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Research Article

Nigam's Strategy for Safe Cholecystectomy (NSSC) – with Do's and Don'ts

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Abstract

We have developed the strategy for safe cholecystectomy, Nigam's strategy for safe cholecystectomy (NSSC) to avoid complications. Safe cholecystectomy is safe for both the patient and the surgeon without any bile duct or hollow organ or vascular injury. The safe cholecystectomy should reduce the risk of complication to minimum. Safe cholecystectomy by laparoscopic approach can be achieved through a thoughtful strategy including good understanding of anatomy and safe dissection. It is randomized study done at Max hospital, Gurgaon, Haryana, India. The study included patients of acute and chronic cholecystitis who attended the hospital between Jan 2019-Jan 2025. Patients other than acute cholecystitis having gall bladder disease where excluded in the study. All patients were operated for cholecystectomy by same team of surgeons. The preoperative and intraoperative discussions along with achievement of critical view of safety (CVS) are essential steps in doing safe cholecystectomy according to Nigam's strategy for safe cholecystectomy. Do's and Don'ts guide the surgeon accordingly for performing safe cholecystectomy. Considering the number of cholecystectomies performed worldwide today it is essential to do safe cholecystectomy and train young surgeons to make a habit of selecting safety over hurry and temptation. The results of the study showed no major complication which concluded that Nigam's strategy safe cholecystectomy (NSSC) is a good practice to avoid complications and do a safe cholecystectomy. We advise young surgeons to follow Nigam's strategy for safe cholecystectomy.

Keywords

Bile Duct Injury, Cholecystectomy, Cholecystitis, NSSC

1. Introduction

1.1. Anatomy

Cholecystectomy is one of the common surgical operations globally. The main aim of cholecystectomy, whether laparoscopic or open is safe surgery avoiding complications which may be serious and sometimes life threatening. Bile duct injury and vascular complication are to be avoided at all cost as they are serious and may make the life of the patient miserable. Bilio-vascular anatomical variations are common and they further complicate the matter and so utmost alertness and caution are required during the dissection in Calot's triangle and around it. Aberrant anatomy may include a short cystic duct, aberrant hepatic ducts or a right hepatic artery that crosses anterior to common bile duct [1].

Anomalous biliary anatomy is frequently encountered by surgeons during cholecystectomy….. but may be significant

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during surgery as failure to recognize them leads to iatrogenic injuries and can increase morbidity and mortality [2].

1.2. Post-operative Complications

Post-operative surgical complications are common with laparoscopic cholecystectomy. It is associated with an overall complication rate of approximately ten percent with a higher risk of biliary injury (0.1%-1.5%) [3-5] when compared to the open approach (0.1%-0.25%) [6, 7]. Most of the complications of cholecystectomy are preventable. By proper understanding of normal and aberrant anatomy of biliary system with sufficient training, correct and cautious surgical approach including achievement of critical view of safety one can do safe cholecystectomy both laparoscopic and open.

1.3. Critical View of Safety (CVS)

The critical view of safety (CVS) achievement is the essential goal before stapling and dividing cystic duct and cystic artery. The R4U line is called the safety line, safe zone of dissection lies cephalad to the line extending from the roof of the Rouviere's sulcus (M. Henri Rouviere described it in 1924) to the umbilical fissure through the base of the segment 4 [8].

1.4. Nigam's Strategy for Safe Cholecystectomy (NSSC)

Safety is the basic requirement of all surgeries, similarly it is needed in laparoscopic or open cholecystectomy also. Safety means reduction in the chances and risk of complications. In case of cholecystectomy bile duct and vascular injuries are the main problems which can be serious. The safe cholecystectomy requires clear understanding of anatomical landmarks and clear and safe dissection, to achieve these factors one must follow a plan or strategy. We have developed our strategy for safe cholecystectomy i.e. Nigam's strategy for safe cholecystectomy (NSSC). We follow certain methods and principles, based on universal understanding of the ways to achieve safe cholecystectomy. We are proposing a strategy to do the cholecystectomy safely though a large number of strategies have been proposed to safeguard against BDI/VBI [9-12].

NSSC broadly divides the whole process into: Preoperative discussion – Intraoperative anatomical landmark identification – Intraoperative time out I and discussion I – surgical steps – (I to VII) – Intraoperative time out II, and discussion II (before clipping cystic duct and artery) remaining. Surgical Steps – (VIII to X).

2. Materials and Methods

2.1. Patient Selection

This study is done at Max Hospital, Gurgaon, Haryana, India. There were 240 total cases in the study who were operated by NSSC between Jan 2019-Jan 2025. This is a single centre study. The study includes cases of acute and chronic cholecystitis with gallstones, pyocele, mucocele, perforation and gangrene of gall bladder. All these cases were operated by same surgeon and same surgical team under same strategy of safe cholecystectomy. Informed consent was taken from all patients. Patients with cholangitis and pregnant patients were excluded from this study.

2.2. Preoperative Discussion

Preoperative discussion between surgeon and assistant surgeon on various investigation reports was done before surgery to make the plan that how to proceed? The ultrasound report was discussed with the radiologist who performed the ultrasound on the particular patient, to understand the severity of inflammation by analysing the details of the inflammation of the wall of gallbladder, the contents in lumen of gallbladder and collection in perigallbladder area. If thickened and striated gallbladder wall, areas of decreased echogenicity (necrosis), pericholeystic fluid in excess, decreased wall perfusion on color doppler and intraluminal gas was found then we suspected gangrenous cholecystitis. It helped up to be prepared for difficult gallbladder.

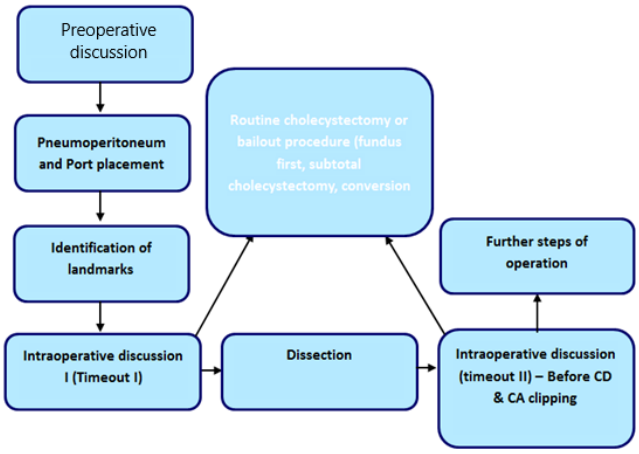

Figure 1. *Flow chart – NSSC Stages.*

2.3. Steps of NSSC (Figure 1)

Step I – Exploration of peritoneal cavity and target site - Patients positioning was done after introduction of all 4 ports, the operation table's head end and right side were elevated about 20 ° as more elevation may cause slipping of patient specially if obese. The 10mm port is placed in the epigastrium at the junction of upper 1/3rd and lower 2/3rd of the midline and just right to the falciform ligament [13], but we have experienced that epigastric port if placed just left to midline, this will make an acute angle with two tubular structures i.e. cystic duct and cystic artery which will help in application of

clips and their division and we did same in all cases.

Step II – Identification of anatomical landmarks - Important anatomical landmarks were identified i.e. bile ducts (cystic and right hepatic), Roviere's sulcus, cystic artery, 4th hepatic segment, umbilical fissure, Calots triangle. Doublet view was used.

Step III – HCT dissection with division of posterior and anterior leaves of peritoneal fold.

First adhesiolysis was done when some adhesions were found. Liver surface was examined for any fibrotic nodule or cirrhosis as it will increase chances of bleeding during dissection. Retraction of fundus of gallbladder (towards right shoulder of the patient) is done to expose gallbladder and infundibulum.

We first tackled posterior leaf of cystic pedicle and then anterior leaf. We held the Hartman's pouch with left hand grasper and applied traction anteromedially to expose posterior leaf of peritoneum. We pinched the peritoneum near cystic duct with Maryland grasper near the junction of cystic duct with neck of gallbladder and cauterized. Through opening this we divided the posterior leaf upto liver. Then the anterior leaf was divided similarly. Cystic duct and cystic artery are separated by opening and closing of the jaws of Maryland grasper. All fibro-fatty tissue in the HCT was cleared, surgeon should not aim to expose the cystic duct – CBD junction, as such attempt will put the CBD at risk of injury [14, 15].

Step IV – Dissection and exposure of cystic duct and artery. Cystic duct and cystic artery are exposed after division of posterior and anterior leaves of the peritoneal folds.

Step V – Dissection to separate lower part of gall bladder from cystic plate. Separation of lower part of gallbladder, infundibulum and neck of gallbladder from cystic plate of liver is done with blunt and sharp dissection with the help of a dissector and electrocautery hook. The plane of dissection is to be kept between gallbladder and cystic plate of liver. The principle of electrocautery hook is – hook-look-cook. Cystic plate is the oral fibrous layer in the gallbladder bed of liver. It is a part of sheath/plate system of the liver [16].

Step VI – CVS achievement - The CVS was achieved by making sure that only two tabular structures were entering the gallbladder meaning only cystic duct and cystic artery were entering gallbladder and there was no third structure.

Step VII – Clipping of cystic duct and cystic artery - After clearing the cystic duct for a length sufficient for applying 3 clips a window was made underneath it with opening and closing the dissector ends. Three clips were applied on cystic duct. Proximal 2 clips were applied close to each other, but the distal one was applied ½-3/4 cm away from these so that after division there is no chance of slipping of clips. Similarly, a window was made under cystic artery and 3 clips were applied. Doublet vision used here.

Step VIII – Division of cystic duct and artery - Doublet view is advised here too to avoid accidental inclusion of any other structure in clips, now under vision cystic duct and cystic artery are divided by scissors.

Step IX – Drain or no drain - If there was pus collection near or in pericholecystic area in any or there was perforation or gangrene of gallbladder, we kept a drain. Suction of all collection over the side of liver and under the live was to be done cautiously.

Step X - After completion of surgery the gallbladder was removed with the help of an extractor through the 10 mm port site. Gas was removed from peritoneal cavity 1-2 ml local anesthetic agent was injected in all the 4 portal sites, Skin clips applied on port sites. The epigastric port was closed with sutures, taking peritoneum with them.

3. Results

This study contains 240 patients and out of which 46 were male and 194 were female. The age of patients ranged from 18 years to 59 years. The mean age was 38.5. The maximum number of patients belonged to the age group 41 years to 50 years. BMI varied from 19 to 34 and one patient, a female, had BMI of 40 (morbidly obese). (Table 1)

Table 1. *Demographics of patients.*

Gender	No. of patients	Percentage (%)
Male	46	19.1
Female	194	80.9
Age		
10-20	1	0.4
21-30	21	8.7
31-40	29	12.1
41-50	171	71.2
51-60	18	7.6
BMI		
18-20	5	2
21-30	86	35.8
31-35	106	44.2
36-40	17	7

n=240

All cases are divided in two groups according to acute and chronic status of cholecystitis with or without complications such as perforation and gangrene of gallbladder (Table 2). All cases were of calculus cholecystitis. No patient in this series was of acalculus cholecystitis.

Table 2. Distribution of patients according to type of cholecystitis.

Types of Cholecystitis	Number of patients	Percentage (%)
Acute Cholecystitis	82	34.2
Chronic Cholecystitis	150	62.5
Acute cholecystitis with perforation of gallbladder	2	0.8
Acute cholecystitis with gangrene of gallbladder	6	2.5

n=240

Cases of chronic cholecystitis were more than acute cholecystitis. In acute cholecystitis 6 cases (2.08%) were of gangrene of gallbladder whereas two cases were of perforation of gallbladder.

The periods of intraperitoneal two timeouts helped us a lot as these time outs helped us to assess and reassess the difficulties in operation and the bailout ways fortunately we decided as per our teams time out discussions and appropriate bail out decision was taken. In our series we felt that adhering to NSCC helped us in avoiding serious complications of BDI & VBI.

Subtotal cholecystectomy was performed in 10 (4.16%) out of 240 cases due to extensive inflammation and adhesions. In 7 (2.91%) cases, we could not perform dissection beyond a certain point and so converted to open cholecystectomy to avoid biliary and vascular injury. (Table 3)

Table 3. Distribution of cases according to type of cholecystectomy.

Type of Cholecystectomy	No. of patients	Percentage (%)
Standard Routine Cholecystectomy	223	92.9
Subtotal Cholecystectomy	10	4.16
Conversion to Open Cholecystectomy	7	2.91

n=240

In most cases bile leak subsided with 3-4 days but in one case it continued to 2 weeks. Which also subsided gradually and no surgical intervention was required. (Table 4)

Table 4. Distribution of cases according to post operative complications.

Complications	No. of patients	Percentage (%)
1. Bile leak	8	3.34
2. Port site infection	10	4.16
3. Bile duct injury	0	0
4. Vascular injury	0	0
5. Perforation of gallbladder with spillage of gallstone peritoneal cavity during cholecystectomy in difficult gall bladder cases	7	2.91

n=240

Total number of “difficult gall bladder” cases were 118 (49%). Maximum difficult gall bladder cases were 83 (34.5%) in this group of age (Table 5).

Table 5. Age wise distribution of cases of 'difficult gall bladder'.

Age	Total number of cases	Number of cases of difficult gall bladder	Percentage (%) of cases of difficult gall bladder
10-20	1	0	0
21-30	21	8	3.3
31-40	29	12	5
41-50	171	83	34.5
51-60	18	15	6.2

n=240

Table 6. Preoperative suspicion of difficult gallbladder.

1.	Male patient
2.	Old age – above 60 years
3.	Big gap of time between first attack of pain and presentation to hospital above 96 hours.
4.	History of multiple biliary colic attacks
5.	Morbid obesity
6.	High fever
7.	Elevated TLC (More than 18000/mm^3)
8.	High C-reactive protein
9.	Gangrenous gallbladder on USG
10.	Perforated gallbladder on USG

4. Discussion

Laparoscopic cholecystectomy (LC) is one of the most commonly performed operation nowadays. Laparoscopic cholecystectomy is the current standard of care for symptomatic cholelithiasis. However, it is associated with higher incidence of complications such as bile duct injury (BDI) and vasculobiliary injury (VBI) than open cholecystectomy [17]. The most common underlying mechanism of major post-cholecystectomy BDI/VBI involves misidentification of anatomical structures [18, 19, 11].

Calot's triangle is an important and crucial landmark during cholecystectomy. It is an area situated below the liver. It's apex is directed upwards towards liver. It's boundaries are as follows: Medial- Common hepatic duct, Inferior – Cystic duct, Superior – Inferior surface of liver, Calot's triangle is also called as hepatocystic triangle (HCT). Lymphnode of Lund (named after Fred Bates Lung, an American surgeon) or lymph node of calot mascagni's lymph node (named after Italian anatomist and physician Paolo Mascagni) and is situated here and also acts as a landmark. It is usually situated at the neck of gallbladder and is near to cystic artery and cystic duct, so guides the surgeon.

Jean C Francois Calot (French Surgeon, 1861-1944,) originally described this triangle in 1890 which included the cystic duct, the common hepatic duct and the cystic artery (not the inferior border of liver as is commonly believed) [20, 21].

In our plan for safe cholecystectomy NSSC, the formula is:

Discuss and Do Safe Dissection satisfactorily

D= Discussion (Preoperative discussion)

A= Anatomical landmarks identification

D= Time Out I and Intraoperative Discussion I

S= Steps of cholecystectomy (I to VII)

D= Timeout II and intraoperative discussion II (before clipping cystic duct and artery)

S= Steps of cholecystectomy remaining (VIII to X)

The fundus should be retracted towards the right shoulder of the patient and the infundibulum should be retracted inferolaterally towards right side of patient [22]. This will expose the anterior peritoneal layer over the HCT. The cystic lymphnode often lies superficial to the cystic artery and acts as a landmark to locate this artery [23]. The artery should be divided on the right side of this lymphnode close to the gallbladder to avoid injury to the right hepatic artery [5].

It is essential for the surgeon to know the safe zone of dissection to identify the cystic duct and the cystic artery. Looking at the fixed anatomical landmarks (B-SAFE) will help the surgeon to identify and remain in the safe zone of dissection. These fixed anatomical landmarks include bile duct and base of segment 4 (B), Rouviere's sulcus, a segment 4 (S), hepatic artery (A), umbilical fissure (F), and enteric viscera (E), e.g., duodenum pylorus [24]. During dissection always remain near the gallbladder. RVS is a 2-5 cm fissure on the visceral surface of liver, between right and caudate lobes of liver. It is an important anatomical and surgical landmark during cholecystectomy. It is present in 80% of normal livers. Umbilical fissure or sulcus is a long and narrow groove on the visceral surface of liver, round ligament (Ligamentum teres) of liver is attached to it. Majority of vasculobiliary injuries during laparoscopic cholecystectomy continue to occur at 0.2% to 0.6% and the vast majority (upto 0.75%) are related to misidentification of anatomical structures [25].

Dissection of HCT requires proper exposure. Imaginary line of safety that is R4U is drawn in mind by connecting R4U structures i.e. Rouviere's sulcus, 4th segment of liver and umbilical fissure. Above this line is safe zone, one has to work in safe zone only to do safe cholecystectomy. Dissection is HCT is done to remove the fatty tissue to clean the contents and boundaries of HCT.

'Line of safety' in cholecystectomy is also called as *R4U* – (Rouviere's sulcus, segment of liver 4, umbilical fissure). It is an imaginary line from roof of RVS to umbilical fissure via segment 4 of liver. Above this line is 'zone of safety' for dissection during cholecystectomy.

Strasberg and colleagues in 1995 first suggested a three-pronged strategy called the 'critical view of safety' (CVS), to minimize the risk of bile duct injuries in laparoscopic cholecystectomy [58]. Critical view of safety (CVS) approach requires dissection of hepatocystic triangle free of fat and fibrous tissue, separation of lower third of gallbladder from liver bed and confirming that only two structures (cystic duct and cystic artery) are seen entering the gallbladder. However, both the origin and the course of cystic artery may be highly variable, and in upto 20% of cases the cystic artery is not found within the anatomical boundaries of the triangles, [23]. Inspite of achieving CVS the biliary and vascular injuries are not 100% prevented. Large case series of laparoscopic cholecystectomies in which the CVS was routinely applied, have reported rate of major bile duct injuries upto 0.54% [26-28]. With proper understanding and training, the CVS can be attained in 85-95% of cases in routine practice [17]. There is rapid increase in the laparoscopic cholecystectomy than open cholecystectomy, but the bile duct injuries still remain higher in laparoscopic cholecystectomy than open cholecystectomy. The close adherence to achieving CVS has definitely reduced the BDIs but still each case of cholecystectomy must be analyzed for which procedure to be applied specially in case of 'difficult gallbladder'.

CBD injury can be serious and even lethal. Reported short term mortality of accidental bile duct injury is approximately 1.9% [29]. Bile duct injury is an especially serious and potentially life-threatening complication that occurs at a reported rate of 0.08-1.5% [30-33]. This fact too stresses seriously for a safe cholecystectomy. Most common vascular injuries are to right hepatic artery and injury of the common bile duct are the most frequent bile duct injuries described in literature ranging from 66% to 72% of all bile duct lesions [34]. In literature there are several reports containing several thousand patients without a biliary injury due to misidentification and in which CVS was the technique of target identification [35-39]. Despite the description of CVS many decades back and uniform recommendations for its use, its poor understanding and low adoption rates among surgeons and trainees in routine general surgical practice remain global problem [27, 40-45].

Prediction or suspicion of difficult gallbladder and difficult cholecystectomy can be done preoperatively by observing certain facts. (Table 6)

We have observed in this study that maximum cases belonged to the age group 41-50 years barring this we have noticed an important feature that these patients had more cases of "Difficult gall bladder" or "Difficult cholecystectomy" than other age groups. The explanations probably are that these patients had more previous mild to moderate attacks of pain of gallstones or cholecystitis and they became habitual to such pain and tolerated mild to moderate degree of pain and discomfort and also got relieved of pain with oral analgesic medicines. These patients reported to doctor only when developed sever pain and vomiting.

This observation reminds us to be careful and be cautious when going to be operating the patients of this age group. The preoperative suspicious of difficult gallbladder is important for being ready to deal with difficulties in cholecystectomy. It also helps the surgeon in being better prepared to anticipate the intra-operative difficulties [46]. Likewise, the elderly population (age >60 years) has been defined as predictor for difficult laparoscopic cholecystectomy in some studies [47, 48].

The increase in difficulty with age has been reported by many authors [49]. Kanaan et al [50] gave older male as one of the main factors of conversion of LC to open cholecystectomy. Two main reasons are thought to be the gallstones formation and cholecystitis in elderly persons are decreased mobility of gallbladder due to diminished muscle tone and this reduces the efficacy of gall bladder to contract powerfully and empty the bile sufficiently and the production of more cholesterol by liver and less of bile salts.

In order to enhance the safety of cholecystectomy and reduce the rate of biliary duct injury, in 2014 the society of Gastrointestinal and Endoscopic Surgeons (SAGES) formed the Safe Cholecystectomy Task Force with the goal of enhancing a culture of safety around this procedure [51]. As the insight into the mechanisms involved in BDI/VBI during LC has evolved [52-54] a large number of strategies have been

proposed to safeguard against BDI/VBI [9, 10]. Our strategy of doing safe cholecystectomy is also an attempt to explain the way to do it without BDI/VBI. NSSC always considers critical view of safety achievement as a basis of safe cholecystectomy.

The right hepatic artery may take a tortuous course (caterpillar turn/Moynihan's hump) within the HC triangle, and it may be very close to the gallbladder and the cystic duct before giving off a short cystic artery [55]. This may cause injury to right hepatic artery during LC. Anatomic variations of RHA are common. It usually passes behind the CHD (87%) before entering the HC triangle [56]. This must be kept informed during same dissection here.

We do it before starting dissection, Time out I and Intraoperative discussion I is done after initial exploration and identification of anatomical landmarks. We discuss and plan for further course and dissection is done accordingly. We discuss about achieving critical view of safety as how to achieve. Time out II and intraoperative discussion II helps in making a plan for further approach i.e. standard cholecystectomy, fundus first cholecystectomy, subtotal cholecystectomy or conversion to open cholecystectomy. Please note that conversion to an open procedure should not be viewed as a complication but as a well-educated decision made by an experienced surgeon to care for patient safety [57]. The important is safety, "atleast do no harm". If conversion is required then don't waste time and, do it fast. NSSC, if followed by strictly adhering to it, definitely avoids BDI and vascular injuries and also from legal litigations. Given the immediate morbidity, higher mortality, decreased quality of life, and decreased long term survival associated with BDI or vasculobiliary injury (VBI), as well as its medicolegal implications [58-62]. The importance of safe performing of LC cannot be underemphasized. The severity of inflammation in the HC Triangle and adjoining area, remains the most common reason for conversion [63].

How many clips to be applied in Calot's triangle in laparoscopic cholecystectomy? is a matter of universal fact and not personal liking, 'six hemoclip rule' is followed everywhere. This rule is not given by one individual but surgeons all over the world feel that unnecessary clips application is to be avoided to avoid complications such as BDI and bleeding. The rule suggests that maximum three clips can be used for cystic duct and three clips on cystic artery to minimize number of clips. We also follow this rule and the distance between clips is always considered important. "The Six Hemoclip Rule", which states that a structure in the cystohepatic triangle requires no more than three clips: two clips placed on the staying side and one clip on the specimen side [64].

Bile duct injury rates have increased since the introduction of laparoscopic cholecystectomy, occurring in about 3per 1000 procedures performed [65]. Bile duct injuries after cholecystectomy can be life altering complications leading to significant morbidity and cost [66, 67]. This fact further stress on safe cholecystitis.

In the United States, gallstone disease remains a prevalent condition effecting over 20-25 million Americans, representing 10-15% of the population [68, 69]. Therefore it is very important to do safe cholecystectomy and train young surgeons to make a habit, selecting safety over hurry and temptation.

5. DOs and Don'ts

5.1. DOs

1) Always remain near gallbladder during dissection.
2) Do your dissection in safe zone, above R4U.
3) Always achieve critical view of safety.
4) Whenever you separate adhesions attached with gallbladder – hold adhesion near gallbladder with forceps and not at a distance from it as it will cause more bleeding and tear of important structures.
5) Do use tip of suction metal tube to separate gallbladder from its bed.
6) Do dissection between gallbladder and cystic plate with blunt object and hook, try to find a plane there which separates gallbladder from cystic plate of liver. It leads to minimal bleeding. If you will breach the cystic plate of liver then will be more bleeding from liver.
7) Do everything under vision there is no place for blind dissection. Tell the camera man to keep the work site in the center of the monitor.

5.2. Don'ts

1) Don't waste time in taking decision. If conversion from laparoscopic to open cholecystectomy is required do it fast don't waste time in further exploration and cause injury or not get tempted to do more dissection.
2) Don't dissect below line of safety R4U however tempting.
3) Don't try to expose cystic duct – CBD junction to avoid injury.
4) Don't use scissors to cut tissues to separate gallbladder from its bed.

6. Limitations

This study is done at one center and by one team of surgeons. The study includes only the cases of acute and chronic cholecystitis. Patients of gallbladder diseases other than acute chronic cholecystitis are excluded in this study.

7. Conclusion

Safe cholecystectomy by laparoscopic approach means a cholecystectomy without complications or with minimal incidence. It can only be achieved through a thoughtful

strategy including good understanding of hepatobiliary anatomy, meticulous surgical dissection, and successfully managing difficult situations. Nigam's strategy for Safe Cholecystectomy (NSSC) follows a plan which is methodical, easily, relaxed and involving all important factors for safe laparoscopic cholecystectomy. NSSC has minimal minor postoperative complications with no bile duct injury (BDI) or biliovascular injury (BVI). No major complications developed. We advices various hospitals to follow NSSC to do safe laparoscopic cholecystectomy specially the new surgeons doing laparoscopic cholecystectomy.

Abbreviations

BDI	Bile Duct Injury
B-SAFE	Bile Duct and Base Of Segment Four, Rouvier's Sulcus, Hepatic Artery, Umbilical Fissure, Enteric Viscera
CA	Cystic Artery
CBD	Common Bile Duct
CD	Cystic Duct
CVS	Critical View of Safety
HCT	Hepatocystic Triangle
LC	Laparoscopic Cholecystectomy
NSSC	Nigam's Strategy for Safe Cholecystectomy
R4U	Rouvier's Sulcus, Segment Four of Liver, Umbilical Fissure
RVS	Rouvier Sulcus
USG	Ultrasonograph
VBI	Vesobiliary Injury

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Author Contributions

Vinod Kumar Nigam: Conceptualization, Funding acquisition, Investigation, Project administration, Resources, Supervision, Validation, Writing – original draft

Siddharth Nigam: Data curation, Formal Analysis, Methodology, Software, Visualization, Writing – review & editing

Declaration of Patient Consent

The authors certify that they have obtained all appropriate patient consent forms. In the form the patient(s) has/have given his/her/their consent for his/her/their images and other clinical information to be reported in the journal. The patient understand that their names and initials will not be published and due efforts will be made to conceal their indent, but anonymity cannot be guaranteed.

Writing Assistance

Siddharth Nigam.

Data Transparency Statement

Free.

We are confirming that the manuscript is not submitted or published elsewhere.

Dr Vinod Kumar Nigam did this study with the help of Dr Siddharth Nigam, who helped in collecting and analyzing the data.

Conflicts of Interest

The authors declare no conflicts of interest.

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