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CASE REPORT

First case of robotic laparoendoscopic single-site radical prostatectomy with single-site VesPa platform

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Abstract This study aimed at reporting our first experience with robotic laparoendoscopic single-site radical prostatectomy (R-LESS-RP) with single-site VesPa platform (Intuitive Surgical Inc.). A 68-year-old-man presenting with a cT1c adenocarcinoma Gleason Score 3 + 4 = 7 in 4/12 bilateral cores underwent a transperitoneal robotic LESS-RP with a single-site Vespa platform. Initial PSA, prostate weight, and body mass index (BMI) were 4.4 ng/ml, 45 g, and 25, respectively. Instruments and camera cross within the Single-Site port; the da Vinci System software detects and reassigns the user's hands with the instruments position. The single-site port is inserted through a 2-cm intraumbilical incision. The robotic 8.5 mm scope and two surgical curved instruments (fenestrated bipolar forceps and cautery hook) are introduced through the ports and used for most of the procedure, whereas a wristed needle driver on the right hand is used for the reconstructive steps. An additional 12 mm port (Air Seal, SurgiQuest) is placed in a midline between the umbilicus and the right iliac spine in order to facilitate table assistance during surgery and to place a drain at the end of the procedure.

Operative time and blood loss were 300 min and 400 mL, respectively. The postoperative course was uneventful. The drain and the catheter were removed on days 1 and 6, respectively. The patient experienced a temporary mild stress incontinence (one pad at sixth month) and erectile dysfunction.

Our first robotic laparoendoscopic single-site radical prostatectomy (R-LESS-RP) with the single-site VesPa platform was associated with acceptable operative times and perioperative outcome. This procedure is feasible without complications, provided that a proper patient selection has occurred. Limited movements together with the lack of the fourth robotic arm require a considerable expertise in robotic surgery. Some tricks can help overcome technical limitations. The Robotic LESS-RP reduces in some measure the limitations of conventional LESS RP, although further refinement of the robotic instruments is necessary.

Keywords Single port radical prostatectomy · Single-site surgery · Robotic prostatectomy · LESS · VesPa

Introduction

The aim of this case report is to describe the procedure and evaluate the feasibility and safety of robotic laparoendoscopic single-site radical prostatectomy with single-site VesPa platform.

Single-Port radical prostatectomy laparoendoscopic (LESS-RP) has established itself as a challenge for the urological community, starting with different approaches: transperitoneal, extraperitoneal, and transvescical, initially described for laparoscopy and then robot-assisted. In order to improve the LESS-RP new instruments, optical devices, trocars, and retraction mechanism have been developed. The aim was not only to improve the esthetic result, but also to decrease the morbidity of procedures, reducing the number and size of trocars.

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The few studies and short series available can be the result of a low interest in the application of LESS-RP in prostate, due to the technical complexity required [1].

We report the first robotic LESS-RP performed with the single-site VesPa platform (Fig. 1a).

Materials and methods

Patient characteristics

The patient was a 68-year-old-man with preoperative BMI, initial PSA, and prostate volume of 26, 4.4 ng/ml, and 43 ml, respectively. cT1 Gleason Score $4 + 3 = 7$ adenocarcinoma was found in 4 of 12 samples at transrectal biopsy. The patient was continent and potent. The Briganti score predicting lymph node invasion was 4%.

Device description

The single-site configuration is compatible with the da Vinci Si Surgical System. Instruments and camera cross within the Single-Site port and use remote center technology to minimize cannula collision, arm interferences, and port-site movement; da Vinci System software automatically detects and re-associates the user's hands through crossed cannulae.

The five-lumen port provides access for single-site instruments: a 8.5-mm port for the 3DHD endoscope, two 5-mm accessory ports for the robotic instruments, and two 5-mm accessory ports for table assistance and insufflator adaptor (Fig. 1a).

We used four 5-mm semi-rigid curved instruments: one fenestrated bipolar forceps (Fig. 1b), one permanent cautery hook (Fig. 1c), one non-articulated scissor, and one wristed needle driver (Fig. 1d).

Surgical technique

A 2-cm incision is created intraumbilically and the umbilicus is released from the rectus fascia (Fig. 2a). The single-site port is introduced carefully using an atraumatic clamp. Incorrect clamping may cause difficulties during the operation, especially if the port is partly torn or damaged. Lubrification of the port by dipping in a sterile solution (e.g., saline or water) is essential for insertion (Fig. 2b). The patient is placed in Trendelemburg (23°) and the da Vinci Si system is docked. The robotic 8.5 mm scope and

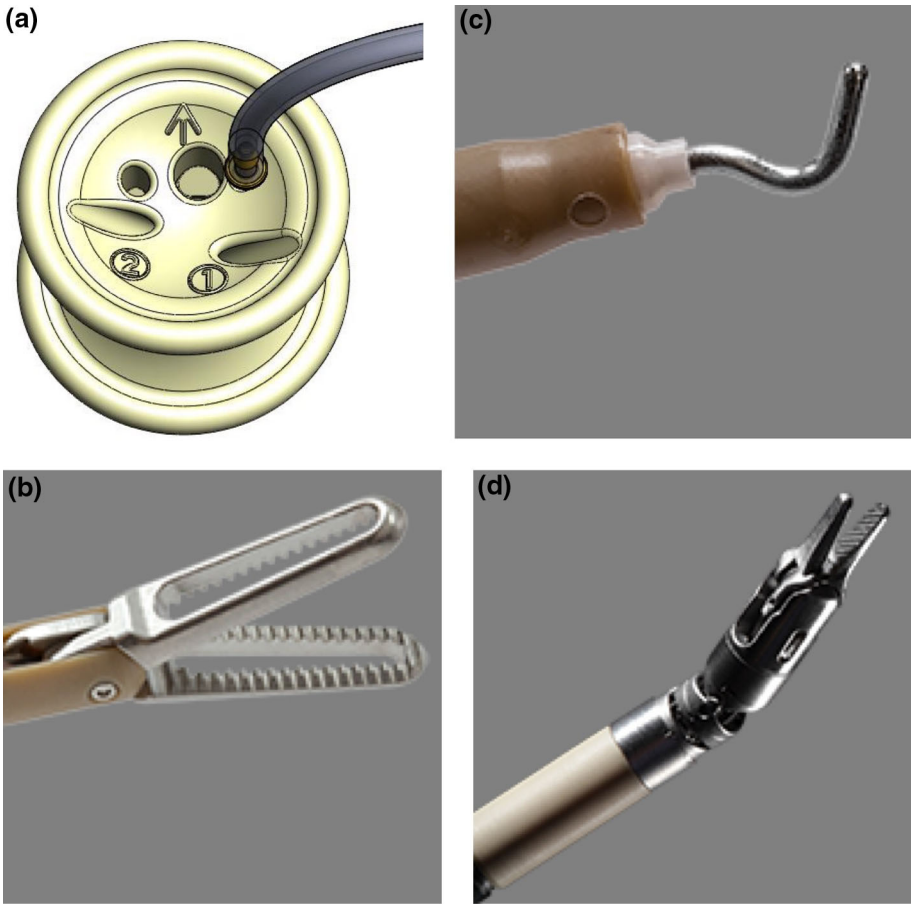

Fig. 1 **a** The da Vinci Single-Site port for the Vespa platform. **b** Bipolar forceps. **c** Permanent Cautery Hook. **d** Wristed Needle Driver

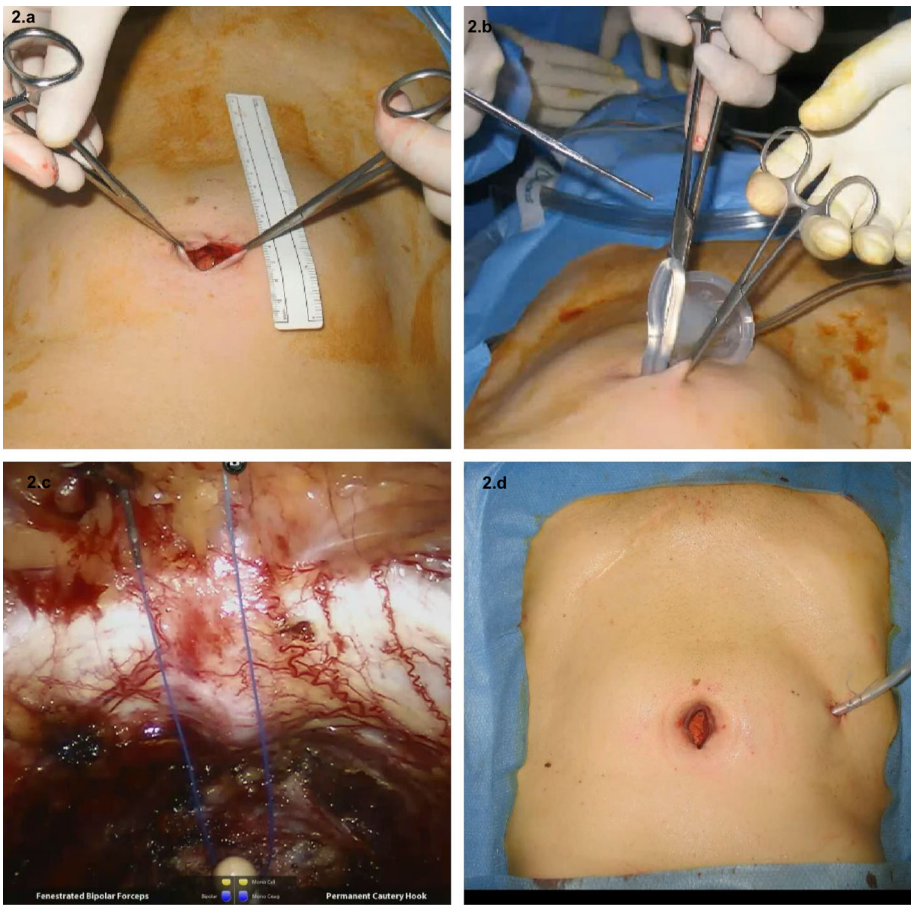

Fig. 2 **a** 2 cm incision. **b** Single-Site port insertion. **c** Suture can be placed through the abdominal wall and passed through the catheter and then exited out of the abdominal wall to serve as a retractor in a "marionette" fashion. **d** Final result

two surgical curved instruments (fenestrated bipolar forceps and cautery hook) are introduced through the ports and used for most of the procedure. An additional 12-mm port (Air Seal, SurgiQuest) is placed in a midline between the single-site port and the right iliac spine in order to facilitate table assistance during surgery and to place a drain at the end of the procedure.

A single right peritoneum incision laterally to the urachus and then bladder mobilization are performed. Defatting of the prostate and incision of the endopelvic fascia are performed. Fatty tissue is swept free from the pubic symphysis exposing the endopelvic fascia, which is then incised. The prostate is mobilized off the levator fibers. The dorsal venous complex with a 2.0 Vycril is ligated with a 5-mm endowrist robotic needle driver. The anterior bladder neck is transected. A suture is placed through the abdominal wall, passed through the catheter, and then exited out of the abdominal wall to serve as a retractor in a "marionette" fashion (Fig. 2c). The posterior bladder neck is then gradually dissected away from the prostate. The anterior layer of Denonvillier's fascia is incised and the vas and seminal vesicles are mobilized and retracted anteriorly with the marionette suture mentioned above.

The lateral border of the prostate and the neurovascular bundles are released from the perirectal fat. An extrafascial approach is accomplished with Hem-o-Lock clips. Assistant retraction with the suction device and/or marionette sutures allows for placement of Hem-o-lok clips.

The 5-mm monopolar hook is used to incise the ligated dorsal vein complex, exposing the underlying urethra. The urethra is transected with a 5-mm non articulated scissor, without cautery. Complete dissection of the prostate apex is accomplished in a retrograde fashion; the prostate is released and placed in a 10-mm entrapment bag.

A 5-mm wristed needle driver in the right hand and the fenestrated bipolar forceps in the left hand are used to complete the vesicourethral anastomosis. Two sutures of 3-0 barbed V-loc® are placed in a semicircular running fashion starting from 6 o'clock position toward the 12 o'clock one. A 20 Ch Foley catheter is inserted under vision into the bladder after completing the anastomosis. The anastomosis is tested by instilling 150 ml of saline into the bladder to ensure the water tightness. A Jackson–Pratt drain is placed in the pelvis and exited through the additional port (Fig. 2d).

Results

The operative time, recorded from skin incision to skin closure, was 300 min, without transfusion and the blood loss was 400 mL; the postoperative course was uneventful: no complications were reported. Drain and catheter were removed on postoperative days 1 and 6, respectively. The definitive pathology revealed a pT2c Gleason Score $3 + 4 = 7$ adenocarcinoma with negative margins. The patient used two pads until the third month, one pad until the sixth, and one safety pad until 12 months. After 12 months, the patient was completely continent; severe erectile dysfunction is reported. PSA was undetectable at 18 months follow-up.

Discussion and review of the literature

Radical prostatectomy (RP) is the standard treatment of organ-confined prostate cancer. RP has changed exponentially with opening of minimally invasive techniques. Laparoendoscopic single-site surgery (LESS) can be regarded as the latest progression in laparoscopic surgery and has garnered much enthusiasm with >400 cases reported [2–6]. The first single-port used in RP was created with a rustic trocar: a single incision is made in the skin and fascia, which is defined as a "site" surgery [2]. Other devices of a single-port access developed several working channels: TriPort/four ports (advanced surgical concepts, Bray, Ireland) [7], and SILS (Covidien, Mansfield, MA, USA) [8]. Other devices offer the option of a single channel in which multiple trocars can be placed as shown in the Gel POINT (Medical Application, Rancho Santa Margarita, CA, USA) [9], Duo Rotate System (Rychard Wolf GmbH, Knittlingen, Germany) [10], and the da Vinci Single-Site Port.

Early clinical experiences with LESS have pointed out several limitations. Working time through a single port, the reduction of the working space is immediately evident, as well as the collision of instruments, the limited freedom of movement, and display of difficulties that inevitably lead to highly complex procedure and requires higher surgical skills.

To help overcome these limitations, the da Vinci surgical system has been applied to LESS and termed robotic LESS. Interestingly, fewer studies and reports on robotic LESS [8, 11, 12] are available as compared to conventional laparoscopic LESS. A possible explanation of this relatively lower interest in robotic LESS might reside in the capability in either laparoscopic LESS and robotic surgery required to safely and rapidly perform such technique. However, the robotic platform reduces the instruments crossing, has superior ergonomics, and instrument tip articulation significantly facilitates suturing. As a result, this technique may have promise compared with its conventional laparoscopic counterpart, in terms of operative outcomes, postoperative pain, and patient-reported convalescence after certain procedures, including nephrectomy and pyeloplasty [13, 14].

This is the first case of robotic LESS-RP performed with the da Vinci Single-Site VesPa platform [1]. The procedure is feasible, provided that careful patient selection is ensured. It is recommended to avoid complex cases, i.d. extended pelvic lymphadenectomy or large prostates. The high complexity of the procedure requires deep expertise in robotic surgery. In our opinion, the additional Air Seal port is very useful for clip placement, suction, and tissue retraction; at the end of surgery, it can also be used for the drain placement. Another useful trick is to use internal retraction sutures in a marionette fashion to replace the fourth robotic arm in order to pull the catheter and the seminal vesicles up. Given the limitations of the technique, the patients undergoing this procedure should be highly selected and definitely with a relatively small prostatic volume.

At this point, robotic LESS-RP with the VesPa platform appears feasible and less challenging compared with conventional LESS. We wish that the ongoing technical innovation will make this approach even easier. The challenges of the LESS platform in the surgical management of urological diseases are clear: the long awaited evolution of robotic technology has begun, and we should keep up with it.

Conclusions

After this first experience, we conclude that robotic-assisted RP with the single-site VesPa platform is associated with acceptable operative times and perioperative outcome. Although the benefits for the patients are unclear, our initial results show that it is at least as safe and effective as the conventional LESS-RP. Careful patient selection is recommended. Further improvement of the single-port robotic instruments is desire needed.

Compliance with ethical standards

Conflict of interest Mattevi D, Luciani LG, Vattovani V, Chiodini S, Puglisi M, Malossini G, declare that they have no conflict of interest.

Ethical approval All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

Informed consent Informed consent was obtained from all individual participants included in the study.

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