USE OF HARMONIC SCALPEL IN LAPAROSCOPIC CHOLECYSTECTOMY

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Abstract

Objective: To determine the effectiveness and safety of the Harmonic Scalpel in laparoscopic cholecystectomy
Study Design: Quasi Experimental Study.
Place and duration of study: Surgical Unit -1 Combined Military Hospital Rawalpindi. From January to December 2009.
Patients and Methods: A total of 110 consecutive patients undergoing laparoscopic cholecystectomy in which the procedures were performed exclusively with the Harmonic Scalpel were included. Patients were of either sex and of different age groups. Only three patients were operated in emergency and all other under went elective surgery. Ease of dissection and clarity of operative field [as determined by definition of dissection planes, need for using irrigation/suction and need for clearing the smoke by evacuation of gas], haemostasis and control of vascular pedicles, rate of complications, rate of conversion to open surgery and dissection time were analysed. Data was analyzed by SPSS. Frequencies and percentages were calculated
Results: There were 65 females and 40 males. Age range was 24-72 years with mean age 45 years. Irrigation with saline and suction was needed in only 5 cases. There was practically no or minimal whitish smoke and none required evacuation of gas to clear the operative field from it. No patient had hemorrhage of any extent. Cystic artery was clipped in 40 (36.36%) patients and in all others [54.54%] it was secured by harmonic coagulation. None had CBD or bowel injury or post op sepsis. Two (1.82%) cases required conversion to open surgery due to dense adhesions and obscure anatomy. Cystic duct was dissected out with the same device but was clipped in all the cases. Average dissection time was 40 minutes (range, 17-75 minutes).There was no mortality.
Conclusion: The Harmonic scalpel is safe and a surgeon friendly instrument for laparoscopic cholecystectomy.

Keywords : Cholecystectomy, Harmonic scalpel, laparoscopy.

Article

INTRODUCTION

Cholecystectomy is one of the commonest surgical procedures and undoubtedly laparoscopic cholecystectomy is the procedure of choice in the treatment of gall stones disease1-3. For the surgical haemostasis and cutting, electrocautery has been conventionally used as the main instrument. However the potential hazards associated with the use of electrocautery are well documented and thus pose great limitations during surgery4.

Overcoming the potential hazards of electrocautery, the introduction of ultrasonically activated (Harmonic) scalpel more then a decade ago has provided a safer alternative for routine surgical use5. This method of tissue dissection is based upon the coagulating and cavitational effects provided by a rapidly vibrating blade contacting various tissues6,7. The principle is transformation of the electric power into mechanical movement of the working part of the instrument longitudinally, by piezoelectrical transducer situated in the hand piece. The resulting decrease in temperatures, smoke, and lateral tissue damage makes the Harmonic scalpel a much safer instrument as compared with electrocautery. Harmonic scalpel has proven to be an efficient and safe instrument for dissection and hemostasis in both open and laparoscopic surgical procedures8,9. The primary use of the Harmonic scalpel in laparoscopic cholecystectomies has been for the division of adhesions, haemostasis, coagulation and cutting of the cystic artery and dissection at liver bed.

Improvements in its blade tip now also provide ultrasonic division and closure of the cystic duct thus obviating the need for clips5,10. The instrument was introduced in CMH Rawalpindi about three years ago and has been used in various open and laparoscopic procedures. This study makes an endeavor to objectively address the feasibility of its regular use in laparoscopic cholecystectomies in our set up.

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PATIENTS AND METHODS

This quasi experimental study was conducted at Surgical unit-1 Combined Military Hospital Rawalpindi from Jan-Dec 2009. Data collected on specified format was scrutinized. A total of 110 consecutive patients undergoing laparoscopic cholecystectomy in which the procedures were performed exclusively with the Harmonic Scalpel were included in the study. All other cases of cholecystectomies, open or laparoscopic, in which harmonic scalpel was not used were excluded. Patients were of either sex and of different age groups. A pre-operative assessment was done by the surgeon and the anesthetist and a full informed written consent was obtained in all the cases. Four standard ports were used with patient positioned in 20 degree head side up and tilting of bed to the left side. The 10-mm-blade Harmonic Scalpel device (manufactured by Ethicon Endosurgical) was used through a 10-mm epigastric port and kept at full power mode. Coagulation of vascular pedicles was achieved with the blades closed in the flat position. Coagulation was done for 10-20 seconds in different locations along the length (1 cm) before final division. When the cystic artery was divided, it was dissected and coagulated closer to gall bladder and then separated. Dissection in the liver bed was done either with coagulations and cutting with blade ends closed or with open edge of the blade. For resection of the omental adhesions the tissues were coagulated together in small bundles and then cut. All the patients received three parenteral doses of a combination of a third generation cephalosporin with an aminoglycoside. First dose was given at the time of induction and two doses were given post-operatively.

Parameters studied were:

*Ease of Dissection and clarity of operative field as determined by: definition of dissection planes, need for using irrigation/suction and need for clearing the smoke by evacuation of gas.
* Haemostasis and control of vascular pedicles.
* Rate of complications determined by minor or major intra-operative or postoperative hemorrhage, CBD injury, bowel injury, and rate of intra abdominal or wound infection.
* Rate of conversion to open surgery.
* Dissection time.

Data was analyzed by SPSS. Descriptive statistics like mean, frequency and percentages were used to describe the data.

RESULTS

A total of 110 patients were studied. There were 65 females and 40 males. Age range was 24-72 years with mean age 45 years. Three (2.73%) cases were declared as ASA-3, 23 (20.91%) cases as ASA-2 and all other 84 (76.36%) case as ASA-1. A total of 107 (97.27%) patients were treated as elective cases and only 3 (2.72%) patients were operated in emergency.

Clarity of operative field was remarkable. Irrigation with saline and suction was required in only 5 (4.54%) cases. Camera lens was never required to be cleaned during the procedure. A minimal whitish smoke was encountered and none required evacuation of gas to clear the operative field. Haemostasis was well secured in all the cases. Cystic artery was managed by only harmonic device in 40 (36.36%) cases thus obviating the need for clipping. In the remaining 60 (54.54%) cases it was secured by clipping in conventional manner. Complications encountered during surgery are shown in table.

Table: Showing complications associated with use of harmonic scalpel (n=110)

Complications	Number of cases (%)
Perforation of gall bladder & spillage of bile	3 (2.72%)
Spillage of calculi	2 (1.8%)
Port site infection	6 (5.5%)
Port site haematoma	1 (0.9%)

No notable or uncontrolled hemorrhage was recorded in any patient. There was no injury to common bile duct or post operative biliary discharge in any patient. Neither any patient had a gut injury. None had evidence of an intra-abdominal sepsis or noticeable rise in temperature in immediate or late post operative period. Conversion to open surgery was required in only 2 (1.81%) cases on account of difficulty in dissection and failure to proceed. Average dissection time was 40 minute range 17 minutes to 70 minutes. There was no mortality in this study.

DISCUSSION

I is well established now that the laparoscopic cholecystectomy is the procedure of choice in the treatment of gall stones disease9,10. The safety issues of laparoscopic procedures however have always been in debate over last many decades. The greatest issue has been the potential complications associated with the conventional use of electrocautery11. The introduction of harmonic device has been a breakthrough and has not only alleviated the fears associated with Electrocautery but has made the laparoscopic procedures more attractive and soothing for the operators8,12. The instrument was introduced more then a decade ago but in our setup its regular use started just three years back at CMH Rawalpindi. Since its introduction the Harmonic scalpel has acquired many applications. It is now used widely in surgery of the head and neck, chest, biliary system, stomach, gastroesophageal junction, small gut, colon, rectum, kidney, adrenal glands and others6. Harmonic scalpel works by coagulating and cutting effectively with the replacement the high frequency current thus eliminating the dangers of direct current application. In addition, it also eliminates the inadvertent and unrecognized, electrical arcing injuries which are known to be associated with the use of elctrocautrey11 Harmonic scalpel is thus a potentially safer instrument for tissue dissection. A total Harmonic scalpel dissection in the performance of a laparoscopic cholecystectomy is well described in the European literature5,7,9,12,13 in which no clips were used either for the cystic duct or the artery. Bessa SS and colleagues5 gave a description of 120 patients with symptomatic gallstone disease, and described the harmonic device as safe and effective in haemostasis as well as bile duct control. We have used harmonic device for the control of cystic artery only in 40 cases because of our uncertaininties and lack of personal experience. However the excellent vascular control has build up the confidence to use it more frequently in future.

We did not use harmonic device for the Cystic duct control and in all cases used the conventional clipping. However the descriptions of one hundred cases by Westervelt J.12 and one hundred cases by Tebala GD.13 with reference to total harmonic dissection [clipless surgery] give sound evidence of the effectiveness and safety of this instrument. Hüscher CG and colleague14 have described 461 consecutive patients undergoing laparoscopic surgery with comparable overall results with the use of harmonic device and conventional practice of using electrocautery and clips. However the ease of the procedure and clarity of the field can not be overemphasized as it is the hallmark of use of harmonic device. Value Harmonic scalpel in acute cholecystitis has been described by Catena F and colleague15 and Salamah S M A16. In our study only three cases were operated in emergency but this limited experience certainly supports these studies. Conversion to open cholecystectomy is required due to many factors17,18. Dissection with harmonic device gives a more clean clear and smokes-free field of operation and thus reduces the operative time, the bleeding, the chance of

complications and need for conversion to 'open' . In this regard a minimal conversion rate in our study supports the description of Minutolo v and colleagues8 and Ghamdi AS and colleague10 Gallbladder perforation and loss of bile or stones into the peritoneal cavity. is a well known complication of laparoscopic cholecystectomy11. The use of ultrasonic dissection in laparoscopic cholecystectomy reduces the incidence of gallbladder perforation and helps the operation to progress smoothly. In our study study there was minimal spillage and it supports the observations of Amarin NS9 and Hüscher CG and colleagues14

The operative time in laparoscopic cholecystectomy varies depending on such factors as: the degree of adhesions, the visibility of the structures, the experience of the surgical team, need for changing the instruments for dissection, cutting ,coagulation and clipping. In our study the average operating time was forty minutes that included such cases which would be otherwise regarded as difficult. The versatile use of Harmonic scalpel overcomes many of the limitation of using electrocautery and benefits in many different ways as described by Catena F and colleagues19. It has a direct impact on reducing the overall operation time and our study supports their description. Today it is undoubted that Laparoscopic cholecystectomy is the procedure of choice for gallstone diseases20, but like any other procedure it carries risks of certain complication. The endeavors for better safety and ease for the operators will continue but at present the use of harmonic scalpel takes a prime position in this regard.

The cost of the instrument is an important issue in our set up, but it needs more detailed view and a separate research effort to address it objectively.

CONCLUSION

The Harmonic scalpel is safe and a surgeon friendly instrument. Clarity of operative field and effective haemostasis is remarkable with its use. It results in minimal conversion rate even in difficult cases. It is thus a very attractive operative tool for laparoscopic cholecystectomies.

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