ORIGINAL ARTICLE

MONOPOLAR ELECTROCAUTERY VERSUS ULTRASONIC DISSECTION OF THE GALLBLADDER FROM THE GALLBLADDER BED IN LAPAROSCOPIC CHOLECYSTECTOMY

Shireen A A Ramzanali, Zia-ul-Islam, Syed Sagheer Hussain Shah
Department of Surgery, Jinnah Postgraduate Medical Centre Karachi, Pakistan

Background: Gold standard treatment for symptomatic gall stones is laparoscopic cholecystectomy (LC). Ultrasonically activated devices have been used for gall bladder dissection in LC. Harmonic scalpel (HS) is the leading ultrasonically cutting coagulation device offering surgeons important benefits. The main aim of our study was to compare the surgical outcomes of LC performed by HS to that performed by conventional mono-polar diathermy (electro-cautery). **Methods:** This prospective randomized study was conducted in surgical department of Jinnah Postgraduate Medical Centre, Karachi, during May–October 2013. During this period we selected 92 patients with symptomatic gallstones who underwent LC; these patients were randomly recruited into two groups using sealed opaque envelopes. Group A underwent gallbladder dissection from its bed using mono-polar diathermy, while on the other hand in Group B the dissection was carried out using harmonic scalpel. The outcomes like gallbladder perforation with bile spillage, intra-operative bleeding and operative time were assessed. **Results:** The harmonic scalpel (HS) usage in surgery results in shorter operative time, it also leads to less gallbladder injury, bile leakage and stone spillage (due to minimal lateralization of heat energy) not only this it also leads to less intra-operative blood loss. **Conclusion:** Harmonic scalpel is a new innovation in gallbladder surgery it has multiple functions like cutting, coagulation, coaptaion and cavitation which have made it safe, handy, effective and reliable instrument.

Keywords: Gall stones, cholecystectomy, electrocautery, monopolar, gall bladder.
J Ayub Med Coll Abbottabad 2013;25(3-4):16–8

INTRODUCTION

Laparoscopic cholecystectomy is the "gold standard" for the treatment of symptomatic cholelithiasis. Gall bladder perforation during dissection from the liver bed with spillage of bile and loss of stones in the peritoneal cavity is a common operative problem during laparoscopic cholecystectomy.[1] The incidence of gallbladder perforation during laparoscopic cholecystectomy has been reported to be 20–40%.[2,3] During surgery, gall bladder perforation with spillage of bile and loss of stones disrupts the level of surgery and prolongs its duration. At present, mono-polar-electro-cautery is the main cutting method used for gallbladder dissection from the liver bed. It is associated with local thermal and distant tissue damage, which might cause inadvertent perforation of the gallbladder during gallbladder bed dissection.[4–6]

The incidence of gall bladder perforation has been reported to be low with ultra-sonic dissection compared to monopolar-electrocautery during laparoscopic cholecystectomy.[7–11]

Ultrasonic dissection of the gall bladder bed during laparoscopic cholecystectomy has the potential to improve the quality of surgery by decreasing the incidence of gall bladder perforation and its intra-operative consequences. The gall bladder perforation and bile leak was 40% in the electro-cautery verses 16.7% in the ultrasonic dissection group.

Studies like randomized controlled trials on the above mentioned techniques are lacking and no local study could be found on this topic. Therefore, the present study is designed to compare the two techniques and the one with better results could be recommended as the first line treatment for the dissection of the gall bladder from the gall bladder bed in laparoscopic cholecystectomy.

MATERIAL AND METHODS

This randomized controlled trial was conducted in the surgical department of Jinnah Postgraduate Medical Centre, Karachi, from May to October 2013. The study was conducted after taking informed consent from the patients after institutional ethical approval. Cases meeting the inclusion criteria were enrolled in the study from the ward admitted through the Outpatient Department. Adult patients of either gender with symptomatic gallstone disease for the last 6 months between 18 and 75 years of age with American Society of Anaesthesiologists (ASA) status I & II were included in the study. Patients with common bile duct stones, suspicion of gall bladder malignancy based on ultrasonography and subsequent computed tomography findings were

excluded from the study. Patients with poor ASA grade and current or previous history of acute cholecystitis, obstructive jaundice or pancreatitis were also excluded from study. Ninety-two patients were randomly allocated to two groups (46 patients in each group) using sealed opaque envelops. Group A underwent gall bladder dissection from its bed using mono-polar diathermy, while on the other hand in Group B the dissection was carried out using harmonic scalpel. The outcomes like gall bladder perforation with bile spillage, intra-operative bleeding and operative time were assessed.

Surgery was performed under general anaesthesia by a consultant having more than 5 years post fellowship experience using a uniform technique of video laparoscopic cholecystectomy involving 4 ports. The outcome that was the gall bladder perforation and bile leak was assessed intra-operatively. This information, demographics and base line characteristics like gender, duration of disease, single or multiple stones, obesity and ASA status was documented on a *pro forma* and analysed using SPSS-16. The *p*-value <.005 was considered significant.

RESULTS

Of the total 92 (46 in each group) patients, there were 85 (92.4%) females and 7 (7.6%) males and the age range was 18–60 years with mean±SD 40.04±7.84 years, 30 (32.6%) cases were declared as ASA-2 while on the other hand the remaining cases were ASA-1. The pre-operative ultrasound showed multiple stones in gall bladder in 68 (73.9%) cases while on the other hand single stone and sludge were seen in 24 (26.1%) patients.

The intra-operative blood loss was less in harmonic scalpel group than in mono-polar-electrocautery group (50 ml verses 100 ml) (*p*=.000). The gall bladder was perforated in 2 cases of HS dissection whereas in 3 electrocautery dissected cases. Furthermore stone spillage was seen in none of HS dissected cases while 4 cases of stone spillage were reported in mono-polare-lectrocautery dissected cases. Mean operative time was less in HS dissected group than in electrocautery group, i.e., 40 verses 80 min (*p*=.000).

Table-1: Comparison of outcome of HS and MEC

Parameters	Harmonic scalpel	Monopolar electrocautery
Operative time (min)		
Range	40–70	50–100
Mean±SD	40±4.42	80±17.02
Gall bladder perforation and bile leakage	2	3
Spillage of stones	0	4
intra-operative blood loss (ml)		
Range	20–200	50–300
Mean±SD	50.17±35.97	100.08±44.72

DISCUSSION

Laparoscopic cholecystectomy is gold standard treatment for gallstones disease. The introduction of Harmonic scalpel (HS) has been a break through for it made the laparoscopic surgery much smoother and attractive. Furthermore it has also alleviated the fear associated with the use of mono-polar-electrocatery (MEC).[13,14] Harmonic scalpel works by cutting and coagulating at the same time. It also eliminates the inadvertent electrical arching injury caused by lateralization of thermal energy which are associated with the use of electrocautery[15] making HS a potentially safer instrument for tissue dissection.[16–18]

The use of MEC produces smoke thereby decreasing the visibility, and to get rid of that smoke the valves of trocars have to be opened thereby leading to repeated loss of pnemo-peritonium.[16] On the other hand the use of HS does not form smoke although the mist may be produced by the vibration effect, thereby ensuring the surgeon to work in clean and clear field which in turn reduces the operative time, bleeding and other complications and therefore the need of conversion into open procedure.[17–19]

The study done by Al-Nakeeb *et al* supports our study in terms of statistically significant short operative time.[20] A randomized controlled study done by Catena F and colleagues[21] also supported our study as well as a study by Minutolo V and colleagues[12] also shows similar results.

Gallbladder perforation, bile leakage and stones spillage are complications of laparoscopic cholecystectomy.[15] The use of HS reduces these complications. In our study there were less cases of gall bladder perforation, therefore, minimal spillage which was supported by Ghandi AS and colleagues[22] and Hüscher CG.[23]

CONCLUSION

Harmonic scalpel is a multifunctional and handy device by the use of which we can reduce operative time, intra- and post- operative complications and psychological stress encountered by surgeons.

REFERENCES

1. Diez J, Arozamena C, Gutierrez L, Bracco J, Mon A, Sanchez Almeyra R, *et al.* Lost Stones During Laparoscopic Cholecystectomy. HPB Surg 1998;11(2):108–9.
2. Peters JH, Gibbons GD, Innes JT, Nichols KE, Front ME, Roby SR *et al*. Complications of laparoscopic cholecystectomy. Surgery 1991;110:769–77.
3. Soper NJ, Dunnegan DL. Does intraoperative gallbladder perforation inluence the early outcome of laparoscopic cholecystectomy? Surg Laparosc Endosc 1991;1(3):156–61.
4. Strasberg SM, Eagon CJ, Drebin JA. The 'hidden cystic duct' syndrome and the infundibular technique of laparoscopic cholecystectomy-the danger of the false infundibulum. J Am Coll Surg 2000;191:661–7.

5. Rosenberg J, Leinskold T. Dome down laparoscopic cholecystectomy. Scand J Surg 2004;93:48–51.
6. Janssen IM, Swank DJ, Boonstra O, Knipscheer BC, Klinkenbijl JH, van Goor H. Randomized clinical trial of ultrasonic versuselectrocautery dissection of the gallbladder in laparoscopic cholecystectomy. Br J Surg 2003;90:799–803.
7. Amaral JF. Laparoscopic cholecystectomy in 200 consecutive patients using an ultrasonically activated scalpel. Surg Laparosc Endosc 1995;5:255–62.
8. Power C, Maguire D, McAnena OJ, Calleary J. Use of the ultrasonic dissecting scalpel in laparoscopic cholecystectomy. Surg Endosc 2000;14:1070–3.
9. Wetter LA, Payne JH, Kirshenbaum G, Podoll EF, Bachinsky T, Way LW. The ultrasonic dissector facilitates laparoscopic cholecystectomy. Arch Surg 1992;127:1195–98.
10. Hui TT, Giurgiu DI, Margulies DR, Takagi S, Iida A, Phillips EH. Iatrogenic gallbladder perforation during laparoscopic cholecystectomy: etiology and sequelae. Am Surg 1999;65:944–8.
11. Tsimoyiannis EC, Jabarin M, Glantzounis G, Lekkas ET, Siakas P, Stefanaki-Nikou S. Laparoscopic cholecystectomy using ultrasonically activated coagulating shears. Surg Laparosc Endosc 1998;8:421–4.
12. Mahabaleshwar V, Kaman L, Iqbal J, Singh R. Monopolarelectrocautery versus ultrasonic dissection of the gallbladder from the gallbladder bed in laparoscopic cholecystectomy. Can J Surg 2012;55:307–11.
13. Khan MW, Aziz MM. Experience in laparoscopic cholecystectomy. Mymensingh Med J 2010;19(1):77–84.
14. Westervelt J. Clipless cholecystectomy: broadening the role of the harmonic scalpel. JSLS 2004;8:283–5.
15. Triantafyllidis I, Nikoloudis N, Sapidis N, Chrissidou M, Kalaitsidou I, Chrissidis T. Complications of laparoscopic cholecystectomy: our experience in a district general hospital. Surg Laparosc Endosc Percutan Tech 2009;19:449–58.
16. Bessa SS, Al-Fayoumi TA, Katri KM, Awad AT. Clipless laparoscopic cholecystectomy by ultrasonic dissection. J Laparoendosc Adv Surg Tech A 2008;18:593–8.
17. Carbonell AM, Joels CS, Kercher KW, Matthews BD, Sing RF, Heniford BT. Acomparison of laparoscopic bipolar vessel sealing devices in the hemostasis of small-, medium-, and largesized arteries. J Laparoendosc Adv Surg Tech A 2003;13:377–80.
18. Amarin NS. Harmonic Scalpel and Clipless Cholecystectomy. World J Laparosc Surg 2008;1:6–8.
19. Tebala GD. Three-port laparoscopic cholecystectomy by harmonic dissection without cystic duct and artery clipping. Am J Surg 2006;191:718–20.
20. Schmidbauer S, Hallfeldt KK, Sitzmann G, Kantelhardt T, Trupka A. Experience withultrasounds scissors and blades (UltraCision) in open and laparoscopic liver resection. Ann Surg 2002;235:27–30.
21. Catena F, Ansaloni L, Di Saverio S, Gazzotti F, Coccolini F, Pinna AD. The HAC Trial (Harmonic for Acute Cholecystitis) Study. Randomized, double-blind, controlled trial of Harmonic (H) versus Monopolar Diathermy (M) for laparoscopic cholecystectomy (LC) for acute cholecystitis (AC) in adults. Trials 2009;10:34.
22. Al Ghamdi AS, Khamis HS, El Said RE, Khairy GA. Laparoscopic cholecystectomy: The outcome with minimal conversion rate: Experience in a district hospital. Saudi J Gastroenterol 2003; 9:124–8.
23. Hüscher CG[1], Lirici MM, Di Paola M, Crafa F, Napolitano C, Mereu A, *et al*. Laparoscopic cholecystectomy by ultrasonic dissection without cystic duct and artery ligature. Surg Endosc. 2003;17:442–51.

Address for Correspondence:

Dr. Shireen AA Ramzanali, 334, Aminabad Colony, Off Martain Road, Near PIB Colony, Karachi-5, Pakistan
Cell: +92-321-8984867
Email: dr_shireenramzanali@yahoo.co.uk