

## Fundus First Method with Catgut Loop for Ligation of Cystic Artery and Duct Stump: An Alternative Technique to Conversion in Difficult Laparoscopic Cholecystectomy

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### Abstract

*Background:* Laparoscopic cholecystectomy is now accepted worldwide as the gold standard surgical technique for cholecystitis. But it is not without difficulties especially in a/c cases. Here we discuss about our experience in difficult cholecystectomy which we managed with fundus first method especially when it is difficult to dissect out cystic artery and duct at Calot's triangle due to dense adhesions. After dissecting fundus, body and neck catgut loops were used to tie the cystic pedicle. *Methods:* 100 cases of laparoscopic cholecystectomy done in patients presented with abdominal pain and USG diagnosis of cholecystitis. The cases were analysed prospectively with data sheets and video recordings over a period of 18 months. The period of study and the 100 cases were selected for statistical significance. Among those 28 cases were done with fundus first technique and out of these 22 cases were with catgut loop tie technique. *Results:* Conversion rate was 0% and there was no CBD injury. On follow up two cases had problems one with retained stones in CBD and other in the cystic duct. One case was managed with endoscopic sphincterotomy and the other case with laparoscopy. *Conclusion:* Fundus first method with catgut loop tie of cystic pedicle with frozen Calot's and thickened cystic duct stump is an alternative technique for conversion to open surgery in difficult cholecystectomy. It is a safe technique with decreased post-operative morbidity.

**Keywords:** Fundus First; Laparoscopic Cholecystectomy; Retrograde Technique; Cystic Duct Stump Ligation; A/C Cholecystitis; Frozen Calot's Triangle; CBD Injury.

### Introduction

Lap cholecystectomy is one of the most common procedures done by surgeons all over the world. Many of the earlier concepts of selection criteria for doing Lap cholecystectomy have been changed and Cases can be done even after 48-72 hrs in a/c cholecystitis. All cholecystectomy should be considered difficult until it is completed. Even in experienced hands there are chances of CBD and vascular injury. It depends on many factors like experience of surgeon; help of modern gadgets, aberrant anatomy and patient factors.

Pre-operative evaluation of cholecystitis was done with USG abdomen, CT scan and MRCP. Other than this high total count with leukocytosis and deranged LFT result were used to assess severity of cholecystitis. Only after putting the laparoscope, method of dissection decided depending on the severity of adhesions at Calot's triangle. Advantage of fundus first method in comparison with conventional technique is described in many papers [2,4,6].

FFC with catgut loop in difficult lap cholecystectomy decreased the conversion rate and also averted the chance of making injury to CBD.

Aims of our study were to evaluate the technical advantage of Fundus First method in difficult cholecystectomies and establishing its effectiveness in reducing conversion and biliary injuries.

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Received on 20.07.2017, Accepted on 16.08.2017

## Methods

The laparoscopic cholecystectomy cases done in patients presented with abdominal pain in the department of surgery over a period of 18 months were studied. The patients admitted with features of cholecystitis having supportive evidence of USG abdomen were taken. The cases unfit for GA and case operated with open cholecystectomy in suspicion of malignancy were not included in the study.

Other tests done are Hb%, TC, LFT, CT, BT, PT INR, Viral screening, ECG, X-Ray chest and CT scan abdomen and MRCP in selective cases. Patient information sheet is provided and detailed informed consent is taken prior to the study.

### *Operative Procedures*

General Anaesthesia is used in all the cases. Standard 4 port technique is used. Additional 5 mm port is used when needed. Patient position, reverse trendelenberg posture with left lateral tilt is used. Ryles tube is put for stomach decompression. Normal technique is first by fundal traction towards right shoulder, the infundibulum is pulled downwards and laterally, and then calot's triangle is dissected.

In fundus first method, all the adhesion of omentum to GB and adjacent structures were released first. In cases where GB is distended, decompression is done by putting trocar directly to GB and then using suction canula contents were aspirated. Fundic peritoneum is dissected and used to retract the under surface of liver. Fan retractor is used in some cases. Fundus of GB is then dissected from liver bed. After reaching calot's if cystic duct and artery could be separately dissected, it was clipped. If not possible especially when there is dense adhesion and in thick cystic duct, catgut loops were used to ligate the stump. 3 loops were used. First loop is put at the maximal end of stump preferably after milking the cystic duct. The stump is divided between the 2nd and 3rd loop. Schematic pictures of procedure is given in Figure 1 and operative pictures in Figure 2. Harmonic scalpel is used when the dissection is difficult. In acute cases when cystic duct stump cannot be clipped or loop cannot be applied, endoscopic suturing was done after cutting at neck of GB.

Standard teaching is converting to open surgery in difficulty. But in laparoscopy we are getting magnified view and the difficulty remains there even with open surgery. In case of bleeding it is advised not to waste time in controlling haemorrhage and prompt opening of the abdomen is justified.

Conversion is not failure. It reflects sound surgical management.

Hundred laparoscopic cholecystectomy cases were done over a period of 18 months who presented with abdominal pain and was diagnosed as cholecystitis with USG abdomen or CT scan. Age varied from 7yrs to 83 yrs. There were 70 females and 30 males. Of these 28 cases were difficult cholecystitis in which fundus first method were done. Among these after mobilising from liver bed when cystic duct and artery were clearly dissected out clips were applied in four cases. In two cases after mobilisation by fundus first method neck is divided. Residual mucosa is fulgurated. Then cystic duct stump is sutured with 2'0' vicryl. Other 22 cases catgut loops were used to ligate cystic duct stump. The tabular representation our study data is given in Table 1.

Time taken to do FFC is more than antegrade method. But this should not be taken into consideration because FFC is done in difficult cholecystitis in which we were not able to do standard technique. The time also varied depending on the anatomical variation and depth of inflammation. None of these cases had any immediate post-operative problems and was discharged after 48-72 hrs subjected to patient's compliance.

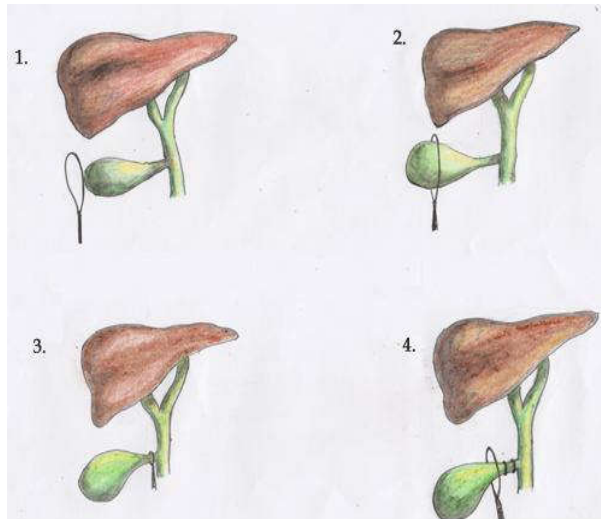
Follow up of cases were done with USG abdomen and LFT for 6 months. On follow up, two cases managed with catgut loops had colics. On evaluation one patient had retained CBD stones after two months which was managed with endoscopic sphincterotomy. The other patient had large cystic duct stone distal to distal loop which was missed during the lap chole done as an emergency. There was pouch dilatation probably as a result of mucocele formation. MRCP was done to confirm the diagnosis and it was almost looking like GB [Figure 3]. Re laparoscopy was done after three months and removed the pouch with cystic duct stone. At that time surgical anatomy was clear to do the procedure.

## Results

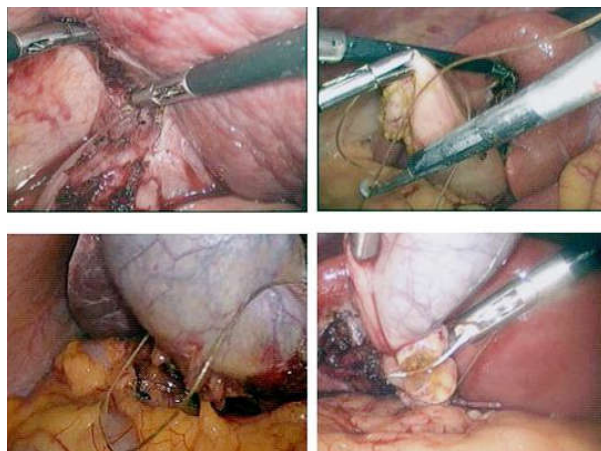
Study included 100 cases of lap cholecystectomy with a/c presentation. Of these, in 28 cases fundus first method of dissection was done. After the dissection, in four cases we were able to clip cystic artery and duct. In 22 cases catgut loops were used to ligate cystic duct stump. None of the cases had any CBD injury or immediate post-operative problems. There was no conversion to open surgery.

**Table 1:** Tabular representation of study data

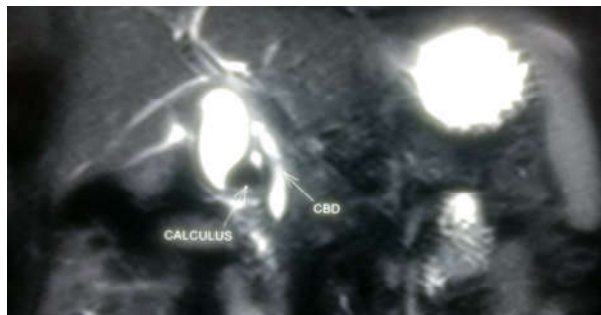
Method of dissection	No of cases	Cystic artery and duct clipping	Cystic duct stump suturing	Cystic stump tie with loop	Conversion to open surgery	CBD Injury	Follow Up 22 cases
Fundus first method	28	4	2	22	0	0	Retained CBD stone-1 Retained Cystic duct stone-1
Ante grade method	72	72	0	0	0	0	



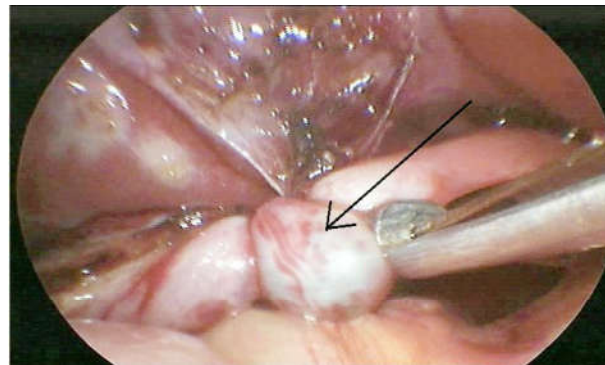
**Fig. 1:** Schematic representation of procedure



**Fig. 2:** Pictures of operative procures



**Fig. 3:** MRI showing retained cystic duct stone with pouch dilatation



**Fig. 4:** Retained stone in between loops

## Discussion

Laparoscopic cholecystectomy is one of the most common surgeries done by the general surgeons worldwide. Even though it is considered as gold standard procedure, many a time patient's life is made miserable when attempted by the inexperienced surgeons without backing up of proper gadgets and experts in the field. Incidence of bile duct injury is 0.5% to 3% in lap cholecystectomy in comparison with 0.1% to 0.5% in open cholecystectomy [2].

Laparoscopic cholecystectomy is difficult when Gall bladder is contracted, calot's triangle is frozen, GB wall is oedematous, previous upper abdominal surgery, empyema GB including Mirizzi syndrome, h/o cholecystostomy and in cholecysto-duodenal fistula. In difficult lap chole there is chance of injuring CBD and hepatic artery especially when we try to dissect out cystic artery and duct. Leaving behind a stump of 0.5 cm to 1 cm cystic duct stump is better than making an injury to CBD while trying to dissect out the cystic duct stump.

It is advised that only experienced surgeons are expected to do laparoscopic cholecystectomy in a/c cholecystitis. There should be adequate facilities to manage the complications. Even then due to visual mis perception and abnormal anatomy there can be CBD or vessel injury.

Fundus first (retrograde) laparoscopic cholecystectomy has an advantage over Ante grade (conventional) laparoscopic cholecystectomy in certain aspects. Most of the complications occur when cystic duct and artery are dissected when dense adhesions are present at calot's triangle, when liver is difficult to be lifted as in cirrhosis and when cystic duct is thick. Many a time when dissection proceeds from fundus to body and neck, cystic duct anatomy becomes clearer and it could be clipped. Or else Cystic duct and artery are ligated with catgut loop as explained. In thick cystic duct clipping may not be possible. While putting loops one should make sure that the structures going to GB only were ligated. In some a/c cases gall bladder is divided at its neck after putting the loop proximal. Then mucosa is cauterised with bipolar and loop is put distally. None of the cases required intra-operative cholangiogram as there was no suspicion of CBD injury.

FFC is not without complications. While putting loops, stones in the GB can be slipped into the CBD. Follow up of one case in our study had Similar problem about which was described earlier. There are chances of putting loops proximal to stone, when we are not able to milk the cystic duct in frozen calot's and the retained stone will produce complications. Figure.4 shows cystic duct stone between 1 and 2 loops which we identified intra-operative period itself. The complication described in the follow up of 2<sup>nd</sup> case was probably retained stone in cystic duct.

On reviewing literature fundus first method has definitely reduced the conversion rate as in our study. Some literature shows disadvantages of metallic clips in lap cholecystectomy [1]. FFC with Teflon ligature of cystic duct was described by Ichihara et all [5] similar to our study. Indication for FFC and reduction in conversion rate are all described by Muhmud [6] et all and Martin [4] et all similar to our study. Kelly MD [8] had described putting endo loops at cystic duct. Our study also stands out for its unique technique of using catgut loops in FFC. Decades ago, in the background of limited next generation surgical equipments Muhmud [6] et all claimed that FFC reduced conversion from 5.2% to 1.2% and Gupta [2] et all 18.75% to 2.08% in large series. With the introduction of modern gadgets and high definition cameras, achieving lower conversion rate to 0% is not unimaginable.

## Conclusion

Fundus first method is a safe technique especially when difficulty in dissecting calot's triangle [4,6]. Ligation of cystic pedicle with catgut loop is acceptable in difficult cases to avert injury to CBD. It helps to decrease the conversion rate and hence decreases the morbidity [7]. Possibility of stone retention in CBD and cystic duct should be thought of while putting loop. Some surgeons even recommend to do fundus first method in routine cholecystectomies.

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