

Comparative Study between Clipless Laparoscopic Cholecystectomy by Bipolar Cautery Versus Traditional Method Using Titanium Clips

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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 compare safety and efficacy of clipless laparoscopic cholecystectomy by bipolar cautery versus traditional method using titanium clips. **Material and Methods:** This was Prospective Randomized study conducted on 100 patients undergoing elective cholecystectomy. Patients were recruited with study to treat after satisfying inclusion and exclusion criteria and divided into two groups of 50 each. Both Groups undergoes elective laparoscopic cholecystectomy, in group A titanium clips were used to resect 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 41.7±4.2 years and in group B was 41.6±4.0 years. There were 36 females in group A and 38 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±1.6 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; Gall Bladder; Laparoscopic; Cholecystectomy; Gall Stones.

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 effecting 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]. Crohns 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 choleangitis, gall stone pancreatitis, cholecystocholedochoal fistula, cholecystoduodenal or cholecystoenteric fistula leading to gallstone ileum, and carcinoma gall bladder. Gall stones in patients without biliary symptoms are commonly diagnosed incidentally on ultrasonography. Over a 20 year

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period, about two third of asymptomatic patients with cholelithiasis remain symptom free [4].

Cholecystectomy is the most common abdominal procedure performed 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 stay, 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 LC is normally performed with a monopolar electrocautery, usually an electrosurgical 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 electrosurgery 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]. Bipolar electrosurgery has not been used widely in laparoscopic cholecystectomy. This study aimed to compare the traditional laparoscopic cholecystectomy using laproscopic clips to seal the cystic duct and artery with clipless laproscopic cholecystectomy using bipolar vessel sealer.

Material and Methods

This was a Prospective Randomised comparative study conducted on 100 patients who presented with calculus cholecystitis for cholecystectomy to Punjab Institute of Medical Sciences during the period from January 2015 to January 2017. 700 patients were presented in OPD and emergency ward during this period. 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 and study was conducted in

accordance to the Helsinki Declaration. Patients were divided randomly into two groups of 50 each: group A, was subjected to traditional laparoscopic cholecystectomy using electrocautery and titanium clips, and group B, subjected to laparoscopic cholecystectomy using bipolar vessel sealer to seal cystic duct and artery. The exclusion criteria included patients older than 80 years of age, patients with a history of upper laparotomy, patients with common bile duct stones, pregnant women, and patients with acute cholecystitis with a history of jaundice and post ERCP (Endoscopic Retrograde Cholangiopancreatography) 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.

Single dose of Ceftriaxone, third generation cephalosporin 1gm was given to both groups 30-60 minutes before surgery. Surgery was performed under general anaesthesia using a conventional four-port; a umbilical port, a port below xiphoid, and two ports below the right costal margin. Pneumoperitoneum at a pressure of 12 mmHg was used. In group A, LC 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, LC was performed by dissection of Calot's triangle and then occlusion of both the cystic duct and artery using a bipolar cautery. Finally, abdominal drain 10 french was inserted into the Morrison pouch in both the groups. The preoperative, intraoperative and postoperative parameters were collected including age, sex, weight, duration of operation, intraoperative blood loss, postoperative pain, complications, hospital stay, amount of postoperative drainage and cost of procedure. The data was analysed using SPSS (version 10; SPSS Inc., Chicago, Illinois, USA). Analysis of data was based on an intention-to-treat principle. For continuous variables, descriptive statistics were calculated and reported as mean \pm SD. Categorical variables were described using frequency distributions.

Results

The mean age of patients in group A was 41.7 \pm 4.2 years and in group B was 41.6 \pm 4.0 years. There were 36 females in group A and 38 in group B. (Table 1). Viral markers were negative in all patients.

Haemoglobin 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 Haemoglobin level. 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 ± 1.6 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 clips 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. 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 both the groups. In our study, mean postoperative pain score on VAS scale in group A was 2.17 ± 0.53 and in group B was 2.17 ± 0.54 . On statistical analysis ($p=0.85$) no significant difference was found in post-operative 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 two groups and its came to be 1-2 days. No Intraoperative complications in the form of bleeding and CBD injury, stone spillage and gall bladder perforation was found in both the groups.

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

	Group A	Group B	Observed difference in mean value	p value
Age	41.7 ± 4.2	41.6 ± 4.0	0.1	$P > 0.05$
Sex	Male 14, Female 36	Male 12, Female 38	-	$P > 0.05$
No. of clips applied	Average 4 -5	Nil		
Duration of surgery	30.9 ± 7.3	37.0 ± 7.5	-6.12	$t = -4.1; df = 98; p < 0.001$
Intraoperative blood loss	9.3 ± 2.9 ml	6.9 ± 1.6 ml	2.38	$t = 5.04; df = 98; p < 0.001$
Amount of post operative drainage	22.4 ± 13.6 ml	3.6 ± 3.9 ml	18.8	$t = 9.32; df = 98; p < 0.001$
Color	Serious	Serious		
Hospital stay	1-2 days	1-2 days	-	$p > 0.05$

Table 2: Postoperative complications

	Group A (%)	Group B (%)
Nausea	(6)3%	(4)2%
Vomiting	(2)1%	(2)1%
Pain	(2)1%	(2)1%
Headache	(4)2%	(4)2%
VAS score	2.17 ± 0.53	2.17 ± 0.54

$p = 0.85$

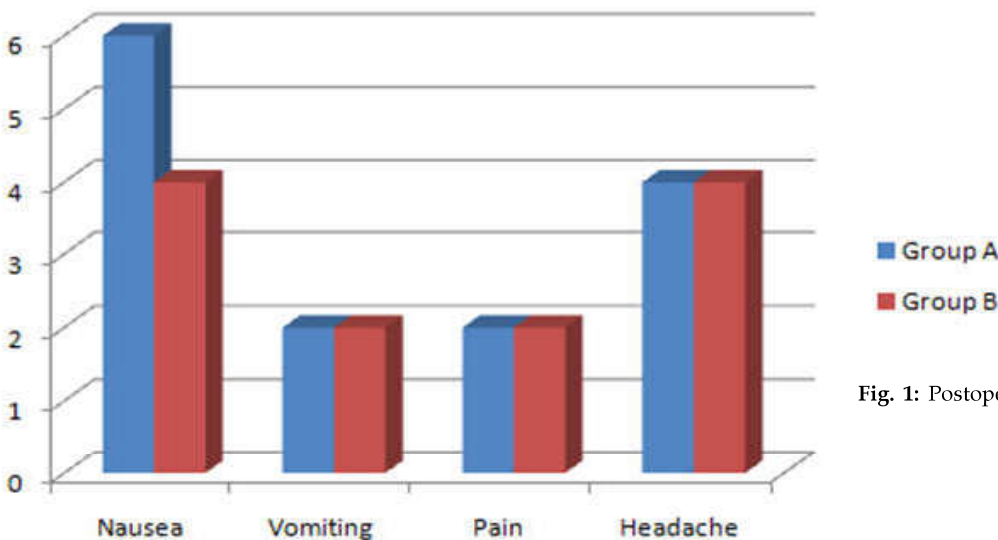


Fig. 1: Postoperative complications

Discussion

Fifty patients were subjected to traditional laparoscopic cholecystectomy using electrocautery and titanium clips and 50 to laparoscopic cholecystectomy using electrocautery and bipolar vessel sealer. 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 significant difference in the duration of surgery in favor 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 LC 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 vs 32±11 vs 37±10 min, respectively). Catena et al [13] further showed in a prospective, randomized, single-center study regarding LC for acute cholecystitis that the Harmonic scalpel or electrocautery techniques had similar mean operative times (101.3 vs 106.4 min; P>.05). This inconsistency in the operative time may be the result of variations in the study protocol, patient selection, operative technique, surgeon's experience, and case volume.

The intraoperative blood loss mean difference in two groups was 2.38 ml and was statistically significant which was indicated by significant reduction in level of hemoglobin and hematocrit in group A.

Katri et al [14] conducted a study in 158 patients, in which they studied the use of monopolar cautery for controlling the cystic artery in 114 patients and clips in 33 patients. They recorded no bleeding complication 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 electrocautery group and found that mean operative time and intraoperative blood loss was significantly less in harmonic shear group and found harmonic scalpel to be effective and safe instrument for dissection and hemostasis 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 with 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. The only complication encountered in the study group was a patient with a 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 [15]. The amount of postoperative drainage was significantly more in group A and mean difference observed was 18.8 ml which may be attributed to presences 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 the mean amount of postoperative drainage was significantly more in the traditional cholecystectomy group than in the harmonic scalpel group. Use of monopolar or bipolar cautery may cause injury to nearby organs i.e CBD, stomach or small intestine. Local complications like liver injury, 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. Cost of instrument is higher than the cost of the clip applied. Harmonic scalpel are also used to seal the cystic artery and cystic duct and 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 an 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 leak in place of metal clips when diameter is less than 6 mm. We found that bipolar vessel sealer led to complete and safe closure of the cystic duct and artery and is cost effective.

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