

ORIGINAL RESEARCH

Clipless laparoscopic Cholecystectomy by Bipolar Cautery Versus Conventional Clips - Prospective Randomized Control Study

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ABSTRACT

Background: Cholecystectomy is the most common abdominal procedure performed for removal of gall bladder in cholelithiasis. Various advances have been made in the laparoscopic cholecystectomy procedures. **Objective:** To assess the safety and document the efficacy of clipless laparoscopic cholecystectomy using bipolar cautery versus conventional clipping method. **Materials and Methods:** This was a Prospective Randomized control study conducted on 50 patients undergoing elective cholecystectomy. Patients were recruited in the study after satisfying inclusion and exclusion criteria and divided into two groups of 25 each. Both groups undergoes elective laparoscopic cholecystectomy. In Group A, titanium clips were used to reseal and ligate cystic duct and artery and in Group B bipolar cautery was used. The preoperative, intraoperative and postoperative parameters were collected and analysed using statistical methods. **Results:** The mean age in Group A was 43.7+/- 4.2 years and in Group B was 44.6 +/- 4.0 years. There were 21 females in group A and 20 in group B. Duration of surgery was 30.9+/- 7.3 and 37.0+/-7.5 in group A and Group B respectively. Intraoperative blood loss was 9.3+2.9 ml in Group A and 6.9+/- 4.6 ml in Group B. There was significant difference between two groups in relation to duration of surgery and intraoperative blood loss. Number of clips applied varies from 4-5 in Group A and no clip was applied in Group B. Amount of post-operative drainage in Group A was 22.4+/-13.6 ml and in Group B was 3.6+/-3.9 ml and there was significant difference between the two. **Conclusion:** Bipolar cautery is a safe alternative to standard clips to ligate and seal cystic duct and artery. It provides less cost and amount of intraoperative blood loss is less.

Keywords: Clips; Bipolar cautery, Laparoscopic cholecystectomy, Gall Stones.

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INTRODUCTION

Gall bladder, the reservoir of bile concentrate and store hepatic bile and deliver it into the duodenum in response to meal. Gall stone disease is one of the most common biliary pathology affecting 10 to 15% of the population in western countries and 7-10% in Asia ^(1, 2). The prevalence of cholelithiasis depends upon many factors like

age, gender, ethnic background, obesity, pregnancy and dietary factors ⁽¹⁾. Crohn's disease, terminal ileal resection, gastric surgery, hereditary spherocytosis, sickle cell disease and thalassemia are all associated with an increased risk of developing gall stones ⁽³⁾. Women are three times more likely to develop gall stones than men and prevalence is twofold greater in

first degree relatives of cholelithiasis patients ⁽¹⁾. Cholesterol, pigment or mixed stones are the three main types of gall stones. In Asia, 80% are pigment stones whereas in the United states 80% are cholesterol or mixed stones. Most of the patients remain asymptomatic from their gall stones throughout life and some progress to a symptomatic stage due to unknown reasons. Complications related to gall stones include acute cholecystitis, choledocholithiasis with or without cholangitis, gall stone pancreatitis, cholecysto choledochal fistula, cholecysto duodenal or cholecysto enteric fistula leading to gallstone ileus and carcinoma gall bladder. Gall stones in patients without biliary symptoms are commonly diagnosed incidentally on ultrasonography. Over a 20 year period, about two third of asymptomatic patients with cholelithiasis remain symptom free ⁽⁴⁾.

Cholecystectomy is the Gold standard procedure for removal of gall bladder. In 1882, Carl Langenbuch performed first successful cholecystectomy and 100 years later in 1987, Philippe Mouret in France introduced laparoscopic cholecystectomy and revolutionized the treatment of gall stones. This minimally invasive procedure with minor pain and scarring, reduced hospital stays, decreased recovery interval, reduced postoperative discomfort leading to early return to full activity, is the treatment of choice for symptomatic gall stones. Serious complications are rare and the mortality rate for laparoscopic cholecystectomy is about 0.1 %. In the acute setting with gall bladder inflammation and infection, the procedure tends to be technically more difficult and has a higher rate of conversion to open technique when compared with elective operations for biliary colic.

The standard lap cholecystectomy is normally performed with a monopolar electrocautery either a Maryland dissector or anelectrosurgical hook, especially for the dissection of gall bladder and coagulation of small vessels. Cystic duct and artery are clipped with titanium clips ^(5, 6).

Monopolar electrocautery is the method preferred by more than 85% of surgeons. Laparoscopic cholecystectomy using a harmonic scalpel provides safe division and closure of both cystic artery and duct, lower intraoperative blood loss, shorter duration of operation, less postoperative drainage, less postoperative pain and shorter hospital stay but the instrument is too costly ⁽⁶⁻¹¹⁾.

The usage of bipolar electrocautery is relatively less in laparoscopic cholecystectomy. This study aimed to compare the traditional laparoscopic cholecystectomy using laparoscopic clips to seal the cystic duct and artery with clipless laparoscopic cholecystectomy using bipolar cautery.

MATERIAL AND METHODS

This was a Prospective Randomized control study conducted on 50 patients who presented with calculus cholecystitis for cholecystectomy in Kanyakumari Government Medical College during the period from January 2020 to December 2022. The patients in whom elective cholecystectomy was planned were included in the study after taking informed written consent with intention to treat after satisfying inclusion and exclusion criteria. The Helsinki Declaration protocols were followed in our study.

Patients were divided randomly into two groups of 25 each. Group A was subjected to traditional laparoscopic cholecystectomy using electrocautery and titanium clips and Group B was subjected to laparoscopic cholecystectomy using bipolar cautery to seal cystic duct and artery. The exclusion criteria included patients older than 80 years of age, patients with a history of laparotomy, patients with common bile duct stones, pregnant women and patients with acute cholecystitis with a history of jaundice and post ERCP (Endoscopic Retrograde Cholangio pancreatography) patients.

All patients were subjected to a thorough assessment of history and clinical examination. The following investigations were performed (Complete blood count, liver function tests, HCV and HBV markers and abdominal ultrasound) to determine the state of the liver, portal vein, gall bladder and CBD.

A single dose of Injection Ceftriaxone, third-generation cephalosporin 1 gm intravenously was given to both groups 30-60 minutes before surgery. Surgery was performed under general anesthesia using a conventional four-port; an umbilical port, a port below the xiphoid, and two ports below the right costal margin. Pneumoperitoneum at a pressure of 12 mmHg was used.

In Group A, Laparoscopic cholecystectomy was performed using the traditional method by dissection of Calot's triangle and clipping of both the cystic duct and artery by metal clips Then, dissection of the gall bladder was performed from its bed by a hook using monopolar electrocautery technique. In Group B, Laparoscopic cholecystectomy was performed by dissection of Calot's triangle and then occlusion of both the cystic duct and artery using bipolar cautery. Finally, abdominal drain 10 French was inserted into the Morrison pouch in both groups. The pre-operative, intraoperative and postoperative parameters were collected including age, sex, weight, duration of operation, intraoperative blood loss, postoperative pain, complications, hospital stay, volume of postoperative drainage and cost of the procedure. The data were analyzed using SPSS (version 22;

SPSS Inc., Chicago, Illinois, USA). Based on an intention to treat principle, the data were analysed. For continuous variables, descriptive statistics were calculated and reported as mean \pm SD. Frequency distributions were used to describe Categorical variables.

RESULTS

The mean age of patients in group A was 41.7 ± 4.2 years and in Group B was 43.6 ± 4.0 years. There were 21 females in group A and 20 in group B. (Table 1). Viral markers were negative in all patients. Hemoglobin level was 12.9 ± 0.9 in group A and 11.0 ± 0.7 in group B. Both Group A and B were comparable to each other in terms of Age, Sex and Hemoglobin level. Duration of surgery was 34.9 ± 7.3 and 41.0 ± 7.5 in group A and Group B respectively. Intraoperative blood loss was 10 ± 2.9 ml in group A and 6 ± 1.6 ml in group B.

The time taken for the surgery and intraoperative blood loss shows there was a significant difference between the two groups. The number of clips applied varies from 4-5 in group A and no clips

were applied in group B.

The volume of post-operative drainage in Group A was 25 ± 13.6 ml and in Group B was 5 ± 3.9 ml and there was a significant difference between the two. Color of post-operative drainage was serous in both the groups except in one case in group B where bilious collection in the drain was seen on 1st day. On 2nd and 3rd day it reduced to nil and managed conservatively without any surgical intervention. No cystic duct leakage was observed in either group. In our study, the mean postoperative pain score on the VAS scale in group A was 2.17 ± 0.53 and in the Group B was 2.17 ± 0.54 . On static analysis, ($p=0.85$) no significant difference was found in postoperative pain scores between the two groups after 24 hrs. (Table 2).

No significant difference was observed in both groups in relation to nausea, vomiting, and headache (Figure 2). In terms of hospital stay, there was no significant difference between the two groups. No intraoperative complications in the form of bleeding, CBD injury, stone spillage and gall bladder perforation were found in both the groups.

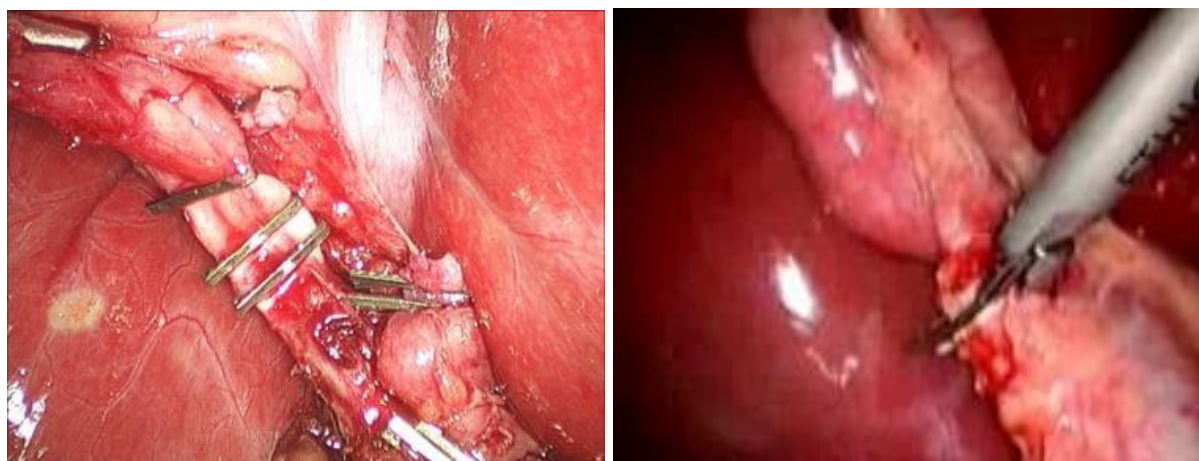


Fig: 1: Clip vs clipless Lap cholecystectomy

	Group A	Group B	Observed difference in mean value	p value
Age	41.7± 4.2	43.6±4.0	1.9	P > 0.05
Sex	Male 4, Female 21	Male 05, Female 20		P >0.05
No. of clips applied	Average 4 -5	Nil		
Duration of surgery	34.9±7.5	41.0±7.5	- 6.1	t=-4.1; df=98; p=<0.001
Intraoperative blood loss	10±2.9 ml	6 ±1.6 ml	4	T=5.04;df=98; p=< 0.001
Amount of post-operative drainage	25 ±13.6 ml	5 ±3.9 ml	20	t=932;df=98 p=<0.001
Color	Serous	serous		
Hospital stay	4 -5 days	3-4 days		p > 0.05

Table 1: Preoperative, intraoperative and postoperative findings in both groups

	GROUP A		GROUP B	
	Number	Percentage	Number	Percentage
Nausea	6	12	4	8
Vomiting	2	4	2	4
Pain	2	4	2	4
Headache	4	8	4	8
VAS SCORE	2.17±0.53		2.17±0-54	

Table 2: Post-operative complications

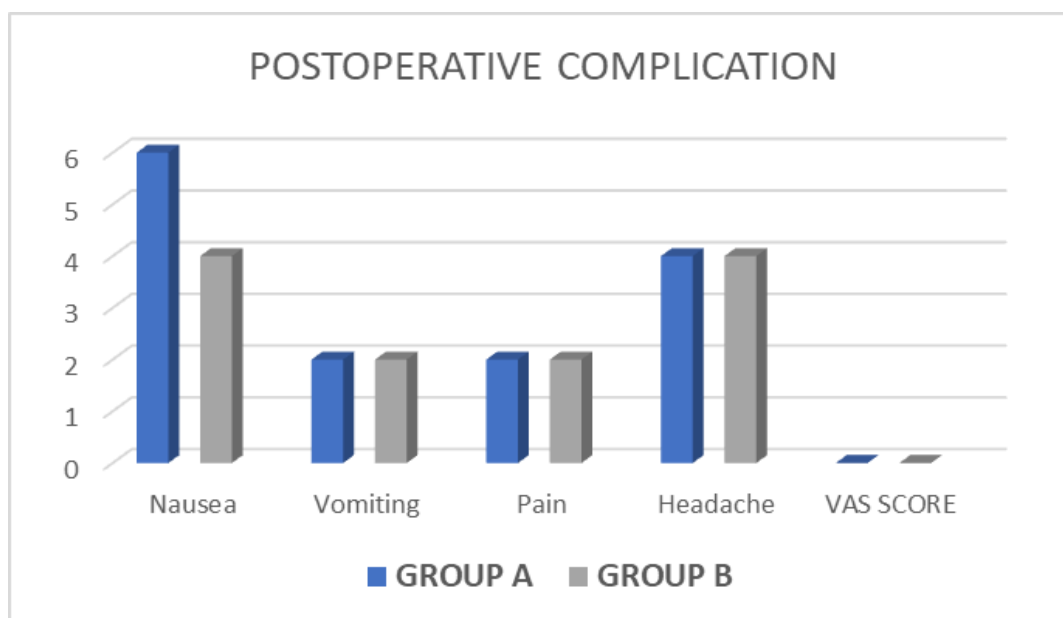


Fig 2: Post-operative complication

DISCUSSION

25 patients were subjected to traditional laparoscopic cholecystectomy using electrocautery and titanium clips and 25 to laparoscopic cholecystectomy using bipolar cautery. The observed difference between the duration of surgery in group A and group B was 6.12 minutes and it was found to be statistically significant.

The mean operative time was significantly more in group B which may be attributed to time required to coagulate proteins after applying bipolar cautery. Bessa et al and others^(6, 7, 8) compared laparoscopic cholecystectomy using a harmonic scalpel with laparoscopic cholecystectomy using electrocautery and bipolar vessel sealer and found a significant difference in the duration of surgery in favour of laparoscopic cholecystectomy using a harmonic scalpel, which may be attributed to fewer number of insertions and extractions of the instrument; in addition, an ultrasonic-activated harmonic scalpel produces no smoke.

Bulus et al⁽¹²⁾ reported in 60 patients who underwent Laparoscopic cholecystectomy with the Harmonic scalpel, bipolar vessel sealing, and monopolar electrocautery that the use of any of these 3 surgical dissection or coagulation instruments was not associated with a clinically significant increase or reduction in mean operative time (33 ± 10 min vs 32 ± 11 min vs 37 ± 10 min, respectively).

Catena et al⁽¹³⁾ further showed in a prospective, randomized, single-centre study regarding Laparoscopic cholecystectomy for acute cholecystitis that the Harmonic scalpel or electrocautery techniques had similar mean operative times (101.3 vs 106.4 min; $P > 0.05$). Variations in the study protocol, patient selection, operative technique, surgeon's experience and case volume have shown inconsistency in the operative time in different studies.

The intraoperative blood loss shows the difference in the two groups was 4 ml and was statistically significant which was indicated by the significant reduction in the level of haemoglobin and haematocrit in group A.

Katri et al⁽¹⁴⁾ conducted a study on 158 patients in which they studied the use of monopolar cautery for controlling the cystic artery in 134 patients and clips in 33 patients. They recorded no bleeding complications during the period of the study.

Bessa et al, Perissat et al and Huscher et al^(6,7,8) compared laparoscopic cholecystectomy using a harmonic scalpel with the electrocautery group and found that mean operative time and intraoperative blood loss were significantly less in the harmonic shear group and found harmonic scalpel to be an effective and safe instrument for dissection and haemostasis but the instrument is expensive.

Schulze et al⁽¹⁵⁾ compared 113 patients undergoing elective laparoscopic cholecystectomy with a

normal closure of the cystic duct with titanium clips and 102 patients undergoing laparoscopic Cholecystectomy using bipolar cautery and found no cystic duct leakage in either of the group and our results are in accordance with it. No comparison was done in relation to intraoperative blood loss and duration of surgery by Schulze. There was leakage from the gallbladder bed, probably due to a small aberrant duct or too deep a dissection in the gallbladder bed when the gallbladder was removed from the liver.

The volume of postoperative drainage was significantly more in group A and the mean difference observed was 20 ml which may be attributed to the presence of foreign bodies in form of metallic clips. This is in agreement with the result of a study carried out by Kandil et al⁽¹⁶⁾ who reported that in the traditional cholecystectomy group than in the harmonic scalpel group the mean amount of postoperative drainage was significantly more. Use of monopolar or bipolar cautery may cause injury to nearby organs i.e CBD, stomach or small intestine. Local complications like liver injury and gall bladder perforation may occur⁽¹⁷⁾. No such injuries or complications had been reported in our study.

One advantage of bipolar cautery is that it leaves no metallic objects in the body and there is no complication of clips being dislodged. The cost of the instrument is higher than the cost of the clip applied. A harmonic scalpel is also used to seal the cystic artery and cystic duct and is found to be better than bipolar vessel sealer and titanium clips but the instrument is too expensive. So, in developing countries like India bipolar vessel sealer is a good alternative. The bipolar cautery or bipolar vessel sealer can safely be used for sealing cystic artery and cystic duct in laparoscopic cholecystectomy without risk of major injuries or leaks in place of metal clips when the diameter is less than 6 mm. We found that bipolar cautery led to complete and safe closure of the cystic duct and artery and is cost-effective.

CONCLUSION

Bipolar cautery is a safe alternative to standard clips to ligate and seal cystic duct and artery. It provides less cost and amount of intraoperative blood loss is less.

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