

Assessment of Harmonic Scalpel Assisted Laparoscopic Cholecystectomy in Comparison of Conventional Laparoscopic Cholecystectomy- A Prospective Study

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ABSTRACT

Introduction: Aim of present study is to evaluate the role of harmonic scalpel in laparoscopic cholecystectomy in comparison of conventional laparoscopic cholecystectomy.

Material and methods: Present study was carried out on 110 patients having symptoms of cholelithiasis presenting to private hospital in Sultanpur district between Jan 2019 to Dec 2019. By random selection, patients were allocated to either Conventional Laparoscopic Cholecystectomy (Group A) or Harmonic Scalpel Assisted Laparoscopic Cholecystectomy (Group B). Various outcome measures (operating time, intra-operative and post-operative complications etc) were measured and compared for both groups.

Results: Maximum cases belonged to age more than 40 years and females (80.09%) outnumbered males (19.1%). About two third patients (62.72%) showed Body mass index less than 30. In CLC group, mean duration of completing surgery was 65 min while in HLC group, mean duration of completing surgery was 57 min. In CLC group, 7.84% patients had significant bleeding in comparison of HLC group (1.69%). In CLC group, 7.84% patients had gall bladder perforation in comparison of HLC group (3.38%). In group A, 11.76% patients had postoperative surgical site infection (SSI) while in group B, only in 3.38% cases, SSI was observed.

Conclusions: Harmonic scalpel assisted laparoscopic cholecystectomy has many advantage over conventional laparoscopic cholecystectomy such as less thermal damage, decreased total operating time, less intra-operative complications and less requirements of analgesics.

Key words: Harmonic Scalpel, Conventional, Bleeding, Gall Bladder Perforation

INTRODUCTION

In the last 3-4 decades, open cholecystectomy has been replaced by the laparoscopic cholecystectomy for the treatment of gall bladder stones.¹ Conventional laparoscopic cholecystectomy (CLC) uses multiple instruments for dissection during surgery and titanium clips for cystic artery and cystic duct occlusion. Due to use of monopolar energy source, CLC is associated with high risk of gall bladder perforation, significant bleeding and thermal injuries.² CLC uses multiple instruments so there are higher chances of titanium clip slippage during exchange of instruments.³⁻⁵ It also uses electrocautery which causes excessive smoke production resulting in tissue damage. Studies done by various authors⁶⁻⁹ have shown that harmonic scalpel can seal vessels and ducts (Cystic duct and cystic

artery) upto 5 mm thickness. However in pathological conditions like acute cholecystitis, fibrosis of gall bladder etc, diameter and thickness of gall bladder varies. Therefore there are higher chances of leakage of bile with the use of total clipless laparoscopic cholecystectomy.

Use of hormonal scalpel for whole surgery except clipping of cystic duct can cause less bleeding, less gall bladder perforation and less operating time.¹⁰ These are the advantage of harmonic scalpel assisted laparoscopic cholecystectomy (HLC) over CLC. Therefore aim of present study is to evaluate the role of harmonic scalpel in laparoscopic cholecystectomy in comparison of conventional laparoscopic cholecystectomy.

MATERIAL AND METHODS

Present study was carried out on 110 patients having symptoms of cholelithiasis presenting to private hospital in Sultanpur district between Jan 2019 to Dec 2019. Patients with acute cholecystitis, laparoscopic cholecystectomy with CBD exploration, suspected GB Carcinoma and pregnant woman were excluded from the study. By random selection, patients were allocated to either Conventional Laparoscopic Cholecystectomy (Group A) or Harmonic Scalpel Assisted Laparoscopic Cholecystectomy (Group B).

In group A patients, conventional four port cholecystectomy was performed and by using monopolar hooks, gall bladder was separated from the Gall Bladder fossa. While in group B patients (HLC group), by using harmonic scalpel, gall bladder was separated from Gall Bladder bed. Various outcome measures (operating time, intra-operative and post-operative complications etc) were measured and compared for both groups.

RESULT

In present study, total of 110 patients were included in which 51 patients were included in group A (CLC) and 59 patients were in group B (HLC).

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How to cite this article: Kumar R, Shanker P. Assessment of harmonic scalpel assisted laparoscopic cholecystectomy in comparison of conventional laparoscopic cholecystectomy- a prospective study. International Journal of Contemporary Medical Research 2022;9(2):B1-B3.



S. No.	Variable	Group		Total
		Group A	Group B	
1	Gender			
	Male	10 (19.6%)	11 (18.64%)	21 (19.1%)
	Female	41 (80.39%)	48 (81.35%)	89 (80.9%)
		51 (46.36%)	59 (53.64%)	110
	Age Group			
2	20-30 Yrs	8 (15.68%)	9 (15.25%)	17(15.45%)
	30-40 Yrs	14 (27.45%)	16 (27.11%)	30 (27.27%)
	>40 Yrs	29 (56.86%)	34 (57.62%)	63 (57.27%)
		51 (46.36%)	59 (53.64%)	110
	Body Mass Index (BMI)			
3	< 30	32 (62.74%)	37 (62.71%)	69 (62.72%)
	>30	19 (37.26%)	22(37.29%)	41(37.27%)
		51 (46.36%)	59 (53.64%)	110

Table-1: Demographic Profile of Cases in Present Study

Duration of surgery (in min)	Group	
	Group A	Group B
Minimum	51 min	46 min
Maximum	88 min	74 min
Mean	65 min	57 min
Median	62 min	56 min

Table-2: Comparison of duration of surgery (in min) between both groups

Variables	Group	
	Group A	Group B
1 st injectable analgesic required	8.1 Hrs	10.8 Hrs
No. of oral analgesic required (mean)	3.5	2.9
No. of inj. analgesic required (mean)	1.7	1.0

Table-3: Comparison of post-operative analgesic requirement in both groups

S. No.	Variable	Group	
		Group A	Group B
1	Intra-operative complication		
	Gall bladder perforation	4 (7.84%)	2 (3.38%)
	Bleeding	4 (7.84%)	1 (1.69%)
2	Post-operative complication		
	Intra-abdominal collection	2 (3.92%)	1 (1.69%)
	Surgical site infection	6 (11.76%)	2 (3.38%)

Table-4: Intra-operative and post-operative complications

Table 1 show that in group A, maximum cases (56.86%) belonged to the age greater than 40 years followed by age group of 30-40 years (27.45%) while in group B, majority of cases (57.62%) belonged to age >40 years followed by age group 30-40 years (27.27%). In present study, females (80.09%) outnumbered males (19.1%). Out of 110 patients, about two third patients (62.72%) showed Body mass index less than 30.

Table 2 compares the duration of surgery in both groups. In group A, The mean duration of completing surgery was 65 min, ranging from minimum 51 min to maximum 46 min while in group B, mean duration of completing surgery was

57 min, ranging from minimum 46 min to maximum 74 min. Table 4 compares the pre-operative and post-operative complications between both groups. In group A, 7.84% patients had significant bleeding which result in increased operation time while in group B, only in 1.69% cases, significant bleeding was observed. In group A, 7.84% patients had gall bladder perforation which may result in bile leakage while in group B, only in 3.38 % cases, gall bladder perforation was observed.

In group A, 3.92% patients had postoperative intra-abdominal collection while in group B, only in 1.69% cases, postoperative intra-abdominal collection was detected on Ultrasonography. In group A, 11.76% patients had postoperative surgical site infection (SSI) while in group B, only in 3.38% cases, postoperative superficial SSI was observed. All the patients were managed conservatively for these complications.

DISCUSSION

Symptomatic cholelithiasis is most common surgical disease found in hospital settings.¹¹ Conventional laparoscopic cholecystectomy (CLC) results in significant bleeding, Gall Bladder perforation and excessive smoke production.

In harmonic assisted laparoscopic cholecystectomy (HLC), Harmonic scalpel can seal luminal structures upto 5 mm diameter. It also produces less smoke in comparison of conventional surgery. In present study, we used Harmonic Scalpel for entire dissection and clipping of cystic duct was done with the help of titanium clips to reduce leakage of bile from divided cystic duct.

We compared the time taken in surgery in both the study groups. In group B (HLC), total operating time was less in comparison of group A (CLC). Results of present study are in accordance to studies done by various authors.^{9,12-13} Reason behind this is that harmonic scalpel replaces the four instruments of conventional surgery i.e. clip applicator, dissector, electro-surgical hook and scissors. It results in no exchange of instruments in group B patients.

Study done by Vu T et al.¹⁴ has shown effectiveness of harmonic scalpel in occlusion and division of cystic artery

resulting less bleeding in comparison of CLC. In present study, in HLC group, only in 1 patient (1.69%), significant bleeding was noted while in CLC group, in 4 patients (7.84%) significant bleeding was observed. Study done by Kandil T et al,⁹ Jain SK et al¹² and Kumar R et al⁶ also found that bleeding was less in patients treated with HLC in comparison of patients treated with CLC.

Various studies have shown effectiveness of harmonic scalpel in reduction of GB perforation in comparison of conventional laparoscopic cholecystectomy. occlusion In present study, in HLC group, 2 patient (3.38%), gall bladder perforation was noted while in CLC group, in 4 patients (7.84%) GB perforation was observed. Study done by Kandil T et al,⁹ and Mahabaleshwar V et al¹³ also found results similar to present study while in study done by Mukesh KS et al,¹⁵ risk of GB perforation was not significant. In CLC, monopolar energy source is used which results in greater tissue damage in comparison of harmonic scalpel which in turn causes higher GB perforation rate.

Postoperative pain depends on various factors like duration of surgery, intra-operative complications etc. Pain in the postoperative period is primarily the result of visceral irritation. The lateral shear of monopolar energy spreads is higher in comparison of ultrasonic harmonic devices. In present study, postoperative requirement of analgesia in HLC group is less in comparison of CLC group. Study done by Jain SK et al¹² and Mahabaleshwar V et al.¹³ found that the post-operative pain was significantly less in HLC group in comparison of CLC group. This is because of less release of inflammatory mediators and lower duration of peritoneal distension.

The risk of surgical site infection (SSI) depends upon various factors like time taken in surgery, bile leakage, presence of drain, various co-morbidities etc. In present study, in CLC group, 6 patients (11.76%) developed superficial SSI while in HLC group; only 2 patients (3.38%) developed SSI. Study done by various authors^{13,14,16} also observed results similar to present study.

CONCLUSION

Harmonic scalpel assisted laparoscopic cholecystectomy has many advantage over conventional laparoscopic cholecystectomy such as less thermal damage, decreased total operating time, less intra-operative complications and less requirements of analgesics. Post-operative complications like intra-abdominal collection and surgical site infections are observed less in HLC group in comparison of CLC group. Further more studies are required to substantiate the advantage of HLC over CLC.

REFERENCES

1. McKernan JB, Champion JK. Access techniques: Veress needle — initial blind trocar insertion versus open laparoscopy with the Hasson trocar. *Endosc. Surg. Allied Technol.* 1995;3:35.
2. Bessa S, Al-Fayoumi T, Katri K, Awad A. Clipless laparoscopic cholecystectomy by ultrasonic dissection. *J Laparoendosc Adv Surg Tech.* 2008; 18:593–598.

3. Hanazaki K, Igarashi J, Sodeyama H, Matsuda Y. Bile leakage resulting from clip displacement of the cystic duct stump: a potential pitfall of laparoscopic cholecystectomy. *Surg Endosc.* 1999;13:168–171.
4. Geissler B, Lindemann F, Hausser L, Witte J. Dislocation of clips of the cystic duct stump. *Zentralbl Chir.* 1998;123:102–105.
5. Kumar B, Ghose S, Pandey G, Ghosh M. Harmonic Scalpel Assisted Laparoscopic Cholecystectomy v/s Monopolar Assisted Laparoscopic Cholecystectomy. *International Journal of Contemporary Medical Research.* 2019;6 (1):A1-A4.
6. Kumar R, Sathashivam SK, Manwar SA, Chellappa VK et al. Harmonic Scalpel Assisted Laparoscopic Cholecystectomy v/s Monopolar Assisted Laparoscopic Cholecystectomy- A Non-randomized control trial. *Cureus.*2018;10(1):3-10.
7. Gelmini R, Franzoni C, Zona S, Andreotti A, Saviano M: Laparoscopic cholecystectomy with harmonic scalpel. *JLS.* 2010;14:14-19.
8. Vettoretto N, Saronni C, Harbi A, Balestra L, Taglietti L, Giovanetti M: Critical view of safety during laparoscopic cholecystectomy. *JLS.* 2011;15:322-325.
9. Kandil T, Nakeeb AE, Hefnawy EE. Comparative study between clipless laparoscopic cholecystectomy by harmonic scalpel versus conventional methods: a prospective randomized study, *J Gastrointest Surg.* 2010;14:323-328.
10. Janseen IMC, Swank DJ, Boonstra O, Knipscheer BC, Klinkenbijl JHG, Van Goor H: Randomized clinical trail of ultrasonic versus electrocautery dissection of the gall bladder in laparoscopic cholecystectomy. *Br J Surg.* 2003;90:799-803.
11. Stromberg C, Nilsson M. Nationwide study of the treatment of common bile duct stones in Sweden between 1965 and 2009. *Br J Surg.* 2014;98:1766-74.
12. Jain SK, Tanwar R, Kaza RCM, Agarwal PN: A prospective randomized study of comparison of clipless cholecystectomy with conventional laparoscopic cholecystectomy. *J Laparoendosc Adv Surg Tech.* 2011, 21:203–208.
13. Mahabaleshwar V, Kaman L, Iqbal J, Singh R: Monopolar electrocautery versus ultrasonic dissection of the gallbladder from the gallbladder bed in laparoscopic cholecystectomy: a randomized controlled trial. *Can J Surg.* 2012;55:307–311.
14. Vu T, Aguilo R, Marshall NC: clipless technique of laparoscopic cholecystectomy using the harmonic scalpel. *Ann R Coll Surg Engl.* 2008;90:612.
15. Mukesh KS, Vijayata S, Mohinder KG, Deepak S: Triple ligation technique of clipless laparoscopic cholecystectomy: a spanner especially for complicated cholecystitis. *Int J Adv Med.* 2017, 4:1358–1363.
16. Kavlakoglu B, Pekcici R, Oral S: Verification of clipless closure of cystic duct by harmonic scalpel. *J Laparoendosc Adv Surg Tech A.* 2010, 20:591–595.

Source of Support: Nil; **Conflict of Interest:** None

Submitted: 24-08-2021; **Accepted:** 20-09-2021; **Published:** 28-02-2022