Research Article

Comparison of Direct Pressure versus Electrocauterization of Liver Bed for Bleeding Control in Laparoscopic Cholecystectomy

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Abstract

Background: Gallstones are very common worldwide with a prevalence of 6% in men and 29% in women of all ages. Laparoscopic cholecystectomy is the gold standard treatment for gallbladder diseases associated with frequent complication of haemorrhage. Applying direct pressure or electrocauterization can be used for securing hemostasis and pain control.

Objective: To compare hemostatic control by direct pressure versus electrocauterization while dissecting the gall bladder from liver bed during laparoscopic cholecystectomy in terms of intra-operative bleeding, Post-operative bleeding and pain.

Methods: This randomized controlled trial was conducted at Surgical Unit of Mayo Hospital Lahore. Total 200 patients were enrolled, in 100 patients haemorrhage from liver bed was controlled by applying direct pressure with the help of gauze for 5 minutes (Group A) and remaining 100 patients (Group B) it was controlled by electrocauterization. Intra-operative bleeding. post-operative bleeding, and post-operative pain scores were recorded and all patients were discharged after 24 hours of close monitoring.

Results: The mean age of cases in A Group and B group was 40.38 ± 12.30 and 42.15 ± 10.40 years respectively. Intraoperative bleeding was secured in 85 (85%) patients in Group-A and in 96(96%) patients in Group-B. Group-B treatment was more effective than Group-A treatment for bleeding (p-value= 0.008). Mean pain score of patients at 12th hour was 4.76 in group A and 5.55 in Group B. It was 3.09 in group A and 3.60 in group B at 24th hour postoperatively with p-value of 0.0001.

Conclusion: Electrocauterization is a better technique for hemostasis of liver bed in comparison with direct pressure during laparoscopic cholecystectomy.

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Introduction

Gallstones are very common worldwide with prevalence of 6% in men and 29% in women of all ages[1].Laparoscopic cholecystectomy is the gold standard treatment for gallbladder diseases(Gall Stones)[2].

Hemorrhage is the frequent complication of laparoscopic removal of gall bladder.[3] It can be a challenging event, if ample and unmanageable haemorrhage abruptly concealed the vision which leads to the conversion of laparoscopic cholecystectomy into an open procedure[4]. Hemostatic methods used in laparoscopic cholecystectomy are monopolar electrocautery, bipolar electrocautery, ultrasonic coagulator and direct pressure on the liver bed[5].

In this study we elaborated an easy and effective method to stop the bleeding from the liver bed in such situation. The hemostasis of small direct tributaries coming from liver bed during laparoscopic cholecystectomy, is either to apply direct pressure with hot sponge for few minutes or by electrocauterization[6].

One study of four hundred and fifty one cases conducted in the department of general surgery, King Edward medical university, Lahore demonstrated the effectiveness of application of direct pressure and other modes of hemostasis for the liver bed in laparoscopic cholecystectomy and revealing the direct pressure application as 83 Percent effective for the bleeding control.[7]

Another Study was done at Al-Jamhori teaching hospital in Mosul, in which 320 patients underwent laparoscopic cholecystectomy, they demonstrated that the electrocautery effectiveness was 65% for securing hemostasis in laparoscopic cholecystectomy.[8]

The rationale of this study is to evaluate the effectiveness and safety of direct pressure compared to electrocauterization for securing hemostasis and pain control. Previously there was no such study which directly compared the both techniques as we have done. But most of the studies have used electrocautery with other modalities for controlling per-operative bleeding during laparoscopic cholecystectomy. So in this study we compare direct pressure and electrocauterization for hemostasis of liver bed in laparoscopic cholecystectomy as these two methods are internationally acceptable.

Methods:

All patients undergoing laparoscopic cholecystectomy between ages of 12 to 70 years having cholelithiasis, confirmed on Ultrasound of either gender were included in the study and admitted through outdoor patient department of North Surgical Unit of mayo Hospital Lahore from July 2018 to january 2019. Patients having history of bleeding disorder, previous multiple abdominal surgeries, gall bladder mass or Ascites confirmed on ultrasonography were excluded from the study. All the patients that presented during the study period and fulfilled the inclusion and exclusion criteria were enrolled in the study through non-probability, purposive sampling technique following inclusion and exclusion criteria. Research analysis carried out after approval from the Institutional Review Board and ethical committee with registration no. 41/RC/KEMU. Sample size of 200 patients (100 patients in each group) is estimated by using 5% level of significance, 90%power of test with expected percentage direct pressure as 83%[7] and electrocauterization as 65%[8]. The demographic information including name,age, gender, address was collected through pro-forma after taking informed consent from patient. All admitted patients were divided into two groups by lottery method. All patients underwent threeportslaparoscopic cholecystectomy by the consultant surgeon (having experience of five years in laparoscopic surgery). Cystic duct and cystic artery was secured with clips and cystic artery is dissected with electrocautery. Gall bladder was dissected from liver bed with the help of L Hook. In Group A bleeding from liver bed was controlled by applying direct pressure with the help of guaze for 5 minutes (which if not succeeded then considered dropout and managed by other hemostatic technique which include bipolar electrocautery and clipping). In Group B, bleeding was controlled by monopolar electrocautrization (which if not succeedded then considered dropout and managed by other hemostatic techniques). Primary outcome variable was Ooze (blood spillage) from gall bladder fossa which changes colour of gall bladder bed after removing gall bladder during laproscopic cholecystectomy assessed by the surgeon. Secondary outcome variable was postoperative bleeding from gall bladder bed which was assessed within 24 hours of the operation, with radiological findings on ultrasound (more than 10ml) consistent with hematoma or collection of blood more than 10 ml in drain and postoperative pain was analyzed by visual analogue scale abelling 0-3 (mild), 4-7 (moderate) and 8-10 (severe). Pain score was calculated at 6, 12 and 24 hours postoperatively and routine analgeics were given (Intravenous ketorolac 30mg 8 hourly). Collected data was entered to SPSS version 21 and was analyzed. Quantitative data like age and pain score was described as mean ± SD. Qualitative variables like gender, per-operative bleeding, post-operative bleeding was described as frequencies, percentages and proportions. Comparison of outcome for pain score between two groups Direct Pressure and Electrocauterization was done with the help of independent sample t-test and for per operative and post operative bleeding with Chi Square test. P-value ≤ 0.05 was considered significant.

Results:

In this study, mean age of patients in Group-A and in Group-B was 40.38 ± 12.30 and 42.15 ± 10.40 years respectively. In Group-A 13(13%) patients were

male and 87 (87%) were female. While in Group-B 10 (10%) patients were male and 90 (90%) were female. Intraoperative bleeding was secured in 85(85%) patients in Group-A and in 96 (96%) patients in Group-B, p-value = 0.008, Table 1.

Table-1: *Intraoperative bleeding status and drain placement*

Intraoperative bleeding status in Treatment Groups				
	Group-A	Group-B	Total	P-Value
Secured	85 (85%)	96 (96%)	181	
Unsecured	15 (15%)	4 (4%)	19	
Total	100	100	200	
				0.008
Drain placed in Treatment Groups				
Yes	16 (18.8%)	11 (11.4%)	27	
No	69 (84%)	85 (89%)	154	
Total	85	96	181	
				0.165
Collection of blood in Drain (>10 ml/24 Hours) in Treatment Groups				
Yes	0 (0%)	0 (0%)	00	
No	16 (100%)	11 (100%)	27	
Total	16	11	27	
Postoperative hematoma on Ultrasound after 24 hours in Treatment Groups				
Yes	0 (0%)	0 (0%)	00	
No	85 (100%)	96 (100%)	181	
Total	85	96	181	

Table-2: *Pain Score at 6,12 and 24 hours*

Pain status at 6thhour in treatment groups			
	Group-A	**Group-B**	**P-value**
N	85	96	
Mean	7.55	6.75	
SD	0.62	1.35	0.000
Minimum	6.00	3.00	
Maximum	9.00	9.00	
Descriptive statistics for Pain status at 12th hour in treatment groups			
N	85	96	
Mean	4.76	5.55	
SD	0.97	1.23	0.000
Minimum	3.00	2.00	
Maximum	7.00	8.00	
Pain status at 24th hour in treatment groups			
N	***85***	***96***	
Mean	3.09	3.60	
SD	0.68	1.10	***0.000***
Minimum	2.00	1.00	
Maximum	6.00	7.00	

Drain was placed in 16 (18.8%) out of 85 patients in Group-A and in 11 (11.4%) out of 96 patients in Group-B. In Group-A 0 (0%) patients out of 16 and in Group-B 0 (0%) patient out of 11 had collection of blood > 10ml/24 Hours. In Group-A 0 (0%) patients out of 85 and in Group-B 0 (0%) patient out of 96

had Postoperative hematoma on ultrasound after 24 hours. At 6th hour mean pain score in Group-A and in Group-B showed significant difference. i.e. Group-A:7.55 ± 0.62 vs. Group-B : 6.75 ± 1.35, p-value = 0.000**.**At 12th hour significant difference was seen in mean pain score in both treatment groups. i.e. Group-A: 4.76 ± 0.97 vs. Group-B: 5.55 ± 1.23, p-value=0.000. At 24th hour also significant difference was seen in mean pain score in Group-A and in Group-B patients. i.e.3.09 ± 0.68 and 3.60 ± 1.10, p-value = 0.000, Table 2.

Discussion:

In surgical centers the operative procedures involving extensive coverage, laparoscopic cholecystectomy is the standard surgical method for patients with symptomatic gallstone disease and other benign gallbladder diseases.[9] It is the preferred due to less post-operative pain, short hospital stay, better cosmetic results and earlier return to work. It is accepted as a gold standard treatment for gall bladder surgery.[10] But this laproscopic cholecystectomy that is currently being frequently performed for gallstones has numerous complications.[11] The known complications are bile duct injuries with an incidence of 0.6%[12] and intraoperative bleeding with an incidence of less than 2%[13]. During Laparoscopic cholecystectomy the most life threatening complication is haemorrhage[14]. It can occur from any site during the procedure e.g port site, cystic artery, right hepatic artery, inferior vena cava and liver bed. Mostly the bleeding complications occur in acute cases because of adhesions, increased vascular supply and friable tissue due to inflammation, where surgeons encounter difficulty in dissecting calot's triangle[7].

The well known methods to the achieve hemostasis from the gallbladder bed are; use of electro-cautery, Liga Sure, laparoscopic suture placement and direct pressure with a surgical gauze.

In this study we compared the outcome of direct pressure versus electrocauterization for hemostasis control of liver bed during laproscopic cholecystectomy. Our results showed that the efficacy of direct pressure for securing bleeding was significantly lower as that of electrocautrization (85% vs. 96%, p-value = 0.008).

One recent study reported the hemostasis efficacy for direct pressure and endoclip technique as 83% and 100%[7]. However in our study the efficacy of direct pressure for controlling haemorrhage was higher than that of mentioned in the above study.

Chan et al., (2000) reported in his study that endovascular gastrointestinal anastomosis stapler is helpful in securing bleeding but malfunction may occur leading to significant blood loss and subsequently need for conversion to open procedure. In these cases vigorous bleeding did not allow immediate placement of clip and hemostasis was secured with the direct pressure by using surgical gauze and 10 mm smooth tipped spoon forcep instrument[15].

Karne et al., (2014) observed that bleeding from liver bed occurred in 12.5% of the patients undergoing laparoscopic cholecystectomy. The incidence of bleeding from liver bed in acute cases was twice as compared to chronic cases[16]. Sahu et al., (2013) reported an incidence of densely adherent gall bladder to liver bed of more than 40% in cases with an acute attack of cholecystitis. They suggested that in such cases skeletonization, division and ligation of vessels becomes essential[17]. The reason for this difficulty is attributed to the fact that alteration of local anatomy occurs as a result of pericholecystitis and subsequently the cleavage plane between the gallbladder and liver bed is lost. These conditions predisposes the traversing vessels to the injury, when dissection of gallbladder from liver bed is attempted[17].

In this study we have focused on another aspect of post-operative pain after laparoscopic cholecystectomy (LC). Studies have not compared / reported pain score in relation to use of different modalities for maintaining laparoscopic hemostasis. But we assessed pain score in both treatment groups postoperatively at 6th, 12th and 24th hour. Mean pain score of patients at 12th and 24th hour postoperatively was significantly higher in patients who underwent electrocautery as compared to the direct pressure group.

Previous studies reported the use of the Harmonic scalpel with less postoperative pain but major cause may be a significantly shorter operative time for LC with Harmonic scalpel than with monopolar electrocautery[18]. However, Guanqun Liao study results showed that the two techniques were associated with similar post-LC pain and requirement for analgesics[19]. Karnail Singh in his study reported very low pain score post operatively in patients who underwent Laparoscopic Cholecystectomy with the use of electrocautery technique[20].

Kari et al in his study reported that monopolar electrocautery can be used to manage cystic artery in laparoscopic gallbladder removal[21]. Redwan AA. in his study reported that the harmonic scalpel as well as clip or electrocautery was effective in laparoscopic cholecystectomy attaining hemostasis with short operative time[22].

In this study hemorrhage was successfully controlled by both electrocautery and direct pressure application for 5 minutes. End suturing was performed in those four cases in which direct pressure application and electrocautery was not sufficient to halt bleeding. Multiple strategies discussed in literature to control hemorrhage during laparoscopic cholecystectomy including direct pressure application, cauterization, endocliping and endosuturing[7]. The advantage of electrocautery was that it reduces the time consumption peroperatively with decreased chances of converting laparoscopic surgery into open procedure. Meticulous hemostasis by electrocauterization reduces the chances of placing drain peroperatively which ultimately reduces the hospital stay of the patient and reduction in hospital cost.

Electrocautery do not have risk of postoperative complications like clip slippage, dislodgement, rebleeding and ulceration. In other words it could be formulated that electrocautery is a better alternative to direct pressure and surgical clips in experienced hands[23]. The time duration, cost aspect and accessibility makes electrocautery more feasible specially in a low resource setting. However, the depth of burn with electrocautery is less predictable and current can be conducted through non-insulated apparatus and trocars. So laparoscopic surgeon must work carefully while doing dissection of the Calot's triangle. Unnecessary and excessive dissection or electrocautery use near common bile duct should be avoided[24].

The study mainly focused on hemostatic control of liver bed during laparoscopic cholecystectomy. The choice of technique is largely dependent on surgeon's choice. However, if the hemorrhage from liver bed is severe then in such cases cauterization and pressure application may fail. Oversewing of the bleeding vessels may be the only solution in those cases.[25] Additionally in setups where more advanced techniques such as harmonic scalpels are routinely used the incidence of hemorrhage from liver bed may reduce. The limitation of this study is that it was conducted at a single center and on a limited number of patients. Future research is needed on this subject with large number of patients from multiple centers.

Conclusion:

Electrocauterization is a better technique for hemostasis of liver bed in comparison with direct pressure during laparoscopic cholecystectomy.

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