

Comparison between Electrocautery Vs Harmonic Scalpel Assisted Dissection in Patients of Single Incision Laparoscopic Cholecystectomy

Dr.RS. Jhobta¹, Dr. Ashish Thakur², Dr.Balwant Negi³, Miss Neha Thakur⁴

1 Professor Department of General Surgery IGMC Shimla

2 Junior Resident Department of General Surgery IGMC Shimla

3 Assistant Professor Department of General Surgery IGMC Shimla

4 PHD Research scholar CSIO-CSIR Chandigarh

Corresponding Author- Dr.Ashish Thakur

Abstract

Introduction-Laparoscopic Cholecystectomy(LC) is the gold standard procedure for symptomatic cholelithiasis. There are many forms of laparoscopic cholecystectomy Single incision laparoscopic cholecystectomy(SILC) being one of them..SILC has some documented advantages in comparison to four port LC.Use of Harmonic Ace in SILC has improved the efficiency of this procedure further and complications rate has been decreased, thus making SILC a promising surgical technique in treatment of symptomatic cholelithiasis.

Methods-Patients of symptomatic cholelithiasis were randomised into 2 groups with 25 patients in each group.one group underwent dissection of gall bladder from liver with help of harmonic ace and other group underwent conventional electrocautery assisted dissection. Results were compared in form of duration of surgery ,quantity of CO₂ used , intra operative stone spillage , intra operative blood loss, post operative pain at 6 hour and 24 hour after the surgery ,duration of hospital stay, any postoperative complications

Result- Operative time , intra operative blood loss , amount of CO₂ used , post operative pain score at 24 hour,intraoperatively stone spillage ,all parameters were found to be statistically significant except for post operative pain score at 6 hours, post operative complications and conversion into 4 port / 2 port /open cholecystectomy.

Conclusion-SILC is emerging as a promising technique for symptomatic cholelithiasis and use of harmonic ace has improved it further in terms of less operative time , less amount of blood loss and CO₂ used , less chances of intraoperative stone spillage , less post operative hospital stay , less pain post operatively.

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I. Introduction

In 1882, Carl Langebuch (1846-1901) of Germany performed the first cholecystectomy¹. In 1985 (103 years later), Prof Dr Erich Mühe of Germany performed the first laparoscopic cholecystectomy (LC). The first reports of SILS cholecystectomy came in 1997 in a letter to the editor in the British Journal of Surgery by Navarra.² Monopolar electrocautery can be used for several modalities including cut, blend, desiccation, and fulguration. Using a pencil instrument, the active electrode is placed in the entry site and can be used to cut tissue and coagulate bleeding. The return electrode pad is attached to the patient, so the electrical current flows from the generator to the electrode through the target tissue, to the patient return pad and back to the generator. The harmonic scalpel was introduced in 1993 (Ethicon Endo-Surgery). It has been shown to be a valuable tool for numerous surgical procedures, including cholecystectomy, bowel resection, and adhesiolysis³. The instrument minimizes lateral thermal tissue damage. There is almost no need for instrument changes.

At present, monopolar electrocautery is the main cutting method used for gallbladder dissection from the liver bed. It is associated with local thermal and distant tissue damage, which might cause inadvertent perforation of the gallbladder during gallbladder bed dissection.⁴ Ultrasonic dissection generates less thermal injury, produces a smaller zone of tissue damage and more precise dissection, and has been suggested as an alternative to monopolar electrocautery in laparoscopic cholecystectomy.⁵ Theoretical benefits for use of harmonic scalpel as dissection technique is –

1. Less operative time
2. Less bleeding
3. Early post operative recovery
4. Less spillage of stones
5. Less chances of converting into open cholecystectomy

6. Less pain post operatively
7. Less amount of CO2 used.

II. Methods

All consecutive patients of symptomatic cholelithiasis confirmed by USG reporting and all patients are operated by same team of surgeons in the Department of General Surgery, IGMC Shimla.

Inclusion criteria for our study were:

1. Age between 21 and 80
2. ASA score of <3
3. Symptomatic Gall stones

Patients in one of the following groups were considered as high risk patients and were not included in the study.

1. Patient with BMI >40
2. Patient with choledocholithiasis with cholelithiasis
3. Previous upper abdominal surgery
4. Patient with bleeding disorder
5. Acute cholecystitis
6. Patient on warfarin
7. Patient not willing to participate in Study.

Patients were divided into two groups of n=25 each.

All eligible patients were randomised into two groups using sealed opaque envelopes which contained computer-generated random number. In Group 1 dissection of gall bladder was done by harmonic scalpel and in group 2 by electrocautery.

Technique followed was-

SILC performed with the help of 2 slings of sutures, which included following steps:

1. Under general anesthesia, a 15-20 mm (approximately) curvilinear skin incision made through the inner margin of the umbilicus. Subcutaneous tunnelling was done on either side to avoid scissoring of instruments. Pneumoperitoneum was created via closed method and set at pressure of 12 mmHg. Two 10 mm trocar, one for 10 mm 30 degree laparoscope and one trocar as a working port were inserted through incision.
2. Fundus of gall bladder was retracted with the help of a suture using a straight needle, which was inserted through right 8th intercostal space in the anterior axillary line. Needle was passed through seromuscular layer of the gallbladder fundus and pulled toward the anterior abdominal wall. This suture was used for retraction by the assistant.
3. Hartmann's pouch was punctured and retracted using the second suture which was inserted in the epigastrium and taken out through the right hypochondrium to expose calot's triangle.
4. Group1- Harmonic scalpel was used for calots triangle dissection. Cystic artery and duct were skeletonised and liga clips were applied. Sectioning was performed with application of harmonic ace on minimum position. The gallbladder dissection from the liver bed was carried out using the ultrasonically activated scalpel in the maximum position from the infundibulum to the fundus, taking advantage of the positive effects of cavitation and coagulation.

Group 2 (monopolar coagulation): Monopolar electrocautery was used for calots triangle dissection. Cystic artery and duct were skeletonised and liga clips were applied. Sectioning was performed with scissor. The gallbladder dissection from the liver bed was carried out using monopolar hook / spatula.

4. Extraction of gall bladder was done through 10 mm trocar after removal of the suspending sutures from the abdominal wall. The umbilical incision was closed with subcuticular sutures or metal clips.

The following parameters were recorded in each group-

A. Intraoperative Parameters

1. Operative findings including status of gall bladder, presence of adhesions, any intra operative stone spillage.
2. Operative time calculated (in minutes) for all cases from skin incision to skin closure
3. Bleeding –Assessed through gauge visual analogue method-

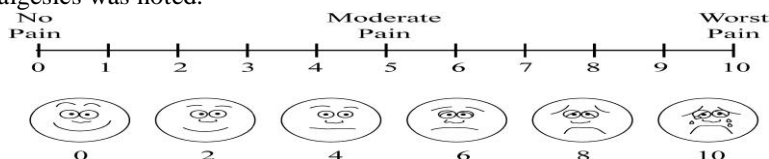
% saturation of gauge piece

Size of gauge in c.m.	25% soaked	50% soaked	75%soaked	100% soaked
10x10	3 m.l.	6 m.l.	9 m.l.	12 m.l.
30x30	25 m.l.	50 m.l.	75 m.l.	100 m.l.
45x45	40 m.l.	80 m.l.	120 m.l.	160 m.l.

4. Quantity of CO₂ used
5. Use of drain
6. Conversion to Open Cholecystectomy / double port / four port cholecystectomy

B. Postoperative Parameters

1. Postoperative pain at 6h and 24h after surgery using visual analogue scale (VAS) used and the requirement of post operative analgesics was noted.



Correlation between Visual and verbal scale:

1-3 = mild pain

4-6 = moderate pain

7-10 = severe pain

2. Length of Hospital Stay (in days)

3. Any postoperative complications

Data collected, cleaned and entered into excel spread sheet.

1. Expressions of discrete variables were as percentages or proportions.

2. Chi-Square test was used to study difference in distribution of discrete variables.

3. Expression of continuous variables were as Mean + SD or median + Interquartile range .

4. Significance of difference in continuous variables were analysed using Student T test or Wilcoxon Signed Rank Test depending on distribution of variables.

5. For all statistical analysis two tailed tests were used.

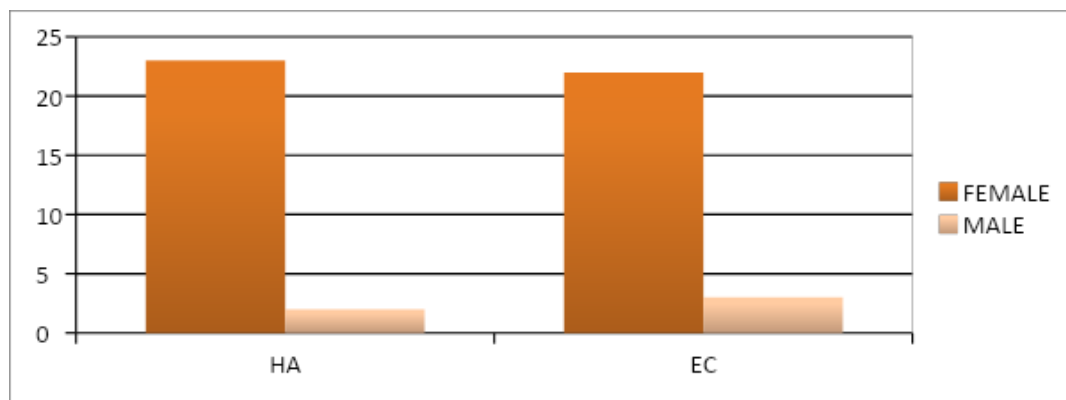
Data was analysed using Epi – info version 7.2.2. P value <0.05 was considered as statistically significant.

At the end of study data was compiled and outcome parameters were studied as follows:

- Duration of surgery
- Quantity of CO2 used
- Intra operative stone spillage
- Intra operative blood loss
- Post operative pain at 6 hour and 24 hour after the surgery
- Duration of hospital stay
- Any postoperative complications

III. Results

Out of 50 patients , 5 patients were male and 45 were female. 2 male and 23 females underwent harmonic ace assisted dissection .3 male and 22 females underwent electrocautery assisted dissection.



AGE DISTRIBUTION-

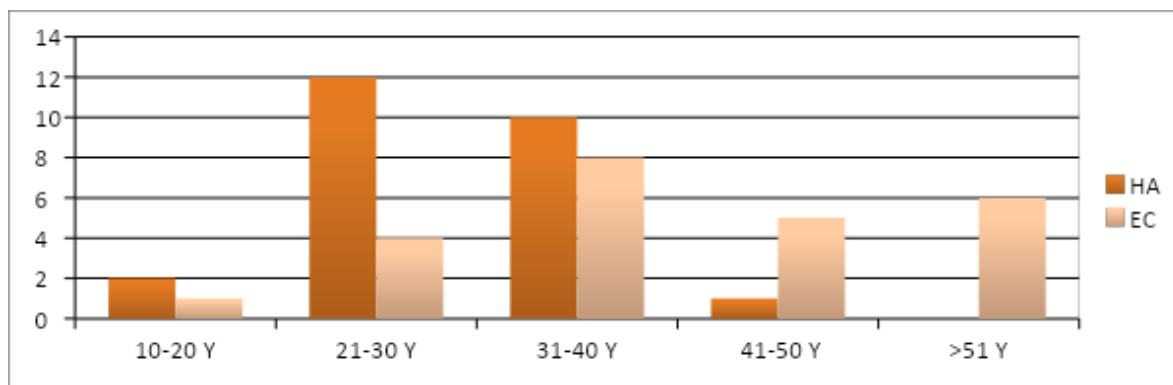
Out of 50 patients 2 patient underwent HA assisted dissection, 1 underwent EC assisted dissection in 10 -20 year age group .

12 patients underwent HA assisted dissection , 4 underwent EC assisted dissection in 21-30 year age group.

10 patients underwent HA assisted dissection and 9 underwent EC assisted dissection in 31-40 year age group.

1 patient in HA group underwent HA assisted dissection and 5 patient underwent EC assisted dissection were in 41-50 year age group.

6 patients underwent EC assisted dissection and no patient underwent HA assisted dissection in > 51 year age group.



PARAMETERS OBSERVED	Mean value with use of H.A	Mean value with use of electrocautery	P value
Operative Time(min)	33.9	52	0.00
CO ₂ Used (L)	30.2	40.8	0.018
Blood loss (ml)	20.96	101.24	0.001
Intraoperative stone spillage(no. of cases)	2	14	0.001
Conversion to four/double port/open cholecystectomy(no. of cases)	0	3	0.74
Pain score at 6 hour	5.8	6.32	0.112
Pain score at 24 hour	2	2.8	0.002
Length of hospital stay(days)	0.600	2.76	0.001
Post op complication	0	2	0.149

Mean operative time for HA group is 33.9±10.6 and for EC group is 52±17.2. P value is 0.000. In terms of CO₂ used mean CO₂ used in HA assisted dissection group is 30.2±14.9 litres , however in electrocautery assisted dissection group is 40.8±15.4 litres. P value for CO₂ used is 0.018. HA assisted dissection group has mean blood loss of 20.9±35.6 ml and in EC assisted dissection group 101.2±98.1 ml P value is .001. mean stay in hospital after HA assisted dissection group is 0.60±0.64 days , however in electrocautery assisted dissection group is 2.76±2.81 days. P value for length of hospital stay is 0.001.

average pain score at 6 hours and 24 hours- In HA assisted dissection group is 5.84 and 2 respectively , however in electrocautery assisted dissection group is 6.32 and 2.88 respectively. P value is 0.112 and 0.002 respectively. In terms of stones spillage , 2 patients in HA assisted dissection group had intra operative stone spillage while in electrocautery assisted dissection group 14 patient had intra operative stone spillage.P value is 0.001. HA assisted dissection group no case is converted and in electrocautery assisted dissection group 3 cases converted into open cholecystectomy . P value for Conversion is 0.074. In HA assisted dissection no post operative complications noted , however in electrocautery assisted dissection group 2 patients developed post operative complication . P value for post operative complications is 0.149.

IV. Discussion

Our study is pilot study , so we can not compare our data with other studies .However different parameters are discussed as follows and data from different studies (four port laparoscopic cholecystectomy based studies) is incorporated .Like our study operating time was significantly less in the harmonic ace assisted LC group in the study conducted by Jain et al (64.7 ± 13.74 vs. 50 ± 9.36; p = 0.001) and Kadil et al (61.88 ± 17.16 vs. 52.14 ± 9.8; p < 0.0001)^{6,7} In their studies, Jain et al and Kandil et al have observed a significant reduction in blood loss^{6,7}. Huscher et al⁸ and Bessa et al⁹ suggest a significant reduction in blood loss in four port laparoscopic cholecystectomy , by use of harmonic ace like same results in our study. As in our study Kandil et al showed in their study that the risk of GB perforation was significantly higher in the traditional group than in the harmonic group (18.6% vs. 7.1%, respectively; p = 0.04)⁷. Risk of GB perforation was not found significant in the study conducted by Mukesh et al¹⁰. Mahabaleshwar et al revealed a 14.23 times greater risk of GB perforation¹¹. Mahabaleshwar et al also concluded that the postoperative pain is less in the harmonic scalpel group¹¹. As in our study post-operative pain scores after 24 hours were found to be significantly better in harmonic ace assisted LC by Kandil et al as well (4.48 ± 1.89 vs. 3.12 ± 1.84; p = 0.000)⁷. Kandil et al suggest less conversion rate in HA group but that was not statistically significant. El Nakeeb et al suggest conversion rate was 5% with electrocautery group and 3.3% with HA group (p = 0.65) . Guanqun et al¹² shows mean stay in hospital after surgery as 3.0 ± 0.4 in HA group and 2.9 ± 0.4 in EC group with p value of 0.315. Gelmini et al¹³ shows mean post operative hospital stay in both group as 2 days and p value is 0.799, but in our study post operative hospital stay was statistically significant .Guanqun et al show no significant post

operative complications in two groups .Our study also show no statistically significant difference in between two groups.

V. Conclusion

Gall stones are major burden on health care services , large number of surgeries are performed in our centre on daily basis . So improvement in the surgical techniques is must to deliver better health care services . SILC being performed in our centre on regular basis so operative time is now comparable to four port laparoscopic cholecystectomy , it has got advantage in term of decrease post operative pain and hospital stay , so burden on health care system is decreased. With the use of harmonic ace SILC has become a safe surgery in comparison to electrocautery assisted dissection. Post operative hospital stay has decreased to some more extent , there is lesser post operative pain and less chances of post operative complications.All the above mentioned factors have decreased the morbidity and burden on health care facilities automatically decreased .So harmonic ace use has made SILC a better suited surgery and results are comparable to four port laparoscopic cholecystectomy.

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