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Liga Clips vs Bipolar Diathermy for cystic artery sealing in laparoscopic cholecystectomy: A comparative study

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Abstract

Introduction: Laparoscopic cholecystectomy is a minimally invasive surgical procedure designed for gallbladder removal, particularly beneficial when gallstones lead to inflammation, pain, or infection.

Aim and Objectives: To assess the feasibility and effectiveness of using Liga clips compared to a bipolar diathermy system for laparoscopic sealing of the cystic artery.

Materials and Methods: A prospective comparative study involving 100 patients diagnosed with gallbladder disease and scheduled for laparoscopic cholecystectomy was conducted at Amar Hospital in Patiala. Pregnant individuals, those with coagulation disorders, umbilical hernia, and patients with associated cardiac comorbidities were excluded from the study.

Results: In this study, we observed that mean age in Group A was 56.1 years, and in Group B, it was 55.08 years. 7 patients (14%) in Group A and 4 patients (8%) in Group B experienced gallbladder (GB) injury. We did not find significant difference in the operative time between the groups ($P=0.154$). None of the patients in either of the two groups experienced post-operative bleeding, and there were no instances of mortality observed in either group.

Conclusion: Our study advocates for the use of bipolar cautery as a safe, cost-effective, and efficient alternative to clipping for sealing the cystic artery during laparoscopic cholecystectomy. This method demonstrates comparable outcomes in morbidity, mortality, and overall efficacy, making it a recommended approach for managing the cystic artery.

Keywords: Liga clips, bipolar diathermy, laparoscopic cholecystectomy

Introduction

Gallstones have been recognized as a health issue since ancient times and have been a source of significant trouble for individuals. Cholecystectomy, the surgical removal of the gallbladder, is the most frequently performed procedure for biliary tract conditions and ranks as the second most common surgical operation in modern medicine. Northern India is notable for having one of the world's highest reported incidences of gallbladder cancer (GBC), a condition that exhibits geographic and ethnic variations ^[1]. Currently, laparoscopic cholecystectomy (LC) stands as the preferred approach for both scheduled and emergency gallbladder removal ^[2].

The benefits of laparoscopic cholecystectomy over open cholecystectomy were quickly recognized. These advantages included a quicker return of bowel function, reduced postoperative pain, improved cosmetic outcomes, shorter hospital stays, faster resumption of regular activities, and lower overall medical expenses ^[3-4].

Laparoscopic cholecystectomy is a minimally invasive surgical procedure designed for gallbladder removal, particularly beneficial when gallstones lead to inflammation, pain, or infection ^[5]. With the introduction of laparoscopic surgery, managing gallstones has become notably easier and is now considered the gold standard compared to open cholecystectomy ^[6].

The right hepatic artery is the most common source of cystic artery; however, it can also come from the common hepatic, celiac trunk, right gastric, superior mesenteric, and other arteries. Because the cystic artery's course and length in the Calot's triangle are variable, haemostasis of the cystic artery is essential because it can cause torrential haemorrhage if not ligated adequately and is the most common cause of postoperative bleeding after laparoscopic cholecystectomy.

As advanced laparoscopic techniques evolved, new technologies for vascular control have become necessary ^[7]. Various methods are now employed, such as the use of titanium clips for haemostasis. More recently, plastic clips and energy sources like ultrasonic coagulating shears and bipolar thermal energy devices have gained popularity.

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These options offer diverse approaches for controlling the cystic artery, including clip application, bipolar diathermy, monopolar diathermy, vascular sealing with ultrasonics, and harmonic devices. However, it's worth noting that clips can have drawbacks such as slipping, dislodging, migrating, or even causing cystic duct necrosis, which can result in complications like bile leakage [8]. Complications associated with titanium clips, commonly used in various surgical procedures, can include migration, tissue reaction, or, rarely, interference with imaging studies.

One popular method in laparoscopic cholecystectomy is Liga-clip application, which uses non-absorbable titanium clips applied by a clip applicator to compress and secure structures like ducts and vessels. This approach is effective and cost-efficient [9]. The cost factor plays a crucial role in the comparative analysis of Liga Clips versus bipolar diathermy for cystic artery sealing in laparoscopic cholecystectomy, with implications for healthcare economics and resource allocation. Another commonly used technique is electro-thermal cauterization, which comes in two forms: Monopolar and bipolar diathermy. While these methods effectively cauterize tissues, they can pose a risk of heat dissipation, potentially causing damage to adjacent structures like the common bile duct, hepatic artery, or portal vein, with monopolar diathermy being more susceptible to this issue [10]. Bipolar diathermy exhibits efficient heat dissipation, making it a noteworthy contender for cystic artery sealing in laparoscopic cholecystectomy compared to Liga clips.

Aims

A comparison between the use of Ligaclip or Bipolar Diathermy during laparoscopic cholecystectomy and to examine the intra operative and postoperative complications.

Objective

- To compare the feasibility and safety of bipolar diathermy in sealing the cystic artery, as compared to clips, in laparoscopic cholecystectomy.
- To compare the post-operative course in terms of morbidity and mortality using bipolar diathermy for cystic artery sealing VS non absorbable clips.
- To compare the rate of complication between bipolar diathermy and clips for cystic artery ligation laparoscopically.

Materials and Methods

A prospective comparative study was conducted on 100 patients of both sexes who were diagnosed with gallbladder disease and were scheduled for laparoscopic cholecystectomy. The study took place in the surgical wards of Amar Hospital in Patiala.

In this study, patients were divided into two groups by draw of lots: Group A and Group B. Group A patients underwent laparoscopic cholecystectomy with the use of bipolar diathermy for sealing the cystic artery, while Group B patients underwent laparoscopic cholecystectomy with the application of non-absorbable Liga clips for sealing the cystic artery.

The study included patients of all ages and both genders who had chronic calculous cholecystitis and were candidates for laparoscopic cholecystectomy. However, pregnant patients, individuals with coagulation disorders, those with umbilical hernia, and patients with associated cardiac or pulmonary comorbidities that contraindicated general anaesthesia were excluded from the study.

Operative Procedure

All patients were kept nil orally the night before surgery for at least 8 hours. Patients were asked to empty urinary bladder before moving to operation theatre. All patients were operated under general anaesthesia with endotracheal intubation. All patients were prepared for operation by disinfection of skin of the entire abdomen and lower anterior chest. All patients were operated using four port technique. A Veress needle was inserted through the Linea Alba and peritoneum where a characteristic popping sensation is felt. An unobstructed free intra peritoneal position for the Veress needle was verified by easy irrigation of clear saline in and out of the peritoneal space and by the hanging drop method where the saline in the translucent hub of the Veress needle is drawn into the peritoneal space when the abdominal wall is lifted. If one does not obtain a free flow or an unobstructed saline irrigation, then the Veress needle may be removed and reinserted. Then appropriate tubing and cables for the CO₂ insufflation, the fiberoptic light source, and the laparoscopic video scope with its sterile sheath positioned as are the lines for the cautery, suction, and saline irrigation. The pneumoperitoneum begins with a low flow of about 1 or 2 L/min with a low-pressure limit. Once 1 to 2 L of CO₂ are in, the abdomen will be hyper resonant to percussion. The flow rate may be increased; however, the pressure limited to 15mmHg. Three to four liters of CO₂ will be required to fully inflate the abdomen and the Veress needle is removed. After grasping either side of the umbilicus, a 10mm trocar port was inserted with a twisting motion, aiming towards the pelvis. A characteristic popping sensation was felt as the trocar enters the peritoneal space. The trocar was removed and the escape of free CO₂ gas was verified. The CO₂ source was attached to this port and the videoscope with its sterile light source cord inserted after white balancing and focusing the system. A general examination of the intraabdominal organs was performed taking special note of any organ pathology or adhesions. Three additional trocar ports was placed, using direct visualization of their sites of intra-abdominal penetration. The second 10-mm trocar port was placed in the epigastrium about 1-2cm below the xiphoid, with its intra-abdominal entrance site being just to the right of the falciform ligament. Two smaller 5-mm trocar ports for instruments are then placed, one in the right upper quadrant near the mid clavicular line several centimetres below the costal margin and another quite laterally at almost the level of the umbilicus. The patient is placed in a mild (10 to 15 degrees) reverse Trendelenburg position, with the patient slightly rotated to the left (right side up) for better visualization of the gallbladder region. The apex of the gallbladder fundus was grasped with a ratcheted forceps through the lateral port. The gallbladder and liver are then lifted superiorly. This manoeuvre provides good exposure of the undersurface of the liver and gallbladder. Omental or other loose adhesions to the gallbladder are gently teased away. The infundibulum of the gallbladder was grasped with forceps through the middle port, lateral traction with the middle forceps exposes the region of the cystic duct and artery. With gentle teasing and spreading motion, the cystic duct and artery are exposed. Each structure is exposed circumferentially. If possible both structures are dissected free and identified prior to clipping and division. It was helpful to obtain the critical view. To minimize bile duct injury the concept of the "Critical view of safety" helpful. The neck of gallbladder must be dissected off the liver bed i.e. unfolding calot's triangle to achieve conclusive identification of the two structure to be divided, the cystic duct and cystic artery. Now one proximal and two distal Titanium clips was applied on cystic duct. In Group

A, the cystic artery was coagulated using bipolar diathermy, then cut with scissor. In Group B, the cystic artery will be divided between 3 clips, two placed distally and one proximally. The cystic artery will be cut in between the clips. The cystic duct will be cut in between the clips. Then gall bladder was removed from liver bed with monopolar cautery. The gallbladder was extracted through the subxiphoid port. Drain was put near gallbladder fossa.

Statistical Analysis

Statistical analysis of the results of study was described in terms of continuous variables which were expressed as means with standard deviations and the Chi square and Fisher Exact tests were used to analyze the categorical data. A Probability value (P-Value) less than 0.05 was considered statistically significant. All statistical calculations were done using SPSS (Statistical Package for the Social Science) Version 21.0 for Microsoft Windows.

Results and Observation

This comparative study, titled "Liga Clips vs. Bipolar Diathermy for Cystic Artery Sealing in Laparoscopic Cholecystectomy," was conducted on a total of 100 patients who were admitted with gallbladder disease and scheduled for laparoscopic cholecystectomy.

The cases in each group were selected by draw of lots and equally divided in two groups. The results of two groups were compared and proper statistical analyses were done.

In this study, we observed that the age range in Group A was from 28 years to 86 years, while in Group B, it varied from 27 years to 95 years. The mean age in Group A was 56.1 years, and in Group B, it was 55.08 years. Notably, a majority of the patients in both groups were female, constituting 68% in Group A and 64% in Group B. In this study pain abdomen was the presenting symptom and 48% in group A and in 62% patients in Group B. Pain and vomiting was present 16% in group A and in 12% in Group B.

Pain, vomiting and dyspepsia was present in 16% in group A and 10% in Group B.

Table 1: Anatomy and Injury

Parameter	Cautery		Clip	
	No. of Patients	Percentage	No. of Patients	Percentage
GB Injury	7	14	4	8
Cystic Artery Anatomy	44	88	42	84
Cystic Duct Injury	0	0	0	0

In Table 1, it's noted that 7 patients (14%) in Group A and 4 patients (8%) in Group B experienced gallbladder (GB) injury. The most common variation observed was the doubling of the cystic artery, which occurred in 12% of patients in Group A and 16% of patients in Group B.

Table 2: Operative Time

Parameter	Cautery		Clip		P-Value
	Mean	SD	Mean	SD	
Operative Time (In Mins)	52.6	20.16	56.3	16.12	0.15

As indicated in Table 2, there was no statistically significant difference in the operative time between the groups (P=0.154). It's worth mentioning that none of the patients in this study required conversion to open cholecystectomy.

Table 3: Drain Volume

Parameter	Cautery		Clip		P-Value
	Mean	SD	Mean	SD	
Intra Operative Drain Volume (ML)	46.4	23.01	47.6	23.35	0.79
Immediately Drain Volume (ML)	33.6	14.8	34.4	14.59	0.77
Drain Volume (Day1)	22	9.48	22.6	9.65	0.76
Drain Volume (Day5)	14.4	6.44	14.6	6.46	0.85

As presented in Table 3, the mean intraoperative drain volume in Group A was 46±23.01, while in Group B, it was 47.60±23.25. The immediate drain volume in Group A was 33.60±14.8, and in Group B, it was 34.40±14.59. Furthermore, the mean drain volume on day 1 in Group A was 22.00±9.48, and in Group B, it was 22.60±9.65. On day 5, the mean drain volume in Group A was 14.40±6.44, and in Group B, it was 14.60±6.46. It's important to note that there were no statistically significant differences observed in any of these parameters between the two groups.

Table 4: Post-Operative Parameter

Parameter	Cautery		Clip	
	No. of Patients	Percentage	No. of Patients	Percentage
Post-Op Bleeding	Nil	0	Nil	0
Mortality	Nil	0	Nil	0

As indicated in Table 4, none of the patients in either of the two groups experienced post-operative bleeding, and there were no instances of mortality observed in either group.

Discussion

Laparoscopic cholecystectomy, introduced successfully by Mouret in 1987, has gained widespread acceptance and is now considered the gold standard treatment for cholelithiasis [11]. Gallstones have been a long-standing issue affecting humanity for centuries and continue to be a prevalent problem, both in Western countries and in our own. This particular study, titled "Liga Clips vs. Bipolar Diathermy for Cystic Artery Sealing in Laparoscopic Cholecystectomy - A Comparative Study," was conducted on 100 patients admitted with gallbladder disease who underwent laparoscopic cholecystectomy at the Department of General Surgery, Amar Hospital in Patiala.

In the present study, the mean age of patients in Group A and Group B was 56.10±14.07 and 55.08±16.34, respectively. These findings align with a study conducted by Emmi MS *et al.* in 2022 [12], which reported a mean age of 50.73±11.09 years for Group A and 54.13±13.2 years for Group B.

Regarding operative time, in the present study, the mean duration in Group A was 52.60 minutes, while in Group B, it was 56.30 minutes. Statistical analysis revealed that the difference in operative time between the two groups was not statistically significant. This corresponds to the results of a study by Emmi *et al.* (2022) [8], where the mean surgical duration in Group B was 50.9±15 minutes, which was less than that of Group A at 56.5±13 minutes.

It's noteworthy that in a study conducted by Nakeeb EL *et al.* in 2010 [12], the use of the Harmonic scalpel resulted in shorter operation times compared to the Traditional Method (45.17±10.54 vs. 69.71±13.01 minutes; P=0.0001).

In our study, we observed that the anatomy of the cystic artery was normal, i.e., positioned posterior to the cystic duct, in 88% of Group A and 84% of Group B. Common variations, such as the doubling of the cystic artery, were found in 12% of Group A and 16% of Group B. Importantly, there was no statistically

significant difference between the groups. These findings are consistent with a study conducted by Balija M *et al.* in 1999^[13] on 200 laparoscopic cholecystectomy cases, where normally positioned cystic arteries were found in 73.5% of patients, making it the most common cystic artery variation.

Furthermore, our study revealed that seven patients (14%) in Group A and four patients (8%) in Group B experienced gallbladder perforation. These results are in line with a study by Rajnish K *et al.* in 2018^[14], where out of 40 patients, five (12.5%) had intra-operative gallbladder perforation. Additionally, Kandil *et al.*^[15], in their study, demonstrated that the risk of gallbladder perforation was significantly higher in the traditional group than in the harmonic scalpel group (18.6% vs. 7.1%, respectively; $P=0.04$).

Remarkably, there were no instances of mortality in either group in our study. These findings align with studies conducted by Katri *et al.*^[16] and Anurag Chauhan *et al.*^[17], both of which reported a 0% mortality rate in laparoscopic cholecystectomy cases.

Conclusion

In conclusion, our study suggests that bipolar cautery is a safe alternative to clipping for sealing the cystic artery in terms of post-operative morbidity, mortality, and overall outcomes. Bipolar cautery is a cost-effective, reliable, and efficient method for addressing the cystic artery. It has proven to be an effective means of achieving hemostasis for cystic arteries of up to 7mm in diameter during laparoscopic cholecystectomy. Additionally, bipolar cautery is more economical compared to Liga clips, as it serves a dual purpose by assisting in tissue dissection during the procedure, eliminating the need for additional instruments. We recommend the use of bipolar cautery as a suitable approach for managing the cystic artery during laparoscopic cholecystectomy.

Conflict of Interest: Not available

Financial Support: Not available

References

- Unisa S, Jagannath P, Dhir V, Khandelwal C, Sarangi L, Roy TK. Population-based study to estimate prevalence and determine risk factors of gallbladder diseases in the rural Gangetic basin of North India. *HPB (Oxford)*. 2011;13(2):117-25.
- Hassler KR, Collins JT, Philip K, Jones MW. Laparoscopic cholecystectomy. In *StatPearls* [Internet]. StatPearls Publishing; c2022 Apr 13.
- Akyurek N, Salman B, Irkorucu O, Tascilar O, Yuksel O, Sare M, *et al.* Laparoscopic cholecystectomy in patients with previous abdominal surgery. *JLS*. 2005 Apr-Jun;9(2):178-83.
- Passos MA, Filho PPE. Antibiotic prophylaxis in laparoscopic cholecystectomy: Is it worth doing. *Arq Bras Cir Dig*. 2016;29(3):170-172.
- Kim SS, Donahue TR. Laparoscopic Cholecystectomy. *JAMA*. 2018;319(17):1834. DOI: 10.1001/jama.2018.3438
- Litwin DE, Cahan MA. Laparoscopic cholecystectomy. *Surgical Clinics of North America*. 2008;88(6):1295-313.
- Comitalo JB. Laparoscopic cholecystectomy and newer techniques of gallbladder removal. *JLS*. 2012 Jul-Sep;16(3):406-12.
- Emmi SM, Suhas DS. A Clinical Comparative Study of Bipolar Electrocautery vs Clips for Cystic Artery during Laparoscopic Cholecystectomy. *World*. 2022;15(1):75.

- Singal R, Sharma A, Zaman M. The safety and efficacy of clipless versus conventional laparoscopic cholecystectomy - Our Experience in an Indian Rural Centre. *Maedica (Bucur)*. 2018 Mar;13(1):34-43.
- Humes DJ, Ahmed I, Lobo DN. The pedicle effect and direct coupling: Delayed thermal injuries to the bile duct after laparoscopic cholecystectomy. *Archives of Surgery*. 2010 Jan 1;145(1):96-8.
- Peterson SL, Stranahan PL, Schmaltz D, Mihaichuk C, Cosgriff N. Comparison of healing process following ligation with sutures and bipolar vessel sealing. *Surg Technol Int*. 2002; 10:55-60.
- El Nakeeb A, Askar W, El Lithy R, Farid M. Clipless laparoscopic cholecystectomy using the Harmonic scalpel for cirrhotic patients: A prospective randomized study. *Surgical endoscopy*. 2010 ;24(10):2536-41.
- Balija M, Huis M, Nikolic V and Stulhofer M. Laparoscopic versus Mini cholecystectomy, The McGill Gallstone treatment group. *Lancet* 1992;340:1116-1119.
- Rajnish K, Sureshkumar S, Ali MS, Vijayakumar C, Sudharsanan S, Palanivel C. Harmonic Scalpel-Assisted Laparoscopic Cholecystectomy vs. Conventional Laparoscopic Cholecystectomy - A Non-randomized Control Trial. *Cureus*. 2018 Jan 18;10(1):e2084.
- Kandil T, Nakeeb AE, Hefnawy EE. Comparative study between clipless laparoscopic cholecystectomy by harmonic scalpel versus conventional method: A prospective randomized study. *J Gastrointest Surg*. 2010;14:323-328.
- Katri KM, Bessa SS, Elnagah GA, El-Kayal El-SA. Is monopolar electrocautery safe and effective for control of the cystic artery during laparoscopic cholecystectomy? *J Laparoendosc Adv Surg Tech A*. 2012;22(6):557-60.
- Chauhan A, Gangji A, Singhal A. Control of cystic artery using monopolar electrocautery in laparoscopic cholecystectomy: Our experience. *Sch J Appl Med Sci* 2014;2(4D):1381-1382.

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