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ROLE OF HARMONIC SCALPEL IN LAPAROSCOPIC CHOLECYSTECTOMY

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ABSTRACT

Background: Gold standard treatment of symptomatic cholelithiatis is laparoscopic cholicystectomy. No doubt, some minor biliary complication may occur by using monopolar hook,that is because of its thermal effect.
In other way,use of ultrasonically activated harmonic scalpel,ie, (Ethicon Endo Surgery INC-Johnson & Johnson Medical SPA, Somerville, NJ) in laparoscopic cholecystectomies is increasing day bye day,for the purpose of dissecting gallbladder,vessels, and the cystic duct, because it reduces the risk of thermal injuries at operative field.
Patients and Methods: This Comparative Study was conducted in surgical department of Ghulam Muhammad Mahar Medical Collage Hospital and Hira Medical Centre Sukkur during a period of last two years from july 2009 to june 2011. In duration of 2-years, we selected 92 patients, in which the, division and dissection of the cystic artery and duct is wholy soly done by Harmonic scalpal. We compared this group of patients with the data of a homogenous control group of patients, in which monopolar electrodiathermy and clips were used, in respect of average length of hospital stay, surgical time duration, and post operative complication.
Results: Harmonic scalpel usage in surgery results shorter operative time but, there is no significant difference between operative and post operative complication in both group of patients.
Conclusion: Harmonic scalpel has multiple function (coagulation, cutting, coaptation, and cavitation), so it is safe, effective and reliable instrument for gallblader surgery, specially in complicated cases. By using this instrument, you can save opertive time, anaesthesia time, operation theatre booking time, and operative as well as post operative complication.

Keywords: Laparoscopic cholecystectomy, Harmonic calpel, Monopolar coagulation .

INTRODUCTION

Laparoscopic cholecystectomy (LC) is considered worldwide the “gold standard” in the surgical treatment of symptomatic cholelithiasis. In common practice of laparoscopic cholicystectomy, surgeons are using monopolar electrosurgical hook for dissection and clips for occlusion of cystic artery and duct. However there are other techniques for cystic duct ligation such as, linear stapler, endoloops and sutures, which are now a days, not used.[1,2] Even if laparoscopic cholecystectomy is cosidered as a safe procedure but, certain things can happens by using monopolar electric scalpel, because of the high risk of local thermal injuries resulting in more postoperative biliary complications. Sometimes a very rare complication , you have to face, that is visceral or solid organ injuries resulting by the frequent instrument exchange.[3] In rare case bile leakage may occur due to slippage of the clips from cystic duct.[4-7]
Since decade ultrasonically activated scalpel (Harmonic) is in surgical practice. This instrument is invention of advance medical technology relies on modifying ultrasound waves into harmonic frequency at tissue level resulting four effects on it, that act synergistically : coagulation,cutting ,coaptation, and cavitation.[8] By using harmonic scalpal,

we are getting lower temperature and the minimal lateral spread ofenergy at tissue site, as compared with monopolar electrosurgical hook, thus reducing the risk of tissue damage.[9-11] The Harmonic scalpel have excellance resurlts in occlusion of biliary ducts and vessels containing diameter up to 4mm or 5mm (as certified by FDA in 2006).

Several studies [12-14] report that surgeons using Harmonal scalpal demonstrated the effectiveness and safety of this instrument in dissection of the gallbladder, but a few surgeons have focused its result 0n the occlusion of the cystic artery and duct, to see its coaptation effect.

Thus, with little experience of our and others study, now it is clear that Hamonic scalpal is safe and effective instrument for correct and complete closure and division of the cystic duct and artery in laparoscopic cholecystectomy. Furthermore, it is also seen that use of single instrument in whole surgical procedure reduces risk of distant organ injuries.[15]

PATIENTS AND METHODS

This Comparative Study was conducted in surgical department of Ghulam Muhammad Mahar Medical Collage Hospital and Hira Medical Centre Sukkur during a period of last two years from july 2009 to june 2011. During a 2-year period, 183 consecutive laparoscopic cholecystectomies were performed in patients preseneted with cholelithiasis, out of which sixty four patients were males, and ninty nine were females having an average age of 51.5 years (range, 17 to 84). Two surgeons of same experience and skill levels were selected for laparoscpic cholicystectomy of all selected patiets with, same approach and techniques.

Patents were retrospectively grouped into 2, grouping was on the basis of instruments used for division of the cystic artery and duct as well as for dissection of the liver bed. On the one side, group 1 which have 92 patients, in which ultrasonically activated scalpel was used as a sole instrument in whole procedure (in 17 patients (17.89%), also clip/ ligature was applied on cystic duct, because of its diameter more than 4mm). On the other side, group 2 having 91 patients in which mono-polar electrodissection was selected and clip was applied for separation and division of cystic artery and cystic duct. Both groups were compared with refferance of age, sex and surgical indication for cholecystectomy. Random clinical trial was adopted for selection of group.

Selection criteria for laparoscopic cholecystectomy was acute cholecystitis or simple gallstones .

In preoperative assessment, abdominal ultrasound in all patients and other routine investigations like L.F.T, CBC, X-ray chest and ECG in older age group were performed.

Surgical Technique

General anaesthesia was selected for all patients. Prophylactic intravenous antibiotics are injected half hour before surgery.

A standard 4 port technique was used, with Hassan technique approach, and pressure of 14 mm Hg is created in peritoneal cavity.

Group 1 (Harmonic scalpal): As discussed earlier, we have selected four port technique of laparoscopic cholicystectomy in all patients. Harmonic scalpal is introduced through trocar #2 and used for dissection of cystic duct and artery. Cystic artery and duct should be clearly visualized and separated from near bye structures, then harmonic scalpal frequency is selected at minimum level and one should take care that artery and duct coaptation and cutting is done with single attempt of shear.[3] While closing blades of shear, one should assure that there is no traction on tissues and are properly closed.[8] Rarely we can face wide diameter cystic ducts (external diameter above 4mm), in which additional ligature or clip is used. Now, problem is, how to asses diameter of duct. So keep the duct in blades of shear, if it is in complete grip, so duct has normal diameter, and if blades do not completely grip the duct, so diameter is wider, then ligature or clip is applied.

Harmonic shear is not only used for cystic duct and artery dissection but also used for separating gallbladder from its fossa by getting advantages of coaptation, and coagulation effcts of this invention.[16]

Group 2 (monopolar electrodiathermy plus clips): In this group of patients, we have selected monopolar electrodiathermy and clips and different instruments which are, dissector and a monopolar hook introduced through trochar #2:, dissection and isolation of cystic artery and duct is done by Maryland dissector followed by

TABLE

COMPARING B/W THE TWO GROUPS

S.No	Variables	Harmonic Scalpel group-1 n=92	Monopolar Diathermy group-2 n=91
1	Median operative time	60 minutes	85 Minutes
2	Open Conversion	01	00
3	Hospital Stay	1-2 days	02 days
4	Intra-operative bleeding	Less	More than group -1(mild)
5	Post-operative collection	02	00
6	Post-operative haemoperitoneum	00	01
7	CBD injury	00	00
8	Bile Leakage	00	00
9	Pleural effusion	00	01
10	Mortality	00	00

applying clips.
Monopolar hook is used for separating gallbladder from its fossa. In both groups, the gallbladder is kept in bag, made by surgical glove and taken out through umbilical port, and if necessary drain is kept.

RESULT

We have foccused our study by analyzing and comparing the results of mean operative time, conversion
rate, hospital stay, morbidity and mortality of two groups. In 183 patients, successful Laparoscopic cholecystectomy was done except in 1 patient from group 1, in which conversion was necessary because of diffuse peritoneal adhesions. During this study, we received a lot of difficult cases in which we need metalic clip over cystic duct, those were 9 cases of group 1(5 patients of empyema gallbladder, and 4 patients of acute cholicytitis).
Median operative time (skin to skin) of group 2 containing ninty one cases was 85 minutes, ranging from 20 to 205 minutes , longer duration was in thirty five cases that is because of difficult and multiple procedural cases. In one hundered one cases we need keeping of drainage tube for twenty four hours. In group 2, median postoperative hospital stay was 2 days (ranging from 1 to 16 days) and mortality was nill. Post-operative complication rate was 2.1% (4 cases), two in group 1 and two in group 2. Case 1, group2 post-operative haemoperitoneum was found due to bleeding of the hepatic bed treated by re-exploration, case 2, group 2, pleural effusion was found treated medically , and two other cases of acute cholicystitis in group 1 presented with post-opertive collection at operative area treated by ultrasound guided percutaneous aspiration, after an MR-cholango-pancreatpgiography which declared intact integrity of the biliary tract. We compared both groups 1 and 2 from multiple aspects and found subscribing results. Conversion rate of laparoscopic to conventional surgery in group1 was one patient and was group 2 was nill, and no significant statistically difference was found. Comparing median operative time which was 60 minutes in group 1 and 85 minutes in group 2 ($P<0.001$). In the end, we found no significant statical difference by using the Harmonic scalpel in Group 1 and monopolar electrodiathermy coagulation plus clips in Group 2 , but by compyling all the results it is found that Harmonic scalpal has edge over monopolr electrodiathermy coagulation.
Follow-up of Six months, we found no significant complication.

DISCUSSION

Different studies [3,8,15] have been conducted throughout world, resulted excellent work with harmonic scalpal in conventional laparoscopic surgery, in behalf of safety and effectiveness, but about one decade back in 1999, 1st case was reported and harmonic shear was used for dissection and closure-division of cystic artery and duct.[17]
The excellant results came out by using this new invention resulted in absence of bile leaks and postoperative hemorrhage in patients in laparoscopic cholicystectomy as well as advance laparoscopic surgery. Bessa, [3] Westervalt, [15] and Tebala, [18] studies of these gentleman clearly demonstrates that, ultrasound activated shear is an effective and safe tool for the coaptation as well as cutting of both the cystic artery and duct at the same time in cases of laparoscopic cholecystectomy.
Data of our study was compylied and analyzed, resulted in no significant statically difference was found in both groups 1 and 2, in respect of all aspects surgery performed with Harmonic scalpal is preferable. Having additional edge, Harmonic scalpal has four functions (coagulation, cutting, coaptation, cavitation), so there is no need of change of instruments. By this multi-functional shear we are decreasing visceral injuries produced by changing of instruments, surgical time, decrease waste of intra-peritoneal gas (because of smoke) and as well as clear view of operative field because while working it does not produce smoke[3](in fact it does not work at high temperatures).
No doubt Harmonic scalpal is to some extent costly than monopolar electrodiathermy, but keeping its advantages in mind such as safe for patient (complication point of view), decreases operative time, (effect of anaesthesia on patient, operation theatre time, as well as fatigue of man power) and psychiologically surgeon is relaxed.

CONCLUSION:

Harmonic scalpel is multi-functional, safe, effective, and reliable instrument resulting in complete haemo-biliary stasis without applying clip over cystic artery and duct. By using this new invention you can decrease operative time, operative and post-operative complication and getting lot of relaxation.

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