

## SURGICAL TECHNIQUE

# LAPAROSCOPIC APPENDECTOMY BY ULTRASONICALLY ACTIVATED SCALPEL: A PROSPECTIVE STUDY

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**Aim:** Laparoscopic appendectomy (LA) is increasingly being used in treating acute appendicitis. New instruments such ultrasonically activated scalpel as have been introduced for most laparoscopic procedures as a hemostatic too. This study was done to evaluate the feasibility and effectiveness of ultrasonically activated scalpel during LA, as the role of this instrument in LA remains to be defined.

**Patients and Methods:** Between January 2004 and April 2005 fifty patients with clinical diagnosis of acute appendicitis were included in this study. Once the diagnosis of acute appendicitis was established, laparoscopic appendectomy was performed using the ultrasonically activated scalpel for coagulation and cutting of the mesoappendix.

**Results:** The mean operative time was 45.6 minutes $\pm$ 11.6. In one patient conversion to open appendectomy was needed. There were no complications related to the ultrasonically activated scalpel for control of the vascular pedicle. No electrosurgical coagulation, clips, loops or endostapler were used in any patient to control the mesoappendix.

**Conclusion:** Use of ultrasonically activated scalpel during laparoscopic appendectomy is feasible. It makes dissection of the appendix easier, helping to reduce the mean operative time.

**Keywords:** Appendesites; laparoscopic; haemostasis.

## INTRODUCTION

Appendicitis is the most common intra-abdominal condition requiring emergency surgery, with a lifetime risk of 6%.<sup>(1)</sup> Open appendectomy has been the treatment of choice for acute appendicitis since its introduction by McBurney in 1894.<sup>(2,3)</sup> For more than a century, open appendectomy (OA) remained the gold standard for the treatment of acute appendicitis. The progress of endoscopic surgery led to the idea of performing LA. In 1981 Semm, a German gynecologist performed the first LA.<sup>(4)</sup> Despite the advances of minimally invasive surgery in other areas, its role in appendectomy was unclear and controversial for a long time. It was felt that appendectomy done through a small McBurney's incision is as cosmetic as multiple port punctures used in the laparoscopic approach. LA was also criticized for increased time required for the procedure

without any significant decrease in hospital stay or recovery time.<sup>(5)</sup> Standard laparoscopic appendectomy is usually accomplished by means of different specialized laparoscopic instruments such as loops, clips, endoscopic stapler, and monopolar or bipolar electrosurgery. However with the development of endoscopic surgery, the potential for collateral damage by diathermy has been recognized.<sup>(6)</sup> This problem, together with the need to reduce instrumental interchange, has favored the use of ultrasonically activated scalpel. This involves the application of ultrasound waves (5.55 KHz) to the tissues, with synergistic effects: cavitation, coaptation-coagulation, and cutting. The disadvantage of monopolar coagulation, which is the collateral damage, the limits of use of the bipolar coagulation and the frequent change of instruments during laparoscopic procedures, are the factors

that make the ultrasonically activated scalpel dissectors very useful in laparoscopic surgery.<sup>(7)</sup> This work presents an experience using the currently available ultrasonically activated scalpel in the laparoscopic management of acute appendicitis.

## PATIENTS AND METHODS

Fifty consecutive patients with acute right lower abdominal pain between January 2004 and April 2005 were included in this study underwent laparoscopic appendectomy using the ultrasonically activated scalpel.

Patients were considered a candidate for appendectomy according to the standard indications for surgery and based on clinical evaluation, laboratory values, and diagnostic imaging. Patients with bleeding diathesis were excluded from the study. Incidental appendectomies and interval appendectomies were excluded.

The laparoscopic procedure was performed by placing a 10-mm Hasson trocar through the umbilicus, using the open technique. A laparoscopic abdominal exploration was done. Once the diagnosis of acute appendicitis was confirmed, LA (Three-trocars technique) was performed using one 10 mm trocar in the right iliac fossa, and one 5 mm trocar in the suprapubic region. The ultrasonically activated scalpel was introduced into this operation to obtain a complete coagulation and cutting of the mesoappendix (Fig. 1).

The mesoappendix is divided with curved shears 5mm LCS/C5 that was introduced through the suprapubic port to dissect, coagulate and cut the mesoappendix (Fig. 2).

The appendix is divided and removed after applying endoloops at the base (Fig. 3).

The appendix is commonly extracted through the right iliac fossa port.

Operative difficulty such as adhesions that need to use haemostatic measures other than Harmonic Scalpel, conversion to open appendectomy was reported. Also duration of surgery, duration of hospital stay was estimated. Postoperative complications such as wound infection, postoperative ileus, pelvic abscess and fecal fistula were reported.

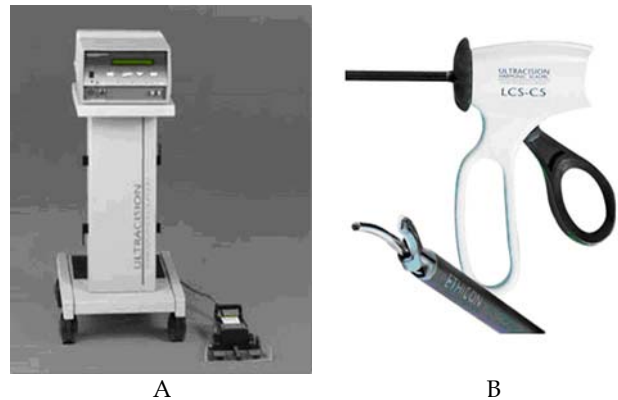


Fig 1. Ultrasonically activated Scalpel (A) Generator. (B) Curved shears.

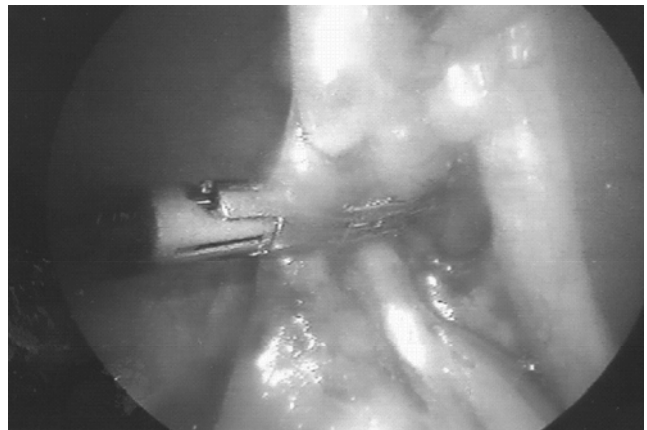


Fig 2. Ultrasonically activated Scalpel applied to secure section of the mesoappendix.

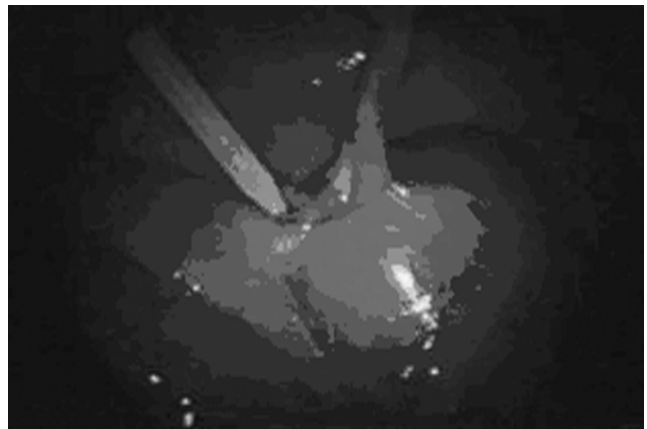


Fig 3. Catgut extra corporeal loop was used around the base of the appendix.

## RESULTS

This study included fifty patients 23 male, 27 female with a mean age of  $28.36 \pm 11.75$  years ranged from 12 to 65 years who underwent laparoscopic appendectomy using the ultrasonically activated scalpel.

Laparoscopic appendectomy was successfully completed in 49 patients but in one patient conversion to open appendectomy due to perforated appendicitis with pelvic collection.

The mean operative time was  $45.6 \pm 11.6$  minutes (range 30 - 90 minutes). It was necessary to perform one or two applications of the ultrasonically activated scalpel for complete transection of the mesoappendix. The postoperative course was without incident complication related to the use of ultrasonically activated scalpel i.e. there were no bleeding problems. One patient developed postoperative port site infection proved to be pseudomonas infection from culture of pus discharged from the port site where the appendix was removed. No postoperative ileus or fecal fistula was reported. Oral intake was reinitiated within 24 hours, and hospital stay ranged between 36 and 72 hours (mean  $45.05 \pm 9.59$  hours).

## DISCUSSION

In recent years, laparoscopic appendectomy has been reported to hold a number of significant advantages over open appendectomy. This advantages include a shorter hospital stay, reduced analgesic requirements postoperatively, faster postoperative recovery of bowel function, better diagnostic accuracy as it allows thorough inspection of the entire abdomen and definitive treatment of non-appendiceal disease, reducing negative or unnecessary laparotomy and fewer wound infections which is probably secondary to the fact that the infected appendix does not come into direct contact with the surgical incision as the appendix is withdrawn into a trocar completely before the trocar is removed.<sup>(8)</sup>

Despite these reported advantages many surgeons continue to view the procedure as too difficult, time-consuming and costly to perform on a routine basis. Also it was felt that appendicectomy done through a small McBurney's incision is as cosmetic as multiple port punctures used in the laparoscopic approach.<sup>(9)</sup>

Main reason for the prolonged operative time of LA was not during operation rather before starting the actual operation in position the patient, adjusting different tubes, cables and video apparatus around the patient. The long operating time seen in many studies is very likely attributable to operator learning curve rather than a defect in the procedure.<sup>(10)</sup>

As a trial to improve these negative aspects, different strategies have been employed focused on reducing costs and operative time. The introduction of ultrasonically activated scalpel into laparoscopic surgery has been demonstrated to be efficient in different surgical procedures. The device has an excellent hemostatic effect, allows efficient section of different tissues such as pancreas and liver,<sup>(11,12)</sup> and has been used for laparoscopic hysterectomy.<sup>(13)</sup> It has been used also in gallbladder dissection during laparoscopic cholecystectomy where it was extremely helpful in safe closure-division of both the cystic duct and artery.<sup>(14)</sup>

The preliminary report of Del Olmo et al., 2002 encouraged us to use the ultrasonically activated scalpel in dissection and division of the mesoappendix.<sup>(15)</sup> In this study the ultrasonically activated scalpel proved to: Reduce the operative time, decrease frequent interchange of instruments; make easier dissection and avoid clip application or utilization of high frequency electro-surgery and absence of smoke leads to improved visibility in the surgical field. However we did not use the ultrasonically activated scalpel to seal the appendicular stump which was done in Del Olmo series who tried this in only three patients because most experimental of ultrasonically activated scalpel at least on the small intestine suggests that intestinal sealing is inconsistent.<sup>(16)</sup> The polymicrobial, mixed aerobic and anaerobic infection that results from appendiceal stump blowout is very dangerous to the patient life and so use of the ultrasonically activated scalpel is not the standard for stump closure which can be ligated with material which is inexpensive as an absorbable ligature and secured in less than a minute so we prefer to ligate the appendiceal stump.

In conclusion the use of ultrasonically activated scalpel in laparoscopic appendectomy allows easy, safe, rapid dissection of the mesoappendix so it decreases the operative time of LA. Although the use of absorbable pre-tied loop in sealing the stump is a mandate. It is concluded that the ultrasonically activated scalpel may be feasible for use in laparoscopic appendectomy.

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