The Egyptian Journal of Hospital Medicine (October 2022) Vol. 89, Page 5871- 5874

# Comparative Study between Traditional Dissection with Electrocautery Versus Ultrasonic Dissection of The Gall Bladder in Laparoscopic Cholecystectomy

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## ABSTRACT

**Background:** Twenty percent to forty percent of those who have laparoscopic cholecystectomy experience perforation of the gallbladder. The incidence of gallbladder perforation and its intraoperative implications may be reduced by using ultrasound to dissect the gallbladder bed during laparoscopic cholecystectomy, which might enhance surgical quality.

**Objectives:** This study aimed to compare between the conventional electrocautery dissection technique and the ultrasonic gall bladder dissection.

**Methods:** The research included 120 adult patients with symptomatic gallstone disease who were candidates for laparoscopic cholecystectomy. Each patient's demographic information, as well as clinical, radiological, and laboratory data, were evaluated. Study was conducted in Safa Almadinah Hospital in Saudi Arabia between June 2019 and May 2022.

**Results:** There was no major difference between the two groups in terms of baseline characteristics and demographic data. Before surgery, ultrasonography data showed no major differences between the two groups. There was significant increase in the incidence of complications in Electrocautery group except for the need to insert hemostatics and stone leakage there was no significant difference between the two groups.

**Conclusion:** In order to improve the surgical course of laparoscopic cholecystectomy, ultrasonic dissection is used. This is because ultrasonic dissection is both safe and effective in minimizing the risk of gallbladder perforation, as well as the time needed and the possibility for complications.

**Keywords:** Dissection, Electrocautery, Ultrasonic, laparoscopic cholecystectomy.

## INTRODUCTION

When symptoms of gallstones are evident, the "gold standard" therapy is a cholecystectomy performed using a laparoscope. Bile leakage and stone loss my happen due to gallbladder rupture during dissection from the liver bed [(1)].

Gallbladder perforation has been observed in 20%-40% of patients after laparoscopic cholecystectomy. Perforation of the gallbladder, which causes bile leakage and stone loss, interrupts and prolongs the therapy. The most often utilized cutting technique for removing the gallbladder from the hepatic bed is monopolar electrocautery [(2)]. It has been linked to both local and remote tissue injury, which might result in gallbladder perforation during gallbladder bed dissection [(1)]. Ultrasonic dissection has been shown to reduce gallbladder perforation during laparoscopic cholecystectomy in contrast to monopolar electrocautery [(3)].

One way in which ultrasonic dissection may improve the quality of laparoscopic cholecystectomy by reducing the risk of gallbladder perforation and the complications that come with it during surgery [(4)]. We compared standard electrocautery dissection against ultrasonic gall bladder dissection during laparoscopic cholecystectomy.

## MATERIAL AND METHODS

The research included 120 adult patients with symptomatic gallstone disease who were candidates for laparoscopic cholecystectomy. Each patient's demographic information, as well as clinical, radiological, and laboratory data, were evaluated. Study was conducted in Safa Almadinah Hospital in Saudi Arabia between June 2019 and May 2022. Before the conduction of the study, the Local Ethical Committee approved the work. All gave consent to participate in the work.

**Exclusion criteria:** Patients with common bile duct stones, suspected gallbladder cancer based on ultrasound and subsequent computed tomography results, and patients unable to undergo laparoscopic surgery were excluded.

Patients were randomly allocated to either monopolar electrocautery or ultrasonic dissection soon before surgery using the envelope approach. They were distributed in a one-to-one proportion.

**Electrocautery group:** included 60 patients treated with electrocautery dissection.

**Ultrasonic group:** included 60 patients treated with ultrasonic dissection.

In the ultrasonic dissection group, the gallbladder was dissected using Harmonic Ace curved shears. Before enrolling patients in this study, we obtained written informed consents from them. All patients had successful laparoscopic cholecystectomy utilizing one of the dissection approaches, according to the random assignment.

Before any procedures were conducted, thorough patient histories were documented. This included the patients' ages, genders, body mass indexes, symptoms,



Received: 27/8/2022
Accepted: 3/9/2022

co-morbidities, prior abdominal surgeries, and ultrasound findings. Factors as swelled, fibrotic gallbladder, thick adhesions formed in the gallbladder's neck, impacted stones formed in the gallbladder's neck, and acute cholecystitis were documented.

Study outcomes included stone spillage (the macroscopic loss of gallstones into the peritoneal cavity), bile leak (the intraoperative release of any quantity of bile from the perforated gallbladder site), gallbladder perforation, duration of surgery (defined as time between incision and closure), Len cleaning (time between incision and closure).

Anesthetics and prophylactic antibiotics were administered to all patients before induction. The standard protocol for cholecystectomies calls for four incisions (ports), and the surgeon and assistant both stand in predetermined positions.

**Ethical Approval:**

**The research was authorised by the Al-Azhar University's Ethical Committee. All participants provided written informed permission. This research was done in an ethical manner, as outlined in the World Medical Association's Declaration of Helsinki (Declaration of Helsinki).**

***Statistical analysis***

IBM SPSS version 22.0 was used to analyse computer-generated data. To express quantitative data, percentages and numbers were employed. Before utilizing the median in nonparametric analysis or the interquartile range in parametric analysis, it was required to perform Kolmogorov-Smirnov tests to ensure that the data were normal. We used the (0.05) significance threshold to establish the significance of the findings. The Chi-Square test was used to compare two or more groups. The Monte Carlo test was used to adjust for any number of cells with a count less than 5. Fischer Chi-Square adjustment was applied to tables demonstrating non continuous data.

**RESULTS**

There was no significant difference between the two groups regarding patients' basal characteristics and demographic data(Table 1).

**Table (1):** Patients basal characteristics and demographic data

| | **Electrocautery** (N = 60) | **Ultrasonic** (N = 60) | P. Value |
|---|---|---|---|
| **Age (Years)** | 48.62 ± 5.62 | 49.44 ± 6.67 | 0.468 [1] |
| **BMI (Kg/m$^2$)** | 27.52 ± 2.1 | 26.98 ± 3.2 | 0.277 [1] |
| **Sex** | | | |
| **Male** | 20 (33.33%) | 18 (30%) | 0.69 [2] |
| **Female** | 40 (66.67%) | 42 (70%) | |
| **History of gallstone pancreatitis** | 5 (8.33%) | 2 (3.33%) | 0.242 [2] |
| **Presenting symptoms** | | | |
| **Heartburn** | 25 (41.67%) | 28 (46.67%) | 0.548 [2] |
| **Right upper quadrant pain** | 27 (45%) | 35 (58.33%) | 0.144 [2] |
| **Dyspepsia** | 48 (80%) | 52 (86.67%) | 0.327 [2] |
| **Previous abdominal surgeries** | 6 (10%) | 8 (13.33%) | 0.57 [2] |
| **Intraoperative complications** | 12 (20%) | 15 (25%) | 0.511 [2] |

[1]: T. Test | [2]: Chi Square P> 0.05 non-significant

There was no significant difference between the two groups regarding pre-operative ultrasonography findings (Table 2).

**Table (2):** Pre-operative ultrasonography findings

| | **Electrocautery** (N = 60) | **Ultrasonic** (N = 60) | P. Value |
|---|---|---|---|
| **Distended gallbladder** | 43 (71.67%) | 46 (76.67%) | 0.53 |
| **Gallbladder wall thickness > 3 mm** | 12 (20%) | 5 (8.33%) | 0.067 |
| **Peichol-cholcystic fluid** | 4 (6.67%) | 5 (8.33%) | 0.727 |
| **Single calculous** | 17 (28.33%) | 12 (20%) | 0.286 |
| **Multiple calculous** | 26 (43.33%) | 35 (58.33%) | 0.1 |
| **Sludge** | 17 (28.33%) | 13 (21.67%) | 0.383 |
| **Stone size > 1 cm** | 6 (10%) | 7 (11.67%) | 0.769 |
| **Common bile duct diameter > 6 mm** | 8 (13.33%) | 11 (18.33%) | 0.453 |

Chi Square P> 0.05 non-significant

There was significant increase in complications occurrence in Electrocautery group except for need to insert hemostatics and stone spillage there was no significant difference between the two groups (Table 3).

**Table (3):** Consequences for the groups using electrocautery and ultrasonic dissection

| | **Electrocautery** (N = 60) | **Ultrasonic** (N = 60) | P. Value |
|---|---|---|---|
| **Gallbladder perforation** | 20 (33.33%) | 8 (13.33%) | 0.0096 [2] |
| **Need to insert hemostatics** | 12 (20%) | 5 (8.33%) | 0.067 [2] |
| **Bile leak** | 26 (43.33%) | 8 (13.33%) | 0.002 [2] |
| **Stone spillage** | 13 (21.67%) | 6 (10%) | 0.08 [2] |
| **Lens cleaning, no. of patients** | 56 (93.33%) | 28 (46.67%) | <0.00001 [2] |
| **Lens cleaning, mean no. of times** | 8 (13.33%) | 2 (3.33%) | 0.048 [2] |
| **Duration of surgery, (min.)** | 35.26 ± 3.21 | 26.89 ± 2.83 | <0.00001 [1] |

[1]: T. Test | [2]: Chi Square P> 0.05 non-significant | P< 0.05 significant

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## DISCUSSION

laparoscopic cholecystectomy has largely supplanted open cholecystectomy for the treatment of uncomplicated gallstone disease [(5)]. While there are a few options for cutting and coagulation during a laparoscopic cholecystectomy, monopolar electrocautery is the most often used technique. However, monopolar electrocautery often results in tissue damage owing to necrosis and ischemia because of the high collateral heat it generates. Most electrical injuries are either first missed or not discovered until days afterwards [(6)].

A burst gallbladder might discharge bile and stones, which could complicate therapy. The procedure might take longer than required, which could have disastrous results. Ultrasonic dissection tools employ ultrasonic vibrations at a frequency of 55 500 Hz and a vibratory excursion of 50 100 m to denature protein, in contrast to monopolar electrocautery, which uses a much lower frequency of 2 kHz [(7)].

The mechanical energy of vibration causes the tissue to cut and coagulate. The vibrating action of the ultrasonic dissector induces a coagulum of denatured protein and blood clot to form, occluding neighboring blood vessels and reducing bleeding. Although dissector scalpel blade oscillation produces less heat than monopolar or laser cautery, it may create cavitations in potential spaces, which can help in tissue dissection [(8)].

The most common intraoperative complication of laparoscopic cholecystectomy is gallbladder perforation. Perforation occurs in 13% to 50% of laparoscopic cholecystectomy patients, with bile leakage and stone spillage occurring in 10% to 40%. The most prevalent mechanism of gallbladder rupture during laparoscopic cholecystectomy is laceration caused by grasper traction and electrocautery dissection [(9)].

The total incidence of gall bladder perforation in our study was 33.33% in the electrocautery group and 13.33% in the ultrasonic group. Another research found that employing an ultrasonic dissector to minimize gallbladder perforation during laparoscopic cholecystectomy might be beneficial. Gallbladder perforation was much lower in ultrasonically dissected gallbladders (30% vs. 10%, P = 0.002). Using ultrasonic dissection in laparoscopic cholecystectomy, according to **Janssen *et al.*** [(10)] reduces the chance of gallbladder perforation while also speeding up the process. Perforation is not always so harmful if the gallbladder area is occluded as quickly as feasible with a grasper to prevent bile from leaking out. Perforation of the gallbladder is more likely to occur following laparoscopic cholecystectomy in patients who have coexisting conditions such as acute cholecystitis, a fibrotic gallbladder, or thick adhesions in the Calot triangle [(11)]. Gallbladder perforation occurred in 33.3% of ultrasonic dissection patients and in all electrocautery patients with difficult cholecystectomy, according to **Mahabaleshwar *et al.*** [(12)]. The ultrasonic dissector, according to this research, is a better device, especially in patients with severe gallbladder disease.

Lens cleaning needed in 90.0% of those who had electrocautery and 63.3% of those who had undergone ultrasonic dissection (p = 0.004) in **Mahabaleshwar *et al.*** [(12)] study. Our findings are consistent with this hypothesis. The duration and complexity of an operation affect how often a lens has to be cleaned (either extracorporeal or intracorporeal).

The ultrasonic dissection group had a substantially shorter operating time than the electrocautery group in our study. This is consistent with **Cengiz *et al.*** [(13)] and **Kandil *et al.*** [(14)] who found equivalent results.

## CONCLUSION

In order to improve the surgical course of laparoscopic cholecystectomy, ultrasonic dissection is used. This is because ultrasonic dissection is both safe and effective in minimizing the risk of gallbladder perforation, and the possibility for complications as well as shortening the time needed.

## DECLARATIONS

**Consent for Publication:** I confirm that all authors accepted the manuscript for submission.

**Availability of data and material:** Available

**Competing interests:** None
**Funding:** No fund
**Conflicts of Interest:** The authors declared no conflicts of interest regarding the publication of this paper.

## REFERENCES

1. **Salih A, Ali A, Almoula J (2022):** Incidence of Gall Bladder Perforation during Laparoscopic Cholecystectomy in Mosul. Iraq, 21 (6):2.
2. **Altuntas Y, Oncel M, Haksal M *et al*. (2018):** Gallbladder perforation during elective laparoscopic cholecystectomy: Incidence, risk factors, and outcomes. Northern clinics of Istanbul, 5 (1): 47.
3. **Mahmoud M, Hamed A, Mekki M (2020):** Clippless Laparoscopic Cholecystectomy Using Ultrasonic Dissection. The Medical Journal of Cairo University, 88 (6): 1157-63.
4. **Blohm M, Sandblom G, Enochsson L *et al*. (2022):** Learning by doing: an observational study of the learning curve for ultrasonic fundus-first dissection in elective cholecystectomy. Surgical endoscopy, 36 (6): 4602-13.
5. **Ullah S, Yang B, Liu D *et al*. (2022):** Are laparoscopic cholecystectomy and natural orifice transluminal endoscopic surgery gallbladder preserving cholecystolithotomy truly comparable? A propensity matched study. World Journal of Gastrointestinal Surgery, 14 (5): 470.
6. **Abounozha S, Ibrahim R, Alshahri T (2021):** Is the rate of bile leak higher in clipless laparoscopic cholecystectomy compared to conventional cholecystectomy? Annals of Medicine and Surgery, 62: 186-9.
7. **Iwasaki M, Ishihara S, Shimomura M *et al*. (2021):** Endoscopic Surgery Using Ultrasonic Energy Device for Tracheal Metastatic Tumor. The Annals of Thoracic Surgery, 114 (3): 189-191.
8. **Yadav P, Shah D, Sutaria A *et al*. (2019):** In vitro comparison of ultrasonic shear versus ligating clip application in closure of cystic duct in cholecystectomy. International Surgery Journal, 6 (6): 2173-7.
9. **Evans L, Sams E, Naguib A *et al*. (2022):** Iatrogenic gallbladder perforation during laparoscopic cholecystectomy and outcomes: a systematic review and meta-analysis. Langenbeck's Archives of Surgery, 407(3):937-946
10. **Janssen I, Swank D, Boonstra O *et al*. (2003):** Randomized clinical trial of ultrasonic versus electrocautery dissection of the gallbladder in laparoscopic cholecystectomy. Journal of British Surgery, 90 (7): 799-803.
11. **Wakabayashi G, Iwashita Y, Hibi T *et al*. (2018):** Tokyo Guidelines 2018: surgical management of acute cholecystitis: safe steps in laparoscopic cholecystectomy for acute cholecystitis (with videos). Journal of Hepato-biliary-pancreatic Sciences, 25 (1): 73-86.
12. **Mahabaleshwar V, Kaman L, Iqbal J *et al*. (2012):** Monopolar electrocautery versus ultrasonic dissection of the gallbladder from the gallbladder bed in laparoscopic cholecystectomy: a randomized controlled trial. Canadian journal of surgery, 55 (5): 307.
13. **Cengiz Y, Jänes A, Grehn Å *et al*. (2005):** Randomized trial of traditional dissection with electrocautery versus ultrasonic fundus-first dissection in patients undergoing laparoscopic cholecystectomy. Journal of British Surgery, 92 (7): 810-3.
14. **Kandil T, El Nakeeb A, El Hefnawy E (2010):** Comparative study between clipless laparoscopic cholecystectomy by harmonic scalpel versus conventional method: a prospective randomized study. Journal of Gastrointestinal Surgery, 14 (2): 323-8.