A Study to Evaluate the Role of Monopolar Electocautery in Laparoscopic Cholecystectomy

Pradeep Goyal[1], Muthuraman S[2]

ABSTRACT

Introduction: Laparoscopic cholecystectomy is one of the most common operation done today. Classically, the cystic artery is controlled by applying simple metal clips. Recently ultrasonic devices have been used successfully to achieve closure and division of the cystic duct and artery but their cost remains a concern. Study aimed to evaluate the cystic artery division during laparoscopic cholecystectomy and to compare postoperative complications, cost and time taken for surgery.

Material and methods: This study was conducted in the Department of Surgery Maharishi Markandeshwar Medical College and Hospital, Kumarhatti, Solan from 1st August 2014 to 31st July 2018 for a period of four years. Total of 200 patients were equally distributed among two groups. Distribution was conducted to nullify different confounding factors. All patients with symptomatic gallstone disease scheduled for laparoscopic cholecystectomy were eligible for the study. All the patients who underwent laparoscopic cholecystectomy during this period were divided into two groups named Group A and Group B. In Group A, cystic artery was clipped and divided by using ligaclips.

Result: Our study clearly demonstrates that the monopolar electrocautery provides complete and reliable hemostasis in most patients undergoing laparoscopic cholecystectomies. In all patients who underwent division of the cystic artery by electrocautery, there were no clinically apparent immediate or remote postoperative bleeding

Conclusion: The monopolar electrocautery is a safe, efficient and practical instrument to use during laparoscopic cholecystectomies

Keywords: Monopolar Electocautery, Laparoscopic Cholecystectomy

INTRODUCTION

Laparoscopic cholecystectomy is one of the most common surgical procedures. Classically the cystic artery is controlled during the procedure using simple metal clips. Recently ultrasonic devices have been used successfully to achieve closure and division of the cystic duct and artery but their cost remains a concern. Although many feel that monopolar electrocautery is an unsafe method of controlling the cystic artery because of concerns over both adequacy of hemostasis and collateral tissue damage, Electrocautery is safe and effective for control of the cystic artery during laparoscopic cholecystectomy[1] We noted an increasing trend among surgeons to use monopolar electrocautery for control of the cystic artery during laparoscopic cholecystectomy. Here we report our experience with the use of monopolar electrocautery to control the cystic artery during laparoscopic cholecystectomy. Study aimed to evaluate the cystic artery division during laparoscopic cholecystectomy and to compare postoperative complications, cost and time taken for surgery

MATERIAL AND METHODS

This study was conducted in the Department of Surgery Maharishi Markandeshwar Medical College and Hospital, Kumarhatti, Solan from 1st August 2014 to 31st July 2018 for a period of four years. Total of 200 patients were equally distributed among two groups. Distribution was conducted to nullify different confounding factors. All patients with symptomatic gallstone disease scheduled for laparoscopic cholecystectomy were eligible for the study. No intraoperative cholangiograms were performed. Patients presenting with abnormal serum bilirubin, alkaline phosphatase, and gamma-glutamyltransferase levels and/or abnormal ultrasonographic findings (e.g. dilated biliary tree) underwent a preoperative endoscopic retrograde cholangiopancreatography for diagnosing and treatment. The following preoperative data were collected: age, sex and associated co morbidities. All the patients who underwent laparoscopic cholecystectomy during this period were divided into two groups named Group A and Group B. In Group A, cystic artery was clipped and divided by using ligaclips. In Group B, cystic artery division was done by the use of multiple monopolar electrocautery over skeletonised cystic artery. Laparoscopic cholecystectomy was performed with the patient under general anaesthesia and placed in the standard supine, reverse Trendelenburg position with the right shoulder up. A uniform technique of the laparoscopic cholecystectomy was performed by same surgeon using four trocar ports.

Dissection of the gallbladder was initiated at the Triangle of Calot with the identification and skeletonization of both

[1]Associate Professor, Department of Surgery, [2]Assistant Professor, Department of Surgery, Maharishi Markandeshwar Medical College and Hospital, Kumarhatti, Solan, HP, India

Corresponding author: Dr Muthuraman S, Assistant Professor, Department of Surgery, Maharishi Markandeshwar Medical College and Hospital, Kumarhatti, Solan, HP, India

How to cite this article: Assistant Professor, Department of Surgery, Maharishi Markandeshwar Medical College and Hospital, Kumarhatti, Solan, HP, IndiaA study to evaluate the role of monopolar electocautery in laparoscopic cholecystectomy. International Journal of Contemporary Medical Research 2019;6(5):E40-E43.

DOI: http://dx.doi.org/10.21276/ijcmr.2019.6.5.51

the cystic duct and artery. No structure was divided before demonstrating the space between the gallbladder and the liver clear of any structure other than the cystic artery (critical view of safety). CIosure of the cystic artery was achieved by either applying simple titanium clips (Group A) or using monopolar electrocautery (Group B) whereas the division was achieved by scissors in the Group A and monopolar cautery in the Group B. When monopolar cautery was used to control the artery, this was done very close to the gallbladder wall, using short bursts with the power level set at 4-5 ESU. The cystic duct was closed by applying simple titanium clips and divided by scissors. Mobilization of the gallbladder from the liver bed was started posteriorly at the triangle of Calot and proceeded anteriorly using the electrosurgical hook or spatula.

Finally the gallbladder was subsequently removed trough the subxiphoid port. A subhepatic tube drain inserted through the most lateral port was used whenever need arise. Detailed history and clinical examination was carried out as per performa attached. Relevant investigations was done.

RESULTS

In Group A (100), 50% of the patients were in the age group of 41-50 years. 38% of the patients were in the age group of 31-40 years. Only 10% of the patients were in the age group of > 50 years. In the Group B (100), 40% of the patients were in the age group of 31-40 years. 24% of the patients were in the age group of 41-50 years and >50 years each.

In Group A out of 100 patients 82 patients were females and 18 patients were males. In Group B 70 patients were females and 30 patients were males. In both groups majority of the patients were females.

In Group A out of 100 patients, 16% of the patients presented with previous history of acute cholecystitis. 2% of the patients had history of biliary pancreatitis. In Group B 8% of the patients were had history of acute cholecystitis. 6% of patients had history of biliary pancreatitis. No patient in both groups had any history of ERCP for choledocholithiasis

Mean operative time was 52.14 hours in Group A and 45.88 hours in Group B.(Table-1)

Operative time	Group A	Group B
Mean	52.14	45.88
SD	9.82	8.17

Table-1: Mean operative time in performing laparoscopic cholecystectomy in Group A and Group B

In both Group A and Group B out of 100 patients, in 36 patients we kept the drain for any leakage. 64% of the patients were without drain. Recovery was fast where no drain was kept. There was leakage of bile in 2% of patients in both Group A and Group B.(Table-2) No bile duct Injury was detected in intra-operative period or post operative period in both groups.

	No. of patients in Group A (n=100)	%age	No. of patients in Group B (n=100)	%age
Bile Leak	2	2%	2	2%

Table-2: Table showing bile leak in Group A and Group B

No patient in both groups had bile collection postoperatively, so did not required any ultrasound guided aspiration or re-exploration (Table-3)

	No. of patients in Group A (n=100)	%age	No. of patients in Group B (n=100)	%age
Bile collection requiring re-operation	0	0%	0	0%

Table-3: Bile collection requiring Re operation or Image guided aspiration

In Group A two patients developed port site infection at epigastric port which was managed with oral antibiotics. No wound was opened. In Group B six patients developed port site infections. (Table-4)

Port site infection	Number	Mean	SD	P value
Group A	2	0.02	0.14	0.1594
Group B	6	0.06	0.24	

Table-4: Table demonstrating Port site infections in Group A and Group B postoperatively

No patient in both groups developed obstructive jaundice clinically and biochemically.(Table-5)

	No. of patients in Group A (n=100)	%age	No. of patients in Group B (n=100)	%age
Obstructive jaundice	0	0%	0	0%

Table-5: Table showing development of obstructive jaundice post operatively in Group A and Group B

Mean hospital stay in Group A was 2.82 days and 2.12 days in Group B.(Table-6)

	Group A (n=100)	Group B (n=100)	P value
Mean hospital stay	2.82 days	2.12 days	0.0361

Table-6: Mean hospital stay in Group A and Group B

In Group A mean time taken to return to work was 8.18 days and in Group B time taken was 6.79 days (Table-7).

	Group A (n=100)	Group B (n=100)	P value
Mean No. of days	8.18 days	6.79 days	0.0477

Table-7: Mean time taken for return to work in Group A and Group B

DISCUSSION

The most efficacious energy source for laparoscopic surgery is constantly being debated. Monopolar electrocautery has

gained wide popularity over laser energy because of its lower cost and ease of use.[2] There are still controversies about the details of the technique, particularly in the method of ligation of the arteries. Most surgeons utilize metal clips to seal arteries. However, many reports have described the disadvantages of using metal clips, which include endoclip slippage and migration into adjacent anatomic structures.[3,4] Absorbable clips and ultrasonic devices have been provided good to close the arteries, but they are costly.[5-8] We had assisted over 200 laparoscopic cholecystectomies using metal clips before starting use of monopolar cautery for dealing with cystic artery. During this period, we began to use monopolar electrocautery cystic artery and demonstrated that monopolar electrocautery artery was safe and effective procedure. The initial results of our study have shown that the procedure can be safely performed. One may argue that the safety of using the monopolar electrocautery alone to control the cystic artery because monopolar electrocautery may not have the adequacy of hemostasis or may cause collateral tissue injury. Especially for cystic artery, the anatomic variations in and around Calot's triangle are frequent. Cystic artery variations are to be found in 20% to 50% of cases.[1,9-12] However, We noted an increasing trend among surgeons using monopolar electrocautery to control the arteries during laparoscopic techniques, and proved that monopolar electrocautery to control the cystic artery is safe and effective during laparoscopic cholecystectomy.

Our study clearly demonstrates that the monopolar electrocautery provides complete and reliable hemostasis in most patients undergoing laparoscopic cholecystectomies. In all patients who underwent division of the cystic artery by electrocautery, there were no clinically apparent immediate or remote postoperative bleeding.

In a study conducted by soper et al,[13] they concluded that laparoscopic cholecystectomy can be performed using monopolar electrocautery without significant acute injury to the liver, bile ducts or surrounding viscera. Furthermore, the porcine model can be utilized by surgeons to attain competence in this technique prior to instituting clinical application in humans.

Fausto Catena, Salomone Di Saverio[14] in their study came to the conclusion that monopolar electrocautery is equally effective to harmonic scalpel in achieving hemostasis.

In one of the other study conducted by Liao G, Wen S[15] they concluded that laparoscopic cholecystectomy using conventional monopolar electrocautery is as effective and safe as that with the Harmonic scalpel for treating uncomplicated cholecystitis and cholelithiasis.

In the study conducted by Guanqun Liao, Shunqian Wen[16] came to the conclusion that there is no significant difference between conventional method of achieving hemostasis and monopolar electocautery.

In our experience, the crucial step during the surgery is to cauterisation of cystic artery. During cystic artery electrocoagulation, accurate identification of the anatomy of the cystic artery is very important. Misuse of cautery to dissect Calot's triangle has been recognized as a possible cause of bile duct injury.[17] We can avoid bile duct injury by taking simple precautions like to apply the cautery very close to the gallbladder and preferably laterally from the cystic lymph nodes. The cystic artery is cauterized at 2 or 3 different time points. The coagulation points are approximately 5 mm apart. Sometimes, it is subsequently lifted on the break end to perform the coagulation. During laparoscopic cholecystectomy using monopolar electrocautery of the arteries, occlusion of the proximal of cystic duct with one absorbable clip or absorbable coils is a safe, effective, and economical surgical procedure.[18]

CONCLUSION

The monopolar electrocautery is a safe, efficient and practical instrument to use during laparoscopic cholecystectomies. Neither bleeding nor bile duct injury was encountered throughout the study period. Cautery should be applied very close to the gallbladder, preferably lateral to the cystic lymph node.

REFERENCES

1. Katri KM, Bessa SS, Elnagah GA, EL-Kayel SA. Is monopolar electrocautery safe and effective for control of the cystic artery during laparoscopic cholecystectomy? J Laparoendosc Adv Surg Tech A 2012;22:557-60
2. Edelman DS, Unger SW. Bipolar versus monopolar cautery scissors for laparoscopic cholecystectomy: a randomized, prospective study. Surg Laparosc Endosc. 1995;5:459-62
3. Yoshizumi T, Ikeda T, Shimizu T, et al. Clip migration causes choledocholithiasis after laparoscopic cholecystectomy. Surg Endosc 2000;14:1188.
4. Hong T, Xu XQ, He XD, et al. Choledochoduodenal fistula caused by migration of endoclip after laparoscopic cholecystectomy. World J Gastroenterol 2014;20:4827–9.
5. Yano H, Okada K, Kinuta M, et al. Efficacy of absorbable clips compared with metal clips for cystic duct ligation in laparoscopic cholecystectomy. Surg Today 2003;33:18–23.
6. Rohatgi A, Widdison AL. An audit of cystic duct closure in laparoscopic cholecystectomies. Surg Endosc 2006;20:875–7.
7. Tebala GD. Three-port laparoscopic cholecystectomy by Harmonic dissection without cystic duct and artery clipping. Am J Surg 2006;191:718–20.
8. Kandil T, El Nakeeb A, El Hefnawy E. Comparative study between clipless laparoscopic cholecystectomy by Harmonic scalpel versus conventional method: a prospective randomized study. J Gastrointest Surg 2010;14:323–8.
9. Balija M, Huis M, Nikolic V, et al. Laparoscopic visualization of the cystic artery anatomy. World J Surg 1999;23:703–7.
10. Suzuki M, Akaishi S, Rikiyama T, et al. Laparoscopic cholecystectomy, Calot's triangle, and variations in cystic arterial supply. Surg Endosc 2000;14:141–4.
11. Larobina M, Nottle PD. Extrahepatic biliary anatomy at laparoscopic cholecystectomy: Is aberrant anatomy

important? ANZ J Surg 2005;75:392–5.
12. Ding YM, Wang B, Wang WX, et al. New classification of the anatomic variations of cystic artery during laparoscopic cholecystectomy. World J Gastroenterol 2007;13:5629–34
13. Soper NJ, Battered JA. Safety and efficacy of laparoscopic cholecystectomy using monopolar electrocautery in the porcine model. Surg Laparosc Endosc.1991;1:17-22.
14. Fausto Catena, Salomone Di Saverio The HAC trial (harmonic for acute cholecystitis): a randomized, double-blind, controlled trial comparing the use of harmonic scalpel to monopolar diathermy for laparoscopic cholecystectomy in cases of acute cholecystitis.World J Emerg Surg. 2014; 9: 53
15. Liao G, Wen S. Harmonic Scalpel versus Monopolar Electrocauterization in Cholecystectomy. Jhsl 2016;20. pii: e2016.00037.
16. Guanqun Liao, MD, PhD, Shunqian Wen, Harmonic Scalpel versus Monopolar Electrocauterization in Cholecystectomy.J SLS. 2016; 20(3)
17. Strasberg SM, Hertl M, Soper NJ. An analysis of the problem of biliary injury during laparoscopic cholecystectomy. J Am Coll Surg 1995;180:101–25.
18. Gui-Bao Liu, MD, Yuan-Yaun Mao, MD, Chang-Ping Yang, MD, and Jin- Lin Cao, MD* Sealing of the cystic and appendix arteries with monopolar electrocautery during laparoscopic combined cholecystectomy and appendectomy Medicine (Baltimore). 2018; 97: e0206.

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

Submitted: 10-04-2019; **Accepted:** 03-05-2019; **Published:** 28-05-2019