Arab Journal of Urology (2011) 9, 73–77

Arab Journal of Urology
(Official Journal of the Arab Association of Urology)

www.sciencedirect.com

POINT OF TECHNIQUE

Laparo-endoscopic single-site radical prostatectomy: Feasibility and technique

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Received 22 February 2011, Accepted 18 March 2011
Available online 6 May 2011

KEYWORDS

Laparoscopy;
Single-port;
Single-site;
Surgery;
Radical prostatectomy

ABBREVIATIONS

LESS, laparo-endoscopic single-site surgery; RALP, robotic-assisted laparoscopic RP; NOTES, natural orifice translumenal endoscopic surgery; RP, radical prostatectomy; VAS, visual analog scale

Abstract *Background:* As laparoscopy becomes a standard approach in many urological procedures, researchers strive to make minimally invasive surgery less invasive. Our objective was to apply recent innovations in equipment and surgical approaches to develop the technique and perform laparo-endoscopic single site radical prostatectomy (LESS-RP).

Methods: The technique for LESS-RP was derived by combining existing techniques of standard laparoscopic RP and developing techniques of urological LESS. This incorporated newly available low-profile trocars, flexible instruments and a flexible-tip laparoscope. The procedure was performed through a single 3-cm transverse infra-umbilical incision. LESS-RP was completed successfully via a single operative site without auxiliary needles or trocars. Perioperative variables and postoperative outcomes were recorded and measured.

Results: The operative time was 424 min and the hospital stay was 10 days because of a vesicourethral leak and ileus. The anastomotic leak resolved and the urethral catheter was removed at 4 weeks after surgery. The final pathology showed negative margins and Gleason 3 + 4 pT2c prostatic adenocarcinoma.

Conclusions: LESS-RP is feasible by replicating laparoscopic RP techniques and incorporating the LESS technique with the advent of flexible-tip laparoscopes and flexible instruments. After a learning curve has been overcome, this should be further tested prospectively to compare oncological and functional outcomes with laparoscopic and robotic-assisted RP.

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2090-598X

Peer review under responsibility of Arab Association of Urology.
doi:10.1016/j.aju.2011.03.017

Production and hosting by Elsevier

Introduction

The surgical treatment of prostate cancer has changed dramatically over the past decade, with most prostatectomies carried out using a minimally invasive approach. In 2005, > 10% of all radical prostatectomies (RPs) in the USA were done using robotic-assisted laparoscopic surgery [1]. Only 2 years later, robotic-assisted laparoscopic RP (RALP) was established as the standard for RP [2]. In fact, there are currently more RALPs performed in the USA than open prostatectomies [3]. As laparoscopic and robotic approaches become the standard of care in various urological procedures, the quest for reducing invasiveness and morbidity continues.

In 2002, Gettman et al. [4] introduced 'natural orifice translumenal endoscopic surgery' (NOTES) in urology, with the hypothesis that in the absence of transperitoneal incisions, there would be no external incisional pain and thus recovery would be quicker. In an effort to altogether eliminate transperitoneal incisions, the authors proposed establishing access through abdominal and pelvic viscera. Not surprisingly, this technique was slow to gain acceptance because there was no effective instrumentation and a stable platform, the potential for iatrogenic intraperitoneal complications, and questions about the proper closure of visceral incisions [5]. Realising the limitations of NOTES, laparoscopic surgeons have embraced the possibility of reducing the number of incisions from the standard three-to-six to a single transperitoneal incision in a procedure consensually termed laparo-endoscopic single-site surgery (LESS).

The incorporation of these novel techniques into RP has been hampered by the inherent technical difficulties and intricacies of performing the procedure laparoscopically. Standard laparoscopic and RALP involves placing five to seven ports transperitoneally. These ports are 5–12 mm in length, and with each port comes the compounding risk of bleeding, organ injury during port placement, port-site pain, and subsequent port-site complications, such as hernias and wound infections [6]. LESS has been applied to several procedures, including appendectomy [7], cholecystectomy [8], nephrectomy [9], partial nephrectomy [10], and recent reports of LESS-RP [11,12] have also been published. The aim of the present report is to describe the technique devised at our institution for nerve-sparing LESS-RP, and to contribute to the existing data available on the feasibility of this novel procedure.

Patient and method

A 49-year-old man presented with cT1c prostate cancer with a PSA level of 18.1 ng/mL. He was otherwise healthy and had no previous abdominal surgery. The Gleason score based on his prostate biopsy showed 3 + 4 adenocarcinoma. The patient had a body mass index of 27 kg/m^2. He elected to undergo minimally invasive RP.

The patient was placed in a Trendelenburg position with low lithotomy stirrups and the arms tucked. Sequential compression devices were placed on both the lower extremities. A single 3-cm transverse infra-umbilical incision was made. Pneumo-insufflation was obtained using a Veress needle. A flexible-tip laparoscope (LTF Series, Olympus Surgical, Orangeburg, NY, USA), two 5-mm Anchorports (Surgiquest, Orange, CT, USA), and a 12-mm trocar were placed through separate fascial punctures within the single infra-umbilical incision site. Flexible instruments (Realhand, Novare, Cupertino, CA, USA) were used in addition to standard laparoscopic instruments. A 5-mm and a 10-mm flexible-tip laparoscope (LTF Series) were used during the procedure, with the 5-mm laparoscope reserved for use when 10-mm instruments were required. A surgical assistant was also present throughout the procedure to guide the laparoscope. The standard laparoscopic RP technique, as described previously [13], was adapted to a single operative site. The seminal vesicles were dissected posteriorly after incising the posterior peritoneum. An athermal technique was used to eliminate thermal injury to the pelvic plexus. A 10-mm disposable titanium clip applier was used for hemostasis, and the seminal vesicles were dissected to their tips. The space of Retzius was then entered by dividing the medial umbilical ligaments and urachal remnant. The endopelvic fascia was incised athermally and the levator musculature swept off the lateral aspect of the prostate. The puboprostatic ligaments were divided sharply. The dorsal venous complex was controlled and divided using a laparoscopic linear stapler. The bladder neck was incised using articulating monopolar scissors. The articulating instrument was critical to direct the tip of the instrument posteriorly and avoid incising into the base of the prostate. The lateral prostatic fascia was incised sharply, and after releasing the neurovascular bundles the vascular pedicles were clipped and divided. The prostatic apex was then dissected and the urethra was transected (Fig. 1). The specimen was immediately placed into an entrapment bag. The vesico-urethral anastomosis was completed with 3–0 poliglecaprone 25 sutures with intracorporeal knot tying (Fig. 2). Minimal leak was noticed upon irrigation at the end of the procedure. The specimen was placed in an entrapment bag and extracted through the infra-umbilical site after the fascial incisions were connected. A 10-F drain was placed through the same incision. No additional ports of any size were used for retraction, dissection, or suturing.

Perioperative data were collected prospectively and recorded. Prophylactic subcutaneous heparin was administered throughout the hospital course. Postoperative pain was assessed by the nursing staff using a visual analog scale (VAS) of 0–10, given to the patient both in the postanaesthesia care unit and every 8 h during the remainder of the hospital stay.

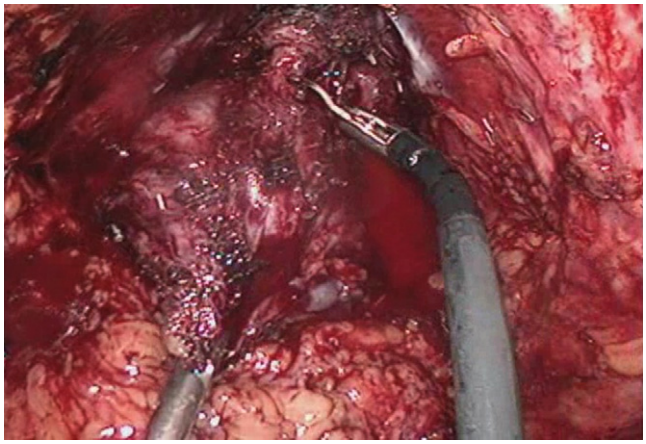

Figure 1 Flexible shears used for prostatic apical dissection and urethral transection.