Comparison of Monopolar Electrocautery Versus Harmonic Scalpel in Dissection of The Gall Bladder from Gallbladder Bed in Laparoscopic Cholecystectomy

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Abstract

Objective: The objective of this study was to compare the incidence of gall bladder perforation during its dissection with monopolar electrocautery Vs harmonic scalpel from liver bed in laparoscopic cholecystectomy.

Method: It was a comparative study held at Surgical Department, surgical department, Services Hospital, Lahore to check the incidence of gallbladder perforation and difference in duration of procedure during gall bladder dissection with harmonic versus monopolar electrocautery. Total 144 patients under laparoscopic cholecystectomy for symptomatic gall stone disease in surgical department of Services Hospital, Lahore were included in this study and divided in two groups. In group A gall bladder dissection was done with monopolar electrocautery while in group B harmonic scalpel was used.

Results: Incidence of perforation in laparoscopic cholecystectomy done with monopolar electrocautery and harmonic scalpel was 16.6 % vs 15.3% and operative time was 46.38±14.04 minutes vs 19.36± 4.96 minutes.

Conclusion: Incidence of perforation of gall bladder is almost equal during its dissection from liver bed when done either with monopolar electrocautery or harmonic scalpel with the duration of procedure making the difference between the two groups.

Keywords: laparoscopic cholecystectomy, harmonic scalpel, monopolar electrocautery.

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Introduction

Removal of gall bladder is known as cholecystectomy.1 It is the most common surgical procedure worldwide. Carl August Langenbuch in 1882 performed first Laparoscopic cholecystectomy. In Pakistan first Laparoscopic cholecystectomy was performed in 1991. Inflammation of gall bladder is known as cholecystitis which most commonly occurs in the presence of gall stones.[2] Patients of acute cholecystitis usually presents with repeated attacks of pain at right hypochondrium and epigastrium. This pain is associated with nausea, vomiting, dyspepsia, indigestion, flatulence, and abdominal distension. Cholecystectomy is the management of choice for cholelithiasis. It is usually done by open and laparoscopic technique. Cholecystectomy is associated with post-operative complications of pain, nausea, vomiting and wound infection.

Laparoscopic cholecystectomy is considered better as compared to open due to significant reduction in post-operative pain, shorter hospital stay and early recovery.[3] It results in patient's earlier return to normal life and work activities. Now a days in experienced hands operation is done as an outpatient procedure in appropriately selected patients.

Different instruments are used for dissection of gall bladder from gall bladder fossa. These include monopolar electrocautery and ultrasonic dissector. Gall bladder

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perforation is associated with spillage of bile and stones in abdominal cavity during dissection. It disrupts flow of surgery and also increase operative time. It may also results in increased postoperative intra peritoneal infections which increase not only morbidity but also mortality rate of patients. Reported incidence of gall bladder perforation during surgery is 20–40%.[4] Currently gall bladder is removed from gall bladder fossa using monopolar electrocautery. Complication includes local and distant tissue damage by heat.

Ultrasonic dissection is now done for gall bladder removal in some setups. This technique is safer due to less thermal injury, creation of smaller zone of tissue damage and more accurate dissection. In some international studies incidence of gallbladder perforation is reported low with ultrasonic dissection compared to monopolar electrocautery during laparoscopic cholecystectomy.[5]

The present study was designed and conducted to determine and compare electrocautery with ultrasonic dissector for gall bladder dissection in laparoscopic cholecystectomy and to determine the incidence of gallbladder perforation during dissection.

Material and Methods

Comparative study was carried out in 6 months from July to December 2020. Inclusion criteria includes patients with age between 16-80 years. Exclusion criteria includes patients with co morbidities, acute cholecystitis and liver cirrhosis. Patient from Services Hospital were selected that were having no comorbidity like hypertension, diabetes, HIV or hepatitis B, C etc and data was documented on prescribed questionnaire after getting permission from Institute Review Board (IRB). Informed patient consent was taken prior to getting information. They were also informed about associated risks with their operation and they were purposively selected for both procedures based on patient's availability and surgeon's willingness for fulfilling the inclusion criteria. All the procedures were performed by consultant surgeons. Sample size was calculated by considering reference study[6] using epi-info software and based on population undergoing surgery in our Hospital with 95% Confidence level and 5% error rate. It was 72 in number for each case i.e. Group A (monopolar electrocautery) and Group B (Harmonic Scalpel). Patients were then randomly allocated into two groups A and B by using random numbers table method. In group A gall bladder dissection was done with the help of monopolar cautery and in group B gall bladder dissection was carried out with the help of harmonic scalpel. The rate of gall bladder perforation was noted in both groups. All cases included in the study were operated under general anesthesia. Demographic information of patient (name, age, sex) was obtained along with informed patient consent prior to anesthesia. Data was analyzed using SPSS version 23 through its statistical program. The variable under study were gall bladder perforation and operative time. The gall bladder perforation was considered positive in case of bile leakage from gall bladder during dissection. Operative time was noted from callot's triangle dissection to gall bladder removal from liver bed. This variable was analyzed using simple descriptive statistics, using mean and standard deviation. The significance of differences observed by the two methods being mainly qualitative (gall bladder wall perforation) were subjected to Chi Square test. A p value of 0.05 or less was taken as criteria of significant results. Data of other variables was stratified for age, gender, number of stones (single and multiple) and duration of symptoms to address effect modifiers. Chi square test was applied post stratification with p-value ≤ 0.05 taken as significant.

Results

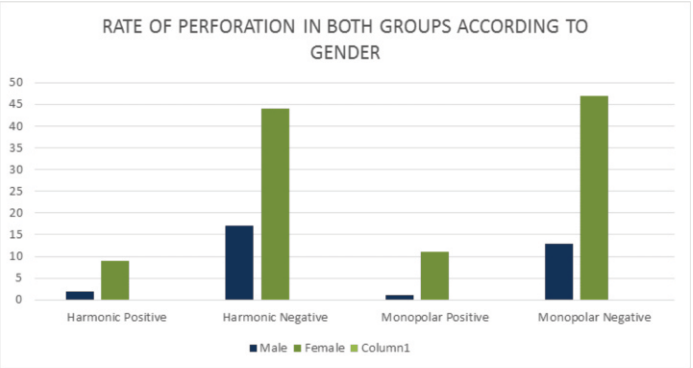
It was found that patients in Group A were 58/72 (80.6%) female and 14/72 (19.4%) male whereas in Group B 53/72 (73.6%) were female and 19/72 (26.4%) were male. The age of the study subjects in group A was comprised of age range of 24-65 years with mean of 38.22±8.30 years and in group B age range was 17-75 years with mean 35.68±7.41years. The pre-operative ultrasound showed multiple stones in gall bladder in all patients of both groups. Stone duration from patients were asked and found that patients had mean value of 14.06±6.08 months in group A while patients of group B had stones with mean value of 15.56±6.84 months

Table 1: *Presentation of statistical analysis of gall bladder perforation in both study groups*

Study Variables		Group A gall bladder dissection was done with the help of monopolar cautery n=72		Group B gall bladder dissection was carried out with the help of harmonic scalpel n=72		P- Value
		Number	Percentage	Number	Percentage	
Perfotion	Positive	12	16.6	11	15.3	0.84
	Negative	60	83.4	61	84.7	

Chi square showed P-Value of 0.587. Operative time for surgical procedures was calculated and it was found that for group A mean value was 46.38±14.04 minutes and for group B mean value was comprised of 19.36± 4.96 minutes. Chi square was applied and p-value was calculated that showed 0.630 for comparing both the cases. Conversion rate to open cholecystectomy was nil and similarly no intraoperative or immediate postoperative complication was reported. Perforation of gall bladder was reported in 12/72 (16.6%) cases of group A whereas 11/72 (15.3%) in group B as shown in Table 1. Perforation within both groups have been shown in (Fig-1).

Fig-1. *Graphical Presentation of Association of Gender with Perforation in both Study Groups*



Discussion

Cholelithiasis is the commonest medical problem that results in surgical intervention. The confounding variables include obesity, hemolytic diseases and cirrhosis but such cases were excluded from the sample.

Although this comparative study did not show significant p-values for determining any relationship between presence of perforation due to usage of scalpel in both study groups but found harmonic scalpel as more effective and safer for removal of gallbladder from liver bed than monopolar cautery as using monopolar cautery cases were presented with relatively high rate of perforation with 16.6% as compared to those performed with harmonic scalpel that resulted in 15.3% cases of peroration. This study confirms with the findings of previous studies who found harmonic scalpel as a safer surgical instrument for gallbladder dissection preventing gall bladder perforation and decreasing operating time as compared to monopolar electrocautery.[5-7] The gall bladder perforation during surgical procedures by any of the two methods may result in lengthening of surgical procedure. Electro cautery dissection is reported for high chances of gall bladder perforation either due to being too close to the gallbladder wall or using lengthy duration of energy delivery.[8]

Cavitation and smokeless coagulation results in advantage over electro cautery for gall bladder dissection by harmonic scalpel. Effective closure of the ducts of Luschka during liver bed dissection is another advantage of Harmonic scalpel as if not done effectively it may result in postoperative pain, small bilomas, and the occasional return to the operative room.[5-7]

According to Tsimoyiannis et al gallbladder dissection using harmonic scalpel in experienced hands results in less incidence of gallbladder perforation and operative time. Inexperienced residents or surgeons who didn't have familiarity with harmonic scalpel may result in prolonged surgical procedures.

According to Wetter et al. usage of harmonic scalpel resulted in less operative time because it was used as a sole instrument that did not allow to use extraction and insertion of various instruments. This resulted also in easy handling of instruments thus minimizing the instrument handling errors and avoid wastage of time. It is reported that smoke was not produced during surgery with harmonic scalpel rather microaromized water droplets were formed. The mist generated by this method was swiftly absorbed through peritoneal surface, and did not require suctioning or releasing caused due monopolar electrocautery dissection. Thus per operatively visibility of the operative field was preserved during procedure.[9-11] Limitation of this study includes small sample size due to single center study. Large multicenter study is required to determine statistical significance in less incidence of gall bladder perforation and operative time between monopolar electrocautery and harmonic scalpel in gall bladder dissection.

Conclusion

This study concluded that both monopolar electrocautery and harmonic scalpel have equal chances of gall bladder perforation during its dissection. However there is significant reduction in operative time while using harmonic scalpel by experienced hands.

Conflict of Interest *None*

Reference

1. Clout M, Blazeby J, Rogers C, Reeves B, Lazaroo M, Avery K, Blencowe NS, Vohra R, Jennings N, Hollingworth W, Thorn J. Randomised controlled trial to establish the clinical and cost-effectiveness of expectant management versus preoperative imaging with magnetic resonance cholangiopancreatography in patients with symptomatic gallbladder disease undergoing laparoscopic cholecystectomy at low or moderate risk of common bile duct stones (The Sunflower Study): a study protocol. BMJ open. 2021 Jun 1;11(6):e044281.

2. Shukla A, Seth S, Ranjan A. A comparative study between laparoscopic and open cholecystectomy in cases of cholecystitis with cholelithiasis: one year experience in tertiary care center. International Surgery Journal. 2017 Feb 25;4(3):903-7.
3. Manatakis DK, Papageorgiou D, Antonopoulou MI, Stamos N, Agalianos C, Ivros N, Davides D, Pechlivanides G, Kyriazanos I. Ten-year audit of safe bail-out alternatives to the critical view of safety in laparoscopic cholecystectomy. World journal of surgery. 2019 Nov; 43(11):2728-33.
4. Altuntas YE, Oncel M, Haksal M, Kement M, Gundogdu E, Aksakal N, Gezen FC. Gallbladder perforation during elective laparoscopic cholecystectomy: Incidence, risk factors, and outcomes. Northern clinics of Istanbul. 2018; 5(1):47.
5. Jiang HP, Liu YD, Li YS, Shen ZL, Ye YJ. Ultrasonic versus electrosurgical device for laparoscopic cholecystectomy: A systematic review with meta-analysis and trial sequential analysis. International journal of surgery. 2017 Apr 1;40:24-32.
6. Sanawan E, Qureshi AU, Qureshi SS, Cheema KM, Cheema MA. Effectiveness of ultrasound shear for clipless laparoscopic cholecystectomy versus conventional unipolar electrocautery in patients with cholelithiasis. Journal of the College of Physicians and Surgeons Pakistan. 2017 Oct 1;27(10):611-5.
7. Rajnish K, Sureshkumar S, Ali MS, Vijayakumar C, Sudharsanan S, Palanivel C. Harmonic scalpel-assisted laparoscopic cholecystectomy vs. conventional laparoscopic cholecystectomy-a non-randomized control trial. Cureus. 2018 Jan;10(1).
8. Rosenberg J, Leinskold T. Dome down laparosonic cholecystectomy. Scandinavian journal of surgery. 2004; 93(1):48-51.
9. Kandil T, El Nakeeb A, El Hefnawy E. Comparative study between clipless laparoscopic cholecystectomy by harmonic scalpel versus conventional method: a prospective randomized study. Journal of Gastrointestinal Surgery. 2010;14(2):323-8.
10. Choi C, Do IG, Song T. Ultrasonic versus monopolar energy-based surgical devices in terms of surgical smoke and lateral thermal damage (ULMOST): a randomized controlled trial. Surgical endoscopy. 2018 Nov; 32(11): 4415-21.
11. Amudhan Kannan AT, Quadir H, Hakobyan K, Gaddam M, Ojinnaka U, Ahmed Z, Dominic JL, Kantamaneni K, Went TR, Mostafa JA. The Outcomes of the Patients Undergoing Harmonic Scalpel Laparoscopic Cholecystectomy. Cureus. 2021 Jun;13(6).

Authors Contribution

MJB: Conceptualization of Project
MAI: Data Collection
UAR: Literature Search
HY: Statistical Analysis
IA: Drafting, Revision
AA: Writing of Manuscript