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Contemporary use of ultrasonic versus standard electrosurgical dissection in laparoscopic nephrectomy: Safety, efficacy and cost

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KEYWORDS

Ultrasonic scalpel;
Harmonic dissection;
Monopolar electrosurgery;
Laparoscopic nephrectomy;
Cost

ABBREVIATIONS

ASA, American Society of Anesthesiologists;
BMI, body mass index;

Abstract ***Objective:*** To assess the safety, efficacy and cost-effectiveness of ultrasonic dissection (USD) compared with standard monopolar electrosurgery (ES) in laparoscopic nephrectomy (LN).

Patients and methods: Retrospective analysis of patients' records who underwent elective LN was performed. Patients were divided in to two groups: USD and ES groups depending on the energy source used during LN. The preoperative (demographics, indication for surgery), intraoperative (conversion to open surgery, operative time, estimated blood loss [EBL], complications), and postoperative (morbidity/mortality, volume of drainage, hospital stay, cost) data were collected and analysed.

Results: Between February 2004 and February 2008, 136 patients were included. The indications for nephrectomy were: inflammatory (51 patients), non-inflammatory (64), and tumours (21). The two groups were similar for preoperative data. The conversion rate to open surgery (12.5%) and mean operative time did not differ significantly between the groups. However, intraoperative mean EBL was

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EBL, estimated blood loss;
ES, electrosurgery;
INR, Indian Rupee;
LN, laparoscopic nephrectomy;
USD, ultrasonic dissection

significantly less with USD, at 140.8 mL vs 182.6 mL for ES. There were no differences in postoperative parameters and morbidity. USD was significantly more expensive than ES (59 000 vs 26 000 Indian Rupees).

Conclusions: ES is a safe and feasible tool like USD in LN when used with caution. USD facilitates completion of difficult cases and reduces intraoperative blood loss. However, the majority of LNs can be completed safely with ES. ES is sturdy and cheap; therefore, selective use of USD appears to be the most cost-effective policy in the developing world.

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Introduction

Clayman et al. [1] introduced laparoscopic nephrectomy (LN) in 1991. During the past two decades, the application of laparoscopic renal surgery has seen tremendous growth, and this has thus created an increased demand for operative techniques, instruments, and their applications. A key factor in laparoscopic surgery is the use of techniques that permit safe dissection of the tissues with minimal collateral damage and adequate haemostasis. Dissection, coagulation, and division of the tissue are integral part of LN, which presents technical and haemostatic challenges. Electrosurgery (ES), although according to a survey of the American College of Surgeons [2], is the most commonly used tool for tissue dissection and coagulation in open surgeries, has shown some complications and limits related to its use in laparoscopy [3–4]. The complications attributed to ES in laparoscopy are often unrecognised and can cause significant morbidity and mortality [5]. The search for a safer energy source has resulted in the use of high-frequency ultrasound energy [6]. This source has also been adapted successfully for laparoscopy in the form of an ultrasonic dissector (Harmonic Scalpel, Ultracision, Ethicon Endosurgery Inc., Cincinnati, OH, USA) [7]. Several authors have reported the advantages of ultrasonic dissection (USD) for different laparoscopic abdominal operations [8–11]. Although USD is being widely used and is replacing conventional ES as the preferred tool for dissection in laparoscopic surgeries, it significantly increases the cost of the operation due to consumption of costly disposable instruments [12]. The cost of disposable instruments is a major determinant of the total cost of operation in the developing world, and is an important disincentive for laparoscopy in comparison to the open operations [13,14]. Fiscal responsibility is mandatory in the current healthcare environment, particularly in developing countries, where it is either public funded or paid by patients themselves due to a lack of health insurance. The aim of this retrospective study was to compare the safety, efficacy and the cost-effectiveness of USD compared with standard ES in LN done by a single surgeon at a single tertiary care centre in India.

Patients and methods

We retrospectively reviewed the records of patients undergoing LN. For study purposes, patients were divided in two groups: in the first, the dissection was conducted by monopolar ES using either scissors or hook (ES group); while ultrasonically activated shears were used for dissection in the second group (USD group). Bipolar coagulation was used in both groups when deemed necessary. During the study period, the ultrasound generator used was Ultracision (Ethicon Endo-Surgery Inc.), and electro-dissector was ForceFx (Valley Lab, Pfizer Inc. USA). The protocols for anaesthesia, and preoperative and postoperative management, were uniform in the two groups. All patients with active infection and sepsis were treated preoperatively with broad-spectrum antibiotics and percutaneous drainage was implemented when deemed necessary. For preoperative bowel preparation polyethylene glycol solution was used. Intravenous antibiotics (amoxicillin clavulanic acid) were administered prior to incision and continued postoperatively until discharge from hospital. Low-molecular-weight heparin was used for deep venous thrombosis prophylaxis. Tramadol ensured postoperative analgesia during the first 48 h, and thereafter by oral non-steroidal analgesics or tramadol/paracetamol was used at patient's request depending on the serum creatinine level.

Surgical technique

All operations were performed by a single surgeon (N.K.A.) transperitoneally, using a previously described technique [13]. Briefly, the open access was obtained and pneumoperitoneum was created, two secondary ports (all metal) were placed and depending upon the requirement of retraction the fourth port was used. The bowel was reflected, and the ureter was dissected and used as a handle to reach the hilum. The hilar

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