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ORIGINAL RESEARCH

Assessment of harmonic scalpel versus monopolar electrocauterization in cholecystectomy

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ABSTRACT

Background: For simple acute or chronic cholecystitis and cholelithiasis, laparoscopic cholecystectomy (LC) has been the gold standard of care, displacing traditional open cholecystectomy. The present study was conducted to compare harmonic scalpel versus monopolar electrocauterization in cholecystectomy. **Materials & Methods:** The study was conducted at PMCH Patna, Bihar from August 2021 to August 2023.70 patients aged 20 –70 years; physical status class I or II, according to American Society of Anesthesiologists (ASA) diagnosed with simple acute or chronic cholecystitis, cholelithiasis, scheduled for LC were divided into 2 groups of 35 each. Group I patients underwent Harmonic scalpel and group II conventional monopolar electrocautery. Parameters such as operative time, blood loss, conversion to laparotomy, postoperative hospital stay, post-LC pain etc. were recorded. **Results:** The mean operative time was 54.2 minutes in group I and 53.1 minutes in group II. The mean blood loss was 15.3 ml in group I and 14.8 ml in group II. There were 2 conversions to laparotomy in group I and 1 in group II, post operative hospital stay was 3.4 days in group I and 2.7 days in group II. The difference was non- significant (P> 0.05). Post operative pain on day 1 was 2.4 and 2.1, on day 2 was 1.8 and 1.4, on day 3 was 1.3 and 1.0 and on day 4 was 1.0 and 0.5 in group I and II respectively. Nausea/vomiting on day 1 was 2.5 and 2.5, on day 2 was 2.1 and 1.7, on day 3 was 2.0 and 1.3 and on day 4 was 1.3 and 0.7 respectively. The difference was significant (P< 0.05). **Conclusion:** For the treatment of simple cholecystitis and cholelithiasis, laparoscopic cholecystectomy utilizing traditional monopolar electrocautery is equally safe and effective as using the Harmonic scalpel.

Keywords: chronic cholecystitis, laparoscopic cholecystectomy, Harmonic scalpel

INTRODUCTION

For simple acute or chronic cholecystitis and cholelithiasis, laparoscopic cholecystectomy (LC) has been the gold standard of care, displacing traditional open cholecystectomy.[1] Its widely acknowledged reduced invasiveness and accelerated postoperative recuperation could be the cause.[2] Typically, a monopolar electrocautery device—typically an electrosurgical hook—is used for routine laparoscopic procedures, particularly when dissecting and coagulating the gallbladder, cholecystic duct, and cholecystic artery.[3] However, using electrocautery in LC could affect the dissection's precision and result in an excessive amount of surgical smoke from cauterizing the tissues. Additionally, through thermal side effects, electrocauterization may result in iatrogenic damage to nearby vessels and solid organs, including the small intestine5 and the common bile duct.[4]

For almost ten years, LC has been using the Harmonic scalpel, a cutting-edge minimally invasive surgical tool.[5] The high-frequency vibration of the scalpel allows for the synchronized cutting, coagulation, and cavitation of the thicker tissue. This causes heat to be produced by tissue stress and friction, which degenerates tissue protein.[6] This method reduces the chance of collateral thermal harm by transferring very little energy to the nearby tissues. Furthermore, vessels and biliary ducts with a diameter of 5 mm can be safely sealed and closed with a harmonic scalpel, negating the need for vessel clipping.[7,8]The present study was conducted to compare harmonic scalpel versus monopolar electrocauterization in cholecystectomy.

MATERIALS & METHODS

The study was conducted at PMCH Patna, Bihar from August 2021 to August 2023. The present study was conducted on 70 patients aged 20 –70 years; physical

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status class I or II, according to American Society of Anesthesiologists (ASA)diagnosed with simple acute or chronic cholecystitis, cholelithiasis, scheduled for LCof both genders. All were informed regarding the study and their written consent was obtained.

Data such as name, age, etc. was recorded. Patients were divided into 2 groups of 35 each. Group I patients underwent Harmonic scalpel and group II conventional monopolar electrocautery. Parameters such as operative time, blood loss, conversion to laparotomy, postoperative hospital stay, post-LC pain etc. were recorded. Data thus obtained were subjected to statistical analysis. P value < 0.05 was considered significant.

RESULTS

Table I Assessment of parameters

Parameters	Group I	Group II	P value
Operative time, min	54.2	53.1	0.85
Blood loss, mL	15.3	14.8	0.21
Conversion to laparotomy	2	1	0.73
PHS, days	3.4	2.7	0.94

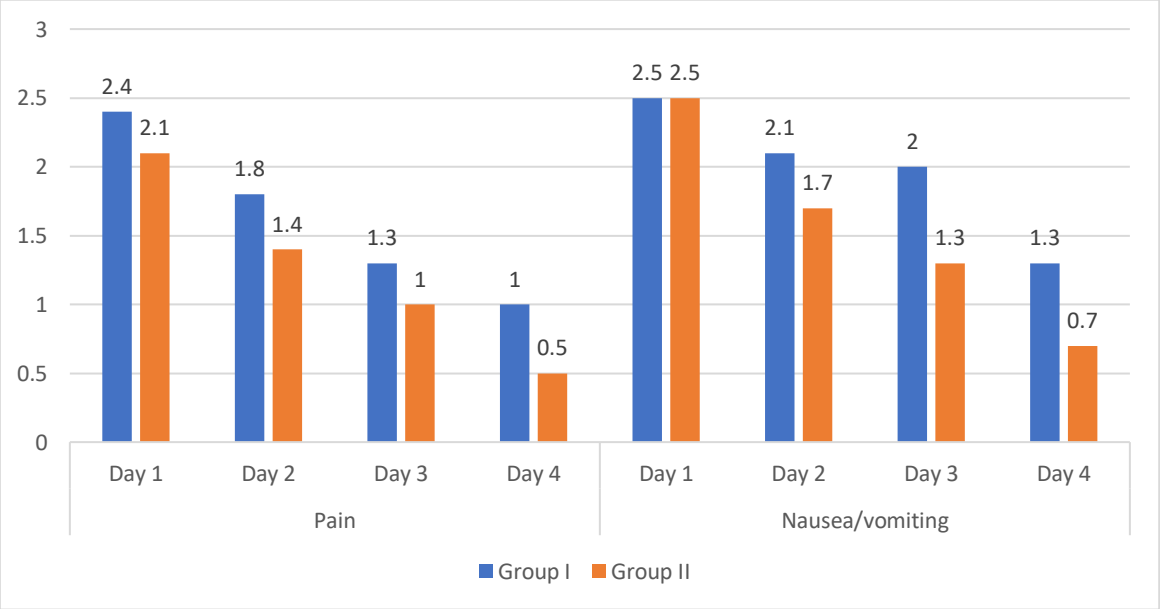
Table I shows that mean operative time was 54.2 minutes in group I and 53.1 minutes in group II. The mean blood loss was 15.3 ml in group I and 14.8 ml in group II. There were 2 conversions to laparotomy in group I and 1 in group II, post operative hospital stay was 3.4 days in group I and 2.7 days in group II. The difference was non- significant (P> 0.05).

Table II Assessment of postoperative pain and nausea/vomiting

Parameters	Variables	Group I	Group II	P value
Pain	Day 1	2.4	2.1	0.05
	Day2	1.8	1.4	
	Day3	1.3	1.0	
	Day4	1.0	0.5	
Nausea/vomiting	Day 1	2.5	2.5	0.04
	Day2	2.1	1.7	
	Day3	2.0	1.3	
	Day4	1.3	0.7	

Table II shows that post operative pain on day 1 was 2.4 and 2.1, on day 2 was 1.8 and 1.4, on day 3 was 1.3 and 1.0 and on day 4 was 1.0 and 0.5 in group I and II respectively. Nausea/vomiting on day 1 was 2.5 and 2.5, on day 2 was 2.1 and 1.7, on day 3 was 2.0 and 1.3 and on day 4 was 1.3 and 0.7 respectively. The difference was significant (P< 0.05).

Graph I Assessment of postoperative pain and nausea/vomiting



DISCUSSION

For hemobiliary immobility in LC, the harmonic scalpel is a reliable and secure substitute for monopolar electrocautery.[9,10] The decrease in operating time is the main benefit of employing the harmonic scalpel in LC as opposed to traditional

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monopolar electrocautery.[11] With the Harmonic scalpel, cystic arteries and ducts ~4-5 mm in diameter can be dissected and closed without the need for clipping.[12,13]The present study was conducted to compare harmonic scalpel versus monopolar electrocauterization in cholecystectomy.

We found that mean operative time was 54.2 minutes in group I and 53.1 minutes in group II. The mean blood loss was 15.3 ml in group I and 14.8 ml in group II. There were 2 conversions to laparotomy in group I and 1 in group II, post operative hospital stay was 3.4 days in group I and 2.7 days in group II. Liao et al[14]evaluated the effectiveness and safety of the Harmonic scalpel, an advanced laparoscopic technique associated with less thermal damage in LC, when compared to electrocautery. A total of 198 patients were randomly allocated to LC with a Harmonic scalpel (experimental group, 117 patients) or conventional monopolar electrocautery (control group, 81 patients). The main outcome measures were operative time, blood loss, conversion to laparotomy, postoperative hospital stay, post-LC pain, and cost effectiveness. The 2 groups were comparable with respect to baseline patient characteristics. When compared to conventional monopolar electrocautery, there were no significant reductions in the operative time, bleeding, frequency of conversion to laparotomy, and duration of postoperative recovery with the Harmonic scalpel.

We found that post operative pain on day 1 was 2.4 and 2.1, on day 2 was 1.8 and 1.4, on day 3 was 1.3 and 1.0 and on day 4 was 1.0 and 0.5 in group I and II respectively. Nausea/vomiting on day 1 was 2.5 and 2.5, on day 2 was 2.1 and 1.7, on day 3 was 2.0 and 1.3 and on day 4 was 1.3 and 0.7 respectively. Manoj et al[15]compared the effectiveness and safety of the HS compared to traditional EC in achieving complete dissection and haemostasis during laparoscopic cholecystectomies. Patients were allocated to two groups, and the outcomes of laparoscopic cholecystectomy were compared between the usage of a HS and EC in Calot's triangle dissection and Gallbladder (GB) dissection from the GB fossa. The mean age was 46.53±13.740 years in the HS group, while it was 45.3±13.961 years in the EC group. The average duration of dissection with a HS was 52.84±6.167 minutes and 56.79±5.582 minutes in the EC group (p-value 0.001). A total of 67 (44.7%) patients in the HS group had minimal or no bleeding, while it was 23 (15.3%) patients in the EC group. GB perforation occurred in 13 (8.7%) patients in the HS group and in 26 (17.3%) patients in the EC group. Liver injury occurred in 2 (1.3%) patients in the HS group and in 6 (4%) patients in the EC group. Postoperative nausea and vomiting were reported in 20 (13.3%) and 72 (48%) patients in the HS and EC groups, respectively, in the first 48 hours. All these associations were found to be statistically significant.

The shortcoming of the study is small sample size.

CONCLUSION

Authors found that for the treatment of simple cholecystitis and cholelithiasis, laparoscopic cholecystectomy utilizing traditional monopolar electrocautery is equally safe and effective as using the Harmonic scalpel.

REFERENCES

1. Sietses C, Eijsbouts QAJ, von Blomberg BM, Cuesta MA. Ultrasonic energy vs monopolar electrosurgery in laparoscopic cholecystectomy: Influence on the postoperative systemic immune response. SurgEndosc. 2001;15(1):69-71.
2. Mishra RK, Steven D, Ray L. Laparoscopic tissue approximation techniques In Text book of practical laparoscopic surgery. 3rd ed. New Delhi: Jaypee Brothers; 2008. Pp.115.
3. Cuschieri A. How I do it, laparoscopic cholecystectomy. JR Coll Surg Edinb. 1999;44(3):187-92.
4. Brent M, Luba N, Estok RN. Ultrasonic and nonultrasonic instrumentation. A systematic review and meta-analysis. Arch Surg. 2008;143(6):592-600.
5. Ahmad A, Nigam A, Kaur A. Principles of Electrosurgery in Laparoscopy. Pan Asian J Obs Gyn. 2019;2(1):22-29.
6. Landman J, Kerbl K, Rehman J, Andreoni C, Humphrey PA, Collyer W. et al. Evaluation of a vessel sealing system, bipolar electrosurgery, Harmonic scalpel, titanium clips, endoscopic gastrointestinal anastomosis vascular staples and sutures for arterial and venous ligation in a porcine model. J Urol. 2003;169(2):697-700.
7. Roberta G, Chiara F, Stefano Z. Laparoscopic cholecystectomy with Harmonic Scalpel. JSLS. 2010;14(1):14-19.
8. Bessa S, Al-Fayoumi T, Katri K, Awad A. Clipless laparoscopic cholecystectomy by ultrasonic dissection. J Laparoendosc Adv Surg Tech. 2008;18(4):593-98.
9. Tebala GD. Three-port laparoscopic cholecystectomy by Harmonic dissection without cystic duct and artery clipping. Am J Surg. 2006;191(5):718-20.
10. Yehia A, Mahmoud E, El-Dsouky M. Laproscopic cholecystectomy using harmonic scalpel versus laproscopic conventional cholecystectomy. MJMR. 2019;1(30):126-31.
11. Simoyiannis T, Jabarin M, Glantzounis G, Lekkas ET, Siakas P, Stefanaki-Nikou S. Laparoscopic cholecystectomy using ultrasonically activated coagulating shears. SurgLaparosc Endosc.1998;8(6):421-24.
12. Cengiz Y, Jänes A, Grehn A, Israelsson LA. Randomized trial of traditional dissection with electrocautery versus ultrasonic fundus-first dissection in patients undergoing laparoscopic cholecystectomy. Br J Surg. 2005;92(7):810-13.
13. Mathur H, Sharma AK, Kalwaniya DS. Comparative study to evaluate ultrasonic verses monopolar electrocautery dissection of gall bladder in laparoscopic cholecystectomy. Int Surg J. 2021;8(7):2054-58.
14. Liao G, Wen S, Xie X, Wu Q. Harmonic scalpel versus monopolar electrocauterization in cholecystectomy. JSLS: Journal of the Society of Laparoendoscopic Surgeons. 2016 Jul;20(3).

DOI: 10.69605/ijlbpr_13.6.2024.93

15. Manoj M, Debata PK, DEBATA I, DAS SK. Harmonic Scalpel versus Electrocautery and its Outcome in Laparoscopic Cholecystectomy: A Prospective Interventional Study. Journal of Clinical & Diagnostic Research. 2023 Oct 1;17(10).