

Laparoscopic Abdominal Cysts Fenestration Using Harmonic Scalpel

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ABSTRACT

The use of ultrasonically activated scalpel for tissue cutting and coagulation is a potential replacement for electrosurgery, which can be related to different complications. Its working principle is to transform the electric power into the mechanical longitudinal movement of the working part of the instrument, by a piezoelectric transducer situated in the hand piece. Between October 2000 and June 2004, six patients with abdominal cysts were treated by laparoscopy, using the harmonic scalpel. The average age was 40.8 (ranging from 15–60) years. Laparoscopic abdominal cyst fenestration was performed in five patients, and laparoscopic cholecystectomy and abdominal cyst fenestration were done in one patient during the same operation. The average duration of the operation was 40 (ranging from 25–70) minutes and hospital stay was 2.8 (ranging from 1–5) days. Laparoscopic abdominal cyst fenestration using the harmonic scalpel is a safe and successful operation, with good results including all the advantages of the minimally invasive surgery.

Key words: harmonic scalpel, laparoscopy, abdominal cyst

Introduction

The ultrasonically activated scalpel (Harmonic scalpel), used for tissue cutting and haemostasis, is the potential replacement for electrosurgery, which can be associated with thermal injuries^{1,2}. The working principle of the harmonic scalpel is transforming the electric power into longitudinal mechanical movement – vibration of the working part of the instrument, by pulses of the piezoelectric crystals, situated in the hand piece. Using the harmonic scalpel, the lower amount of energy is transduced to the tissue with less possibility of the lateral thermal damage or penetration depth^{1–5}.

The vibrations frequency is between 23.5 and 55 kHz, and the movement distance of the working part of the instrument is between 25 and 200 μm . The movement distance can be changed, depending of the generator power output¹.

The harmonic scalpel causes three different effects: cavitation, coaptation/coagulation and cutting. Effects can be used separately or together, depending on different factors, such as output power, movement distance (amplitude), application time, instrument pressure and shape, the kind of tissue and water concentration, tissue tension. Experience is necessary for the appropriate usage¹.

Abdominal cysts are rare and can be divided into mesenteric, omental, retroperitoneal and urachal cysts. Diagnostic algorithms included ultrasound (US) and computerized tomography (CT). Surgical treatment is a method of choice because complications such as torsion, rupture, infection, bowel obstruction and malignant alternation are possible. That was the indication for the surgery for the all of our patients. Recently, open excision or wide fenestration were methods of choice. Nowadays, laparoscopic operations are more frequent.^{8–24}

The harmonic scalpel is used in many different abdominal procedures, like cholecystectomy^{2,4,25}, reflux oesophagitis procedure^{26–28}, large bowel operation^{29,30}, stomach resection^{31,32}, liver resection³³, splenectomy³⁴, and fenestration of the nonparasitic splenic^{19,35,36} or liver cysts^{19,37}.

Patients, Methods and Results

Between October 2000 and June 2004 six patients with abdominal cysts were treated by laparoscopy, using the Harmonic scalpel. Three cysts were mesenteric and one cyst was retroperitoneal, urachal and splenic. Me-

senteric cysts were situated behind the liver and close to the lesser stomach curvature, respectively. Finally, in one female patient, during laparoscopic cholecystectomy, accidentally diagnosed small mesenteric cyst on the peritoneal surface of the anterior abdominal wall was fenestrated. Urachal cyst was situated in the midline below the umbilicus, on the abdominal wall. Splenic cyst was situated at the lower splenic part.

Patient, trocars position and operating room setup depended on cysts position. The monitor was situated in the view direction, and trocars placed to allow »two-handed« operation technique with optimal visualization of the operation field. All patients were treated using three trocars. For the three mesenteric and one splenic cyst patient was positioned at lithotomy position. Surgeon was between his or her legs, assistant and scrub nurse were on the surgeon right and left side, respectively. The monitors were behind patient right and left shoulder. The first trocar for the laparoscope was positioned supraumbilically. For the mesenteric cysts the second trocar was positioned at the right mammary line and the third (the »working trocar«) at the left paramedial line. For the splenic cyst the second and the third trocar were positioned at the right paramedial and the left mammary line, respectively. For the retroperitoneal and urachal cyst, situated at the lower part of the abdomen, patients were in the supine position, surgeon was at the patients left side, the scrub nurse was on the surgeon left side and assistant was on the patient right side. The monitors were near patient right and left foot. The first trocars was positioned supraumbilically, and the second and the third trocars were in the right and left mammary line, respectively.

The cysts were excised or the abdominal cyst wall was cut off (fenestrated), performing wide opening, previously coagulated-coaptated using the harmonic scalpel (UltraCision®, Ethicon Endosurgery, Cincinnati, USA). The specimens were sent for pathohistologic examination during the operation⁶.

Operations and postoperative courses were uneventful. We have achieved a very good hemostasis and specimens were appropriate for pathohistologic examination. The average duration of the operation was 40 (ranging from 25–70) minutes and the average hospital stay was 2.8 (ranging from 1–5) days.

Final pathohistologic findings were the same as the first clinical diagnosis (mesenteric, urachal and splenic cyst).

Between 18 months and 5 years after the operation, patients were without any symptoms, with normal finding on abdominal US examination.

Discussion

The ultrasonically activated scalpel (Harmonic scalpel) allows a safe operation, with some benefit over the electrosurgery.

In the use of the harmonic scalpel there is no electrical energy passed through the body. Lateral thermal damage is reduced, due to the fact that a lower amount of energy is transduced to the tissue. For this reason the surgical stress is potentially reduced². The using of the same instrument makes tissue cutting and coagulation possible. Consequently the operation is faster and simplified, with less ligatures or clips. The harmonic scalpel produces protein cloth, which can occlude the vessel with 4 millimeters in diameter.

During tissue dissection, compared to electrosurgery, there is less smoke production using harmonic scalpel. Such smoke contains particles and cells which are highly toxic and potentially carcinogenic².

The harmonic scalpel causes the formation of bio-aerosols, composed of material of respirable size. When this device is used, a local exhaust system or smoke-evacuation method should be activated to reduce exposure to potentially infectious materials^{38,39}.

The use of the harmonic scalpel for the endoscopic treatment of cancer, viable malignant cells can be liberated, but not more compared to the electrosurgery^{39,40}.

Compared to older version, the 10-mm one, the new 5-mm shears are more practical, easy to handle and maintain. The clinical experience and practice with these instruments are relatively new, therefore further improvements are possible. Instruments are disposable, which excludes the possibility of disease transmission, but increases the operation costs.

Abdominal cysts are rare condition and can be diagnosed using US and CT. Surgical treatment is a method of choice because different complications and potential malignant alternation are possible. At the other hand, malignant cysts can be misdiagnosed, and surgical excision or wide fenestration (with the partial wall excision) with pathohistologic examination are preferred method of treatment. Today, laparoscopic operations are more frequent than open procedure. Laparoscopically is easier to reach a different parts of abdominal cavity, without laparotomy. During laparoscopic operation a clear operation field with no bleeding is essential. The wall of the cyst is a very thin and thermal damage can lead to poor specimen without possibility of a safe pathohistologic diagnosis. For this reason, Harmonic scalpel is an ideal instrument for this procedure. During its application, the tissue cutting and haemostasis are achieved without high frequency current, which can be associated with thermal injuries of surrounding organs and lateral thermal damage of the excised cyst wall (the pathohistologic specimen)^{1,2,41,42}.

According to our experience, abdominal cyst fenestration with the use of the harmonic scalpel is a safe and successful procedure, which can be proposed as an operation of choice, with good results including the advantages of the minimally invasive surgery and with the appropriate pathohistologic specimen.

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FENESTRIRANJE ABDOMINALNIH CISTA PRIMJENOM TITRAJUĆEG REZAČA

SAŽETAK

Korištenjem titrajućeg rezača (harmoničnog noža) za rezanje tkiva i zaustavljanje krvarenja može se izbjeći primjena elektrokirurgije, koja može biti povezana s različitim komplikacijama. Način rada ovog uređaja je pretvaranje električne energije u mehaničko uzdužno gibanje radnog dijela instrumenta, pomoću piezoelektričnog pretvarača koji se nalazi u dršci. Između listopada 2000. i lipnja 2004. godine, šest bolesnika s cistama trbuha smo liječili laparoskopskim načinom, pomoću titrajućeg rezača. Prosječna dob bila je 40,8 (od 15 do 60) godina. Laparoskopjska fenestrija cista urađena je kod pet bolesnika, a laparoskopjska kolecistektomija i fenestrija ciste kod jednog bolesnika, tijekom iste operacije. Prosječno trajanje operacije bilo je 40 (od 25–70) minuta, a hospitalizacija je trajala prosječno 2,8 (od 1 do 5) dana. Laparoskopjska fenestrija cista trbuha pomoću harmoničnog rezača je sigurna i uspješna operacija, s dobrim rezultatima uključujući prednosti minimalno invazivne kirurgije.