

## Role of Critical View of Safety in Laparoscopic Cholecystectomy

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### ABSTRACT

**Background:** Biliary injury is frequently seen as a complication after laparoscopic removal of gall bladder. In order to minimize the occurrence of this dreadful complication, "critical view of safety" involving dissection in the triangle of Calot's and subsequent recognition of cystic structures before surgery has been proposed.

**Objective:** To determine the role of critical view of safety in laparoscopic cholecystectomy.

**Study Design:** Descriptive cross-sectional study.

**Place and Duration of Study:** Department of Surgery, Benazir Bhutto Shaheed Teaching Hospital Abbottabad from 1<sup>st</sup> January 2018 to 30<sup>th</sup> September 2019.

**Methods:** Three hundred patients requiring laparoscopic cholecystectomy were enrolled. Before clipping, the cystic artery and duct were isolated by critical view of safety. Demographic data of patients in addition to occurrence of intra-operative or post-operative complications was recorded.

**Results:** Majority of study participants were females, 264 (88%) females and 36 (12 %) males. Females were older than males ( $p>0.05$ ). Operative findings included non inflamed gall bladders in 83% patients of which 90% were females and rest were males. Difficult cholecystectomy like acutely inflamed gall bladder was seen in 17% patients and out of those 13% were females. Most of the patients were discharged from hospital by the third post-operative day. Only one patient developed bile leak but that was due to cystic duct slipped ligature.

**Conclusions:** The incidence of injury to biliary ducts during laparoscopic cholecystectomy can be minimized by application of "critical view of safety".

**Key words:** Critical view of safety (CVS), Laparoscopic cholecystectomy (LC), Common bile duct (CBD)

### INTRODUCTION

Despite the fact that laparoscopic cholecystectomy is considered the "gold standard" for surgical treatment of cholelithiasis since 1992<sup>1,2</sup>, the intra-operative injury to biliary structures is three times common than in traditional surgical technique.<sup>3</sup>

A standard approach for laparoscopic cholecystectomies involves dissection of the Calot's triangle to remove extra layer of fat for clipping of cystic structures which include the cystic artery and duct. This technique is called "infundibular approach". While laparoscopic cholecystectomy has a number of advantages for the patients such as faster recovery, a short stay at hospital and less pain, it is associated with injury to major bile ducts (3 per 1000 surgeries).<sup>4</sup> Incorrect identification of structures in the triangle of Calot's is the most common reason for such injury.<sup>5</sup>

The concept of "critical view of safety" addresses this problem and stresses correct identification of targets, i.e. cystic artery and cystic duct.<sup>6</sup> Since its introduction by Strasberg and colleagues in early 1990s, this concept has found acceptance and wide use in laparoscopic cholecystectomy.<sup>7</sup> There is consistent evidence of technique's benefits in the literature with significant reduction in inadvertent injury to bile ducts.<sup>8</sup> Critical view of safety requires dissection in the Calot's triangle to the extent of "skeletonizing" the structures presents in the triangle and to identify the cystic artery as well as the cystic duct entering the common bile duct.<sup>1,8,9</sup>

Here, we share our experience of laparoscopic cholecystectomies in patients who were operated by different surgeons who started laparoscopy and followed CVS before clipping cystic duct and artery and the outcome was determined in terms of injury to common bile duct or the common hepatic duct in our patient population.

### MATERIALS AND METHODS

This descriptive cross-sectional study was conducted at Department of Surgery, Benazir Bhutto Shaheed Teaching Hospital, Abbottabad from 1<sup>st</sup> January 2018 to 30<sup>th</sup> September, 2019. A total of 300 patients underwent laparoscopic removal of gall bladder and these surgeries were included in this study. All surgeries requiring conversion to open cholecystectomy were excluded from this study. All operations were carried out by different surgeons and each carried almost same number of cases

in above period. During post operative time patients in surgical ward were kept under observation regarding development of bile leak in terms of drain output, severe abdominal pain + collection on ultrasound or development of jaundice. Standard four port laparoscopic cholecystectomy was done in all patients and before application of clips, critical view of safety was achieved and Calot's triangle was clearly defined. Dissection of the gallbladder peritoneum was started posteriorly from infundibulum followed by anterior dissection with the help of electrocautery hook. The right side of the gall bladder peritoneum was opened, and a hole above the cystic artery and duct was thus formed. Clips were not applied to any structure before clearing lower third of gall bladder off the liver bed. The data was entered and analyzed through SPSS-25.

### RESULTS

The majority of study participants were females 264 (88%), the rest were males 36 (12%). The mean age was  $45.62\pm 5.78$  years. Females were older than males ( $44.28\pm 4.83$  years in females vs  $42.88\pm 2.34$  years in males) although the difference was not statistically significant ( $p>0.05$ ). Different operative findings included non inflamed gall bladders in 83% patients of which 90% were females and rest were males. Difficult cholecystectomy like acutely inflamed gall bladder was seen in 51 (17%) patients and out of those 39 (76.47%) were females. In patients of acutely inflamed gall bladder, sub-hepatic drain was placed and out of these 12 (23.53%) patients had bile output of 20-50 ml in first 24 hours followed by nil or less than few milliliters in next 24-48 hours. Those patients with serous or bloody output in drain were not considered. Majority of patients 82% with laparoscopic cholecystectomy were sent home on 1<sup>st</sup> post operative day. The rest were sent home on 2<sup>nd</sup> or 3<sup>rd</sup> post-operative day. All the patients had uneventful post operative stay and were discharged from hospital. Only one female patient was re-admitted on 5<sup>th</sup> post operative day due to persistent abdominal pain, vomiting and jaundice. Her operative findings were Empyema gall bladder and poorly defined Calot's triangle. MRCP showed sub-hepatic collection but point of leak not mentioned. U/S guided aspiration of around 500 ml was done that revealed bile but re-collection confirmed on sonography again in next 2 days. The patient was explored and operative findings were intra peritoneal bile and slippage of ligature of cystic duct which was ligated again. Patient

was kept on broad spectrum IV antibiotics and fluids and sent home on 7<sup>th</sup> post operative day.

## DISCUSSION

Following laparoscopic cholecystectomy, complications such as injury to bile duct remain important determinants of subsequent morbidity and mortality. A number of risk factors have been identified that affect the incidence of such injuries and these include: inflammation of gall bladder, surgeon's experience and anatomical variations of nearby biliary structures. Acute cholecystitis, has a three times increased risk of biliary tree injury in laparoscopic cholecystectomy.<sup>10</sup> Another important risk factor for injury to biliary structures is inflammation at the triangle of Calot.<sup>11</sup> It is widely believed that a "learning curve" is responsible for the incidence of biliary injuries early in the career of laparoscopic surgeons, however, inexperience of the surgeon alone cannot explain this phenomenon.<sup>12</sup>

The critical view of safety is not a complicated procedure; it can be used by any surgeon during open as well as laparoscopic removal of gall bladder. In this technique, the operating surgeon cut the lateral serosal leaf of gall-bladder before doing the medial dissection. The majority of dissection to achieve CVS was done using cautery hook but Maryland's forceps was also used where needed. The triangle of Calot's was dissected thoroughly to make sure proper structures entering/leaving the gall bladder and were clipped afterwards and before cutting of duct.<sup>7,13</sup> In our study, only one patient (0.33%) developed bile leak after surgery and was managed accordingly. The rest of patients had an uneventful recovery in the post op follow-up period. In a comparison of infundibular technique with the critical view of safety technique, Vettoretto et al<sup>8</sup> reported that among 90 patients operated with critical view of safety technique had only 1 (1.11%) had developed cystic duct leak. On the other hand, among 84 patients operated by infundibular approach, 2 (2.4%) had developed intra-operative bleeding. Vettoretto et al<sup>8</sup> also reported that the shorter operative time made critical view of safety a "gold standard" for laparoscopic removal of gall bladder. Similar results have been reported by Kaya and colleagues who reported no intra- or post-operative biliary complications in a cohort of 120 patients where females constituted the majority.<sup>1</sup> A randomized controlled trial from Lahore, Pakistan, which compared critical view of safety with infundibular approach in terms of common bile duct injuries and mean operative time reported that there was no significant difference between the two approaches in terms of injury to common bile duct ( $p>0.05$ ).<sup>15</sup> Lesser incidence of bile duct injury in critical view of safety approach has been documented in literature.<sup>8,16</sup> Our results are comparable to those reported in literature, though a comparison of critical view of safety with other approaches for laparoscopic cholecystectomy would have helped us observe the effectiveness of this approach in a much better way.

The critical view of safety technique has established itself as an effective means to decrease the morbidity and mortality after laparoscopic cholecystectomy. Infact, it has been recommended as the "most effective approach to prevent bile duct injury" by the European Association of Endoscopic Surgery (EAES).<sup>14</sup> In view of such recommendations and its obvious advantage over other techniques, the critical view of safety approach to laparoscopic removal of gall bladder should be made a first choice for this procedure and be included in the curriculum of surgical residency programs. We conclude that the CVS technique is very safe and

minimize bile duct injury during laparoscopic cholecystectomy, including the difficult cases.

## CONCLUSION

Critical view of safety technique minimizes the bile duct injury during laparoscopic cholecystectomy, even in complicated cases. Further training is needed to properly apply the CVS technique in clinical practice to standardize laparoscopic approaches to gallstone disease.

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