CBD or CHD for cystic duct in an acute case.

Present study has demonstrated the presence of a anatomic landmark in the Calots triangle, a vein (cystic vein), a constant feature which can help laparoscopic surgeons to conduct a safe LC along with other precautions to be adopted.

METHODS

This study is a retrospective analysis of the laparoscopic cholecystectomies done by the team of two surgeons, equally acquainted with basic laparoscopic procedures over a 2-year period (January 2014 to December 2015). All the cases have been selected from the patients coming to our OPD with acute and chronic gallbladder disease. Patients excluded from the study were suspected gallbladder mass, malignancy, and empyema and those cases where it was decided to perform a OC.

In a total 100 cases were taken in the study irrespective of age, sex and duration of disease. These cases were categorized into 2 groups: Group 1 consisting of the acute cases operated within 72 hours (30 cases) and Group 2 consisting of chronic gallbladder disease (70 cases) who have been operated after 4 to 6 weeks of acute attack or later as and when they presented. The cases who had to be converted to OC were excluded from the study (4). From Group 1, 5 cases were converted and from Group 2, 3 cases were converted.

All the cholecystectomies were done taking the critical view of safety into consideration. The calots triangle was meticulously cleared of all the fat. The cystic duct and cystic artery were clearly delineated. The cystic vein was dissected out and was cauterized using Harmonics and then the duct and artery was clipped.

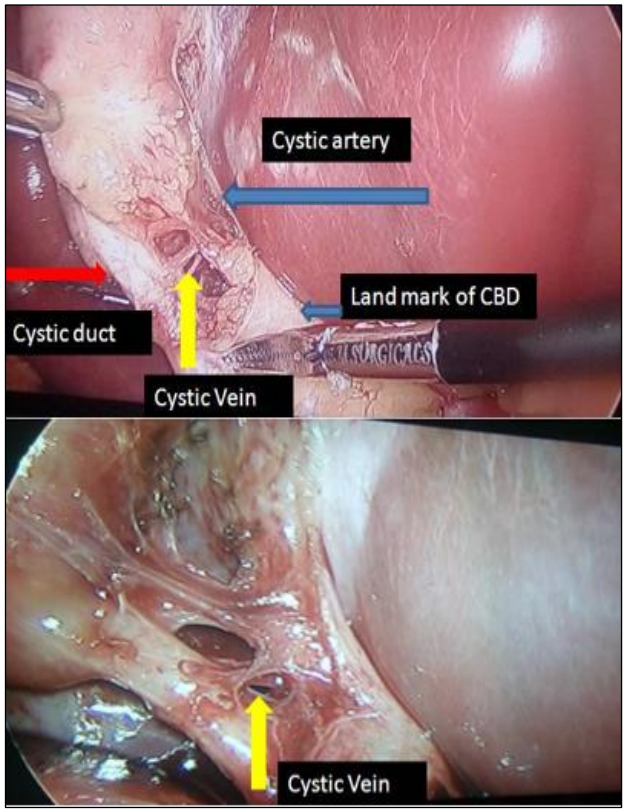

Figure 1: Laparoscopic view of calots triangle with cystic vein at crucial point.

RESULTS

Out of the 100 cases taken for study, Group I (acute cases, who were operated within 72 hours of attack) consisted of 30 cases and Group II (electively operated cases) 70 cases. In Group I we had to convert 4 cases to open cholecystectomy due to frozen Calot's. In Group II, 3 cases were converted. Thus 7 cases were converted (from both groups) and were not taken into consideration in this study. From the remaining cases in Group I (26), and Group II (67) were thus taken in the study.

Table 1: Total number of study cases with respect to group.

Group	Total cases	OC	Study cases	Percentage of conversion
I	30	4	26	13.3%
II	70	3	67	4.1%

Out of the 26 cases in Group I (acute cases), cystic vein was very well delineated in 20 cases (76%). The cystic veins were dissected out and we found in 12 cases there were multiple cystic veins (60%) and in 8 (40%) cases there was only 1 vein. Out of the 67 cases in the second group (chronic) cystic vein was delineated in 60 cases (89%) Table 2.

Table 2: Percentage of cases cystic vein delineated.

Group	Cases	Cystic vein delineated	Percentage
I	26	20	76%
II	67	60	89%

Here also we could differentiate between multiple and single cystic veins. Out of the 60 cases we found multiple cystic veins in 47 cases (78.3%) and single cystic vein was found in 13 cases (21.66 %).

DISCUSSION

Laparoscopic cholecystectomy was first done in 1989. It was advocated as the best method and elected as the "gold standard" for cholecystectomy by the National Institute of Health Consensus in 1992.[1] After some period of time emerged the realization that the rate of bile duct injuries has increased.[2,3] In 1990, Sir Alfred Cuschieri alerted the surgeons regarding the complication of laparoscopic cholecystectomy.[4] Rate of biliary injuries in LC is almost 3 times that of OC (0.2-2.2% versus 0.2%).[3]

Different studies were conducted over the period of time to determine approaches for a safe LC. The oldest and the common approach to LC was the infundibular approach (dissection).[5,6] But the pitfall in this approach was that the anatomical variants of biliary tract and vasculature may be misidentified as the cystic structures. Katkhouda et al, propounded the visual cholangiography approach, where he extended the cystic duct dissection to the CHD.[7] Then

was propagated the "fundus first" (dome down) approach, advocated for acute cholecystitis.[8,9] Stratsberg et al pointed out the importance of the critical view of safety.[5] Three criteria are required to achieve the CVS:

- Hepatocytic triangle is delineated clearly by removal of fat and fibrous tissue
- Cystic plate is dissected out
- 2 structures seen entering the gallbladder.

In 2012, Peti and Moser determined the surgical importance of Rouviere's sulcus for a safe cholecystectomy.[10,11] The cystic duct and artery lay anterosuperior to it and the CBD lay below it. The Rouviere's sulcus was first identified by Rouviere who used it as a reference point for liver dissection.[12] The SAGES safe cholecystectomy program suggested strategies for a safe LC. Six anatomical landmarks for a safe LC are Hartmann's pouch, lymph node of lund, Calot's triangle, union of cystic duct with bile duct, cystic artery and right hepatic artery, Rouviere's sulcus.[13,14]

Cystic veins are one structure in the body which have been variously described in different books. In the Thesaurus dictionary, it is said to be having anterior and posterior branches, drain the neck of gallbladder and cystic duct along which they pass to enter the right branch of portal vein. In the anatomy books, it also has been variously described. Grant's anatomy book describes cystic vein as draining directly to liver and venous twigs joining the branches of portal vein.[15,16] Gray's anatomy describes cystic veins joining near the neck of gallbladder to form either single or double cystic veins which flow along the cystic duct and upward along the hepatic ducts.[17] Schwartz principle of surgery describes the venous drainage as variable and generally does not run parallel with the arteries.[18] Other books also vaguely describe the cystic vein as either draining to the liver or the portal vein.[19]

Laparoscopy has apart from its other advantages, magnified the anatomy of the Calots triangle. This magnified view and meticulous dissection necessitated to avoid bleeding during laparoscopy has led to the uncovering of these venous structures within the calots. These veins are seen to cross between the cystic duct and the cystic artery almost midway between the infundibulum of the gallbladder and cystic duct CHD junction. These veins have been constant except in frozen calots, or very dense adhesions. We usually need to cauterize these veins to avoid the minimal oozing that is associated with these.

During difficult cases as well as in other cases this vein may also be taken as a landmark for a safe cholecystectomy. By not going below this vein, we may avoid injuring the CBD/CHD. This cystic vein may serve as an adjunct to other safety methods we have adopted to make laparoscopic cholecystectomy safe. Further studies may be warranted to establish this fact but to make laparoscopic cholecystectomy as safe as possible is a burden we have taken upon ourselves.

CONCLUSION

A consistent feature of the laparoscopic cholecystectomy in the present study group was the presence of these venous twigs that cross between the cystic duct and cystic artery. A vein is seen running longitudinally along the cystic duct adhered to it. The venous twig in the present study is seen running longitudinal to this, arising from it. They are usually seen to lie between the infundibulum of the gallbladder and the junction of the cystic duct and CBD/CHD. They can be either single or double in nature. They do not cross the CHD. Thus, we can safely take it as an anatomical landmark in the Calots triangle for a safe laparoscopic cholecystectomy. If we can adequately identify this vein the CHD/CBD can be safely presumed to lie some distance below it. Thus, this vein can be used as an adjunct to the widely accepted CVS technique and other landmarks for a safe LC.

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