

Use of Harmonic shear vs Titanium clips in Laparoscopic Cholecystectomy: Experience in Nawaz Sharif Social Security Teaching Hospital Lahore

SAFDAR HUSSAIN BALOCH, SIKANDER AFZAL, TAHIR HAMID

ABSTRACT

Background: Laparoscopic cholecystectomy (LC) is the procedure of choice for symptomatic gall stones. Conventionally titanium clips are used to close cystic duct (CD) & Cystic artery (CA) followed by division with endoscopic scissors and Gall bladder (GB) dissection with electro cautery using L-hook. To reduce complications and for ease of use, alternative techniques including use of harmonic shears to close & divide CD & CA and GB dissection have been introduced although not widely practiced as yet.

Aim: To compare the duration of operation, safety and complications of conventional method versus Harmonic shear method for closure and division of cystic duct (CD) and cystic artery (CA) and GB dissection during laparoscopic cholecystectomy.

Methods: 86 patients with symptomatic gall stones listed for Laparoscopic cholecystectomy were included in the study and randomised in two groups. 43 patients in one group were planned to undergo closure of CD & CA with titanium clips and division with endoscopic scissors followed by dissection of gall bladder with electro cautery using L-hook (TC group). 43 patients in second group were planned to have closure and division of CD & CA and dissection of GB using harmonic shears (HS group). Duration of operation, perop & postope bleeding and biliary leakage were compared between 2 groups.

Results: There was no significant difference in the rate of complications of bleeding & bile leak between the two groups. However the duration of operation was significantly shorter in HS group.

Conclusion: Use of harmonic shears in Laparoscopic cholecystectomy to close and divide CD & CA and GB dissection is safe with the added advantage of ease of use and time saving compared to conventional titanium clip closure of CD & CA, division with endoscopic scissors and GB dissection with diathermy using L-hook.

Keywords: Laparoscopic Cholecystectomy, Cystic duct, Cystic artery, Titanium Clips

INTRODUCTION

Laparoscopic cholecystectomy is the procedure of choice for symptomatic gall stones^{1,2} and is the most commonly performed major abdominal procedure in the western countries¹. A National Institutes of Health consensus statement in 1992 stated that laparoscopic cholecystectomy provides safe and effective treatment for most patients with symptomatic gallstones and has become the treatment of choice for many patients³. Several methods have been developed⁴ to close the cystic duct (CD) during a surgical procedure, but titanium clip application is currently the most frequently used technique^{5,6}. Complications due to titanium clips like 'dropped clip' with risk of abdominal sepsis^{7,8} and migration of clips⁹ have been reported.

Although postoperative bile leakage is rare, it is a serious complication and occurs in 0.3-0.6% of

cases^{5,10,18}. Therefore methods are being developed to further improve the technique, make it safer and reduce the incidence of complications. Use of absorbable clips¹¹, ligatures¹², Bipolar vessel sealer [13] and Harmonic Shears (HS) without clipping^{13,14,15} has been described for closure of cystic duct (CD) and cystic artery (CA).

LC is being performed in Nawaz Sharif Social Security Hospital Lahore for the last twenty years. We have conventionally used three or four ports at umbilical (11mm), epigastric (11mm), right subcostal (5mm) & lateral (5mm) sites. Camera is inserted through the umbilical port. The dissection in Calot's triangle is performed using Maryland's dissector through epigastric port holding the gallbladder with graspers through lateral ports. Cystic duct and the cystic artery are closed with titanium clips using applicator. Two clips are applied proximally and one distally on cystic duct and cystic artery and the structures are divided in between the proximal and distal clips using endoscopic scissors. The gallbladder is dissected from the liver with diathermy using L-Hook and haemostasis secured with diathermy coagulation. Any blood or bile spillage is

Department of General Surgery, Nawaz Sharif Social Security Teaching Hospital, University College of Medicine & Dentistry, The University of Lahore

Correspondence to Dr. Sikander Afzal Email: safzal57@hotmail.com

washed with normal saline and then sucked using an irrigation-suction cannula. Gallbladder is removed through the 11mm umbilical or epigastric ports. The linea alba at umbilical port is stitched with No. 1 polypropylene suture. The rest of the port incisions are closed with 3/0 polypropylene skin suture.

The aim of this prospective study was to compare the operating time, safety and complications of conventional method versus harmonic shears method for closure & division of CD & CA and GB dissection during Laparoscopic cholecystectomy.

METHODS

The prospective study was conducted over 12 months period from Jan 2014 to Jan 2015 in one of the two surgical units in Nawaz Sharif Social Security hospital Lahore. 86 patients with symptomatic gallstone disease and considered suitable and fit for laparoscopic cholecystectomy were included in this study. Patients with previous abdominal surgery, acute presentation or who refused to be included in the trial were excluded. A written informed consent and anaesthesia fitness was obtained for each patient. The patients were randomised to have conventional surgery with closure of CD and CA with titanium clips, division of structures with laparoscopic scissors and dissection of gall bladder with electro cautery using L-hook (TC Group) or closure and division of CD and CA and dissection of gall bladder using harmonic shears (HS Group). All operations were performed by senior consultants with more than five years post fellowship experience. 3 or 4 port technique was used depending upon surgeon's choice or need for an extra port. In TC group, previously described conventional technique was used. In HS group, after dissection in the Calot's triangle and identification of structures, the CD and CA was coagulated and sealed at two different points in a low power mode and then divided in the middle using harmonic shears. Gall bladder was dissected and haemostasis secured using HS. All patients in both groups had a tube drain inserted in the sub-hepatic space to monitor any biliary leakage or bleeding. Duration of surgery, starting after insertion of all ports to the complete freeing of the gall bladder was noted in both groups. Significant bleeding during the procedure and post-operative bleeding requiring blood transfusion or re-operation & bile leak in the post-operative period requiring intervention was recorded. Patients with more than expected post-operative pain, unexplained tachycardia, pyrexia or bile in the drain had an ultrasound scan for possible collection between 24 – 48 hours post-op. Patients were retained in the ward for 24 – 72 hours. Duration of surgery, complications of bile leak and bleeding were compared between the two groups.

RESULTS

Eighty six patients underwent elective laparoscopic cholecystectomy during the period of study. 43 patients (50%) were in TC group and 43 (50%) in HS group. In TC group 02 patients (4.7%) were converted to open due to unclear anatomy of the Calot's triangle. 03 patients (7%) in HS group were converted to open, 02 due to unclear anatomy in the Calot's triangle and 01 due to technical reasons. Patients who had their operations converted to open were excluded from the study. Results in 41 patients in TC group and 40 patients in HS group were compared. Mean age of patients in TC group was 44.19 years (23 – 71 years) and 43.62 years (24 – 71 years) in HS group. In TC group 38 (92.7%) were Females and 3 (7.3%) were male, F:M ratio of 12.6:1. In HS group 36 (90.0%) were Females and 4 (10.0%) were male, F:M ratio of 9.0:1. Mean time of operation from insertion of all ports to complete freeing of Gall bladder was significantly lower in HS group compared to TC group. Mean time of operation in HS group was 21.55 mins (12 – 38 mins) vs 26.63 mins (15 – 44 mins) in TC group ($p = 0.002$). 01 patient (2.4%) in TC group drained 300ml of blood in first 24 hours post-op period but remained haemodynamically stable and did not require blood transfusion. Bleeding stopped and drain was removed after 48 hours. No significant bleeding was noted in HS group. However the difference was statistically not significant ($p = 0.163$). 01 patient (2.5%) in HS group had minor bile leak noted in the drain in first 24 hours but did not have systemic symptoms. Ultrasound scan failed to show significant collection that was reassuring. Bile leak settled and drains were removed after 72 hours and patient discharged. Minor bile leak was noted in the drain in 01 patient (2.4%) in TC group. Patient remained well and bile leak settled spontaneously, drain removed after 48 hours and patient discharged. The difference was statistically not significant ($p = 0.157$).

DISCUSSION

LC has become the new gold standard for the management of symptomatic gall stones^{13,16,17}. There have been many modifications in the technique of Laparoscopic cholecystectomy since it was introduced in 1987. Conventional use of Titanium clips for closure of CD & CA and division with endoscopic scissors along with GB dissection with diathermy using L-hook is still most commonly used method for LC⁵. Post-operative bile leak, although rare, still remains major cause of morbidity & mortality^{5,10,18}. GB perforation during operation^{19,20}, Haemorrhage and complications directly due to titanium clips¹⁷ like dropped clips with risk of intra-abdominal sepsis^{7,8} and migration of clips⁹ also

contribute to the morbidity. Various alternative methods have been proposed to reduce the incidence of these complications with variable results. These include use of absorbable clips¹¹, ligatures¹², Bipolar vessel sealer^{13,18} and use of harmonic scalpel^{13,14,15,17} to close and divide CD & CA and GB dissection. This last technique has shown to reduce time of surgery^{14,15,21}, reduces incidence of gall bladder perforation^{15,19,20,21,22}, less bleeding¹⁵, and is safe without increasing the incidence of complications^{13,14,17,19,22}. HS at low settings coagulates and securely seals the blood vessels up to 5mm in diameter by the unique technology of high speed vibrations. Extension of this sealing ability for the closure of CD has been found to be effective and secure. The same instrument can be used to seal & divide both CD & CA and dissect GB from the liver bed. This avoids introduction of clip applicator and endoscopic scissors, often twice, to close and divide CD & CA separately, followed by introducing L-hook attached with electro cautery to dissect GB from liver bed. All this consumes time, risks tissue injury²³ and requires re-orientation each time as the view is often lost due to various manoeuvres. All these steps can be performed with single introduction of HS thereby reducing the operating time with added advantage of convenience of use and no increased risk of complications²³.

CONCLUSION

Our study has supported the observation of many similar studies that the use of harmonic shears as alternative to conventional use of titanium clips to close and divide cystic duct & cystic artery and gall bladder dissection is safe and reduces the time of operation in laparoscopic cholecystectomy without increasing the rate of complications and with added advantage of convenience of use. However much larger multicentre study is required before this technique is universally accepted.

REFERENCES

1. L Nayak, MD, C O Menias, MD, G Gayer, MD. Dropped gallstones: spectrum of imaging findings, complications & diagnostic pitfalls. *Br J radiol.* 2013 Aug; 86(1028):20120588
2. Albasini JL, Aledo VS, Dexter SP, Marton J, Martin IG, McMahon MJ. Bile leakage following laparoscopic cholecystectomy. *SurgEndosc* 1995;9:1274-1278.
3. National Institutes of Health (NIH). Gallstones and Laparoscopic Cholecystectomy. NIH Consensus Statement. NIH; September 14-16, 1992. 10(3):1-28
4. Ozer MT, Sinan H, Kilbas Z, Coskun AK, Demibras S, Kantarcioglu M, Uzar AL, Kozak O. Comparison of different Cystic Duct Closure Methods in Laparoscopic Cholecystectomy: Silk Suture, Surgical Clip, Harmonic Scalpel and Plasma Kinetic. *Arch Clin Exp Surg.* 2012;1(3): 168-171.
5. Rohatgi A, Widdison AL. An audit of cystic duct closure in laparoscopic cholecystectomies. *SurgEndosc* 2006;20:875.
6. Yilmaz H, Alptekin H, Ece I, Calisir A, Sahin M (2014) Closure of the Cystic Duct: Comparison to Harmonic Scalpel Versus Clip Application in Single Incision Laparoscopic Cholecystectomy. *J Gastroint Dig Syst* 4:165.
7. Rawson JV, Klein RM, Hodgson J. "Dropped" surgical clips following laparoscopic cholecystectomy. *SurgEndosc* 1996;10:77-78.
8. Hussain S: Sepsis from dropped clips at laparoscopic cholecystectomy. *Eur J Radiol.* 2001 Dec;40(3):244-7.
9. W.T. NG, C.K. Kong and W.M. Lee. Migration of three endoclips following laparoscopic cholecystectomy. *J.R.Coll.Surg.Edinb.*,44, June 1999, 200-2.
10. Norman Oneil Machado. Biliary Complications Post Laparoscopic Cholecystectomy: Mechanism, Preventive Measures, and Approach to Management: A Review. *Diagnostic and Therapeutic Endoscopy Volume 2011 (2011)*, Article ID 967017, 9 pages.
11. Yano H, Okada K, Kinuta M, Nakano Y, Tono T, Matsui S, et al. Efficacy of absorbable clips compared with metal clips for cystic duct ligation in laparoscopic cholecystectomy. *Surg Today*2003;33:18-23.
12. JN Shah, SB Mahajan. Clipless Laparoscopic Cholecystectomy – a prospective observational study. *Nepal Med Coll J* 2010; 12(2): 69-71.
13. Bulus H, Basar O, Tas A, Yavuz A, Akkoca M,. Evaluation of three instruments for Laparoscopic Cholecystectomy: Harmonic scalpel, Bipolar vessel sealer, and Conventional technique. *Minerva Chir Minerva Chir* 2013; 68(6): 537-42.
14. Gelmini R, Franzoni C, Zona S, Andreotti A, Saviano M. Laparoscopic Cholecystectomy with Harmonic scalpel. *JSLs* 2010 Jan-Mar;14(1):14-9.
15. Shireen A A Ramzanali, Zia-ul-Islam. Monopolar Electrocautery versus Ultrasonic Dissection of Gall Bladder from the Gall bladder bed in laparoscopic Cholecystectomy. *J Ayub Med Coll Abbottabad.* 2013;25(3-4):16-8.
16. Mosimann F: Laparoscopic cholecystectomy has become the new gold standard for the management of symptomatic gallbladder stones. *Hepatogastroenterology.* 2006 May-Jun;53(69).
17. Edward Wills, George Crawford. Clipless versus conventional laparoscopic cholecystectomy. *J LaparoendoscAdvSurg Tech A* 2013 Mar 11;23(3):237-9.
18. Schulze S, Damgaard B, Jorgensen LN, Larsen SS, Kristiansen VB. Cystic duct closure by sealing with Electrocoagulation. *JSLs.* 2010 Jan-Mar;14(1):20-2.
19. VarunMahabaleshwar, MS, Lileswar Kaman, MS, Javid Iqbal, MS, and Rajinder Singh, MS. Monopolarelectrocautery versus ultrasonic dissection of the gallbladder from the gallbladder bed in laparoscopic cholecystectomy: a randomized controlled trial. *Can J Surg.* 2012 Oct; 55(5): 307–311.
20. Janssen IM, Swank DJ, Boonstra O, Knipscheer BC, Klinkenbijl JH, van Goor J. Randomized clinical trial of ultrasonic versus electrocautery dissection of gallbladder in Laparoscopic cholecystectomy. *Br J Surg.* 2003 Jul;90(7):799-803.
21. TharwatKandil, Ayman El Nakeeb, Emad El Hefnawy. Comparative study between clipless Laparoscopic cholecystectomy by harmonic scalpel versus conventional method: a prospective randomized study. *J GastrointestSurg* 2010 Feb 31;14(2):323-8.
22. Bessa SS, Al-Fayoumi TA, Katri KM, Awad AT. Clipless laparoscopic cholecystectomy by ultrasonic dissection. *J Laparoendosc Adv Surg Tech A* 2008;18:593-598.
23. Tebala GD. Three-port laparoscopic cholecystectomy by harmonic dissection without cystic duct and artery clipping. *Am J Surg* 2006;191:718-720.