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# HARMONIC SCALPEL VERSUS ELECTROCAUTERY ASSISTED DISSECTION IN LAPAROSCOPIC CHOLECYSTECTOMY: A REVIEW

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## ABSTRACT

***Introduction****-Laparoscopic Cholecystectomy is the gold standard procedure for symptomatic cholelithiasis for years Phillipe Mouret of Lyon, France, performed his first laparoscopic cholecystectomy in 1987, followed by Francois Dubois of Paris, France, in 1988.[1,2] For a long time dissection is done with electrosurgical instruments which was first invented by William T Bovie, but with advancements of tools harmonic scalpel is showing promising results. Theoretical benefits for use of harmonic scalpel as dissection technique is less operative time, less bleeding, early post operative recovery, less spillage of stones, less chances of converting into open cholecystectomy, less pain post operatively, less amount of $CO_2$ used.* ***Methods****-A comprehensive literature search was performed for trials and studies comparing harmonic scalpel assisted dissection vs electrocautery assisted dissection in laparoscopic cholecystectomy. Results were documented 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, intraoperative bleeding, intraoperative stone spillage, amount of $CO_2$ used and post operative pain all were decreased with use of harmonic ace as compared to electrocautery in most of the studies , however post operative hospital stay and post operative complications are not statiscally reduced with use of harmonic ace as adissection tool.* ***Conclusion****-After reviewing various studies it is found that harmonic ace is a better dissecting instrument than electrocautery. Harmonic ace is a costly instrument so cost – benefit ratio is to be evaluated before its use in developing countries. Overall harmonic ace dominate electrocautery in all the testing fields and is a promising new dissection tool.*

## INTRODUCTION

Laparoscopic Cholecystectomy is the gold standard procedure for symptomatic cholelithiasis for years Phillipe Mouret of Lyon, France, performed his first laparoscopic cholecystectomy in 1987, followed by Francois Dubois of Paris, France, in 1988.[1,2] 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.[3] 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 adhesiolysis.[4] The instrument minimizes lateral thermal tissue damage. There is almost no need for instrument changes. Ultrasonic dissection has been suggested as an alternative to monopolar electrocautery in laparoscopic cholecystectomy because it generates less tissue damage and may have a lower incidence of gallbladder perforation.[5] Theoretical benefits for use of harmonic scalpel as dissection technique is less operative time, less bleeding, early post operative recovery, less spillage of stones, less chances of converting into open cholecystectomy, less pain post operatively, less amount of $CO_2$ used.

## METHODS

PubMed central, scopus and chocrane central register of controlled trials (CENTRAL) were systematically searched for all indexed articles published. After that all results are again filtered after reviewing their abstracts and finally studies contributing to our paper are screened thoroughly. Following clinical outcomes were measured-

1. Operative time
2. Blood Loss
3. Post operative recovery
4. Intra op spillage of stones
5. Chances of converting into open cholecystectomy
6. Post operative pain
7. Amount of CO2 used

## RESULTS AND DISCUSSIONS

### OPERATIVE TIME

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 16vs. 52.14 ± 9.8; p < 0.0001).[6,7]The Harmonic scalpel allows dissection and closure of the cystic artery and ducts 4–5 mm in diameter without requiring clipping (reported by Huscer et al in 1999)so significantly reducing operative time. According to a retrospective case series by Gelmini et al, the use of the Harm.[8] onic scalpel in four port LC is associated with a significantly shorter median operative time, as compared to that of conventional monopolar coagulation: 60 min (range, 20–205 min) vs 85 min (45– 150 min); P <.001. Zanghi et al also reported in a retrospective study of 164 patients that the use of the Harmonic scalpel is associated with a significantly shorter mean operative time (35 ± 10 vs 56 ± 12 min, P< .001) in four port LC. Rajnish et al suggest that there was no significant difference in operating time. Guanqun et al suggest no significant difference in operating time.[9] El- Nakeeb et al.[10] study is associated with a statistically significant shorter mean/median operative time.

### BLOOD LOSS

In their studies, Jain et al and Kandil et al have observed a significant reduction in blood loss, which was measured indirectly by means of a fall in hemoglobin and haematocrit.

Huscher et al[8] and Bessa et al[11] suggest a significant reduction in blood loss in four port laparoscopic cholecystectomy. Rajnish et al and Guanqun et al suggest that there was no significant difference in blood loss .El-Nakeeb et al[10] study is associated with significant difference in blood loss.

### INTRAOPERATIVE STONE SPILLAGE

Kandil et al, in their study, showed 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 al.[12] Mahabaleshwar et al revealed a 14.23 times greater risk of GB perforation.[13] Janssen and colleagues.[3] reported that the gallbladder perforation with stone spillage was 6 times higher in the electrocautery group than the ultrasonic dissection group. Guanqun et al reported no statistical significance between two groups in terms of gall bladder perforation.

### $CO_2$ USED

Amount of $CO_2$ used depends directly on operative time. No study to our knowledge has compared amount of $CO_2$ used. But various studies had compared mean operative time which reflect indirectly amount of $CO_2$ used. Blood loss, intraoperative stone spillage require use of suction intra operatively which also indirectly reflect amount of $CO_2$ used.

### PAIN SCORE

Jain et al noted that post-operative pain was significantly less in the harmonic shear group.[6] This is due to less release of inflammatory mediators, as there is less lateral tissue and nerve damage. Also, the duration of peritoneal distension is less due to the shorter surgery duration, thereby directly affecting the duration and degree of traction to vessels and nerve. Mahabaleshwar et al also concluded that the postoperative pain is less in the harmonic scalpel group.[13] 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] Jain et al found a significantly lower analgesic requirement in the ultrasonically activated scalpel group (2.66 ± 0.66 vs. 1.89 ± 0.59; p = 0.001).Guanqun et al.[9] and Rajnish et al suggest there is no significant pain reduction in post operative pain and analgesic requirement in both groups.

### CONVERSION INTO OPEN CHOLECYSTECTOMY

Catena et al concluded that 40% patients had undergone intra-operative conversion to an open procedure.[14] 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). Bessa et al report no statiscally significant difference in .between two groups. Guanqun et al [9] and Rajnish et al suggest there is no significant.

### LENGTH OF POST OPERATIVE HOSPITAL STAY

Guanqun et al[9] shows mean stay in hospital after surgery as 3.0 ±0.4 in HA group and 2.9±in Ec group with p value of 0.315. Gelmini et al[15] shows mean post operative hospital stay in both group as 2 days and p value is 0.799.

### POST OPERATIVE COMPLICATIONS-

In Rajnish et al study post operative complications in term of surgical site infection and intraabdominal collection there was no statiscally significant difference in between two groups. Guanqun et al and Karnail singh et al show no significant post operative complications in two groups.

## 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. After reviewing various studies it is found that harmonic ace is a better dissecting instrument than electrocautery. Harmonic ace is a costly instrument so cost –benefit ratio is to be evaluated before its use in developing countries. Overall harmonic ace dominate electrocautery in all the testing fields and is a promising new dissection tool.

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