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Improving the Preservation of the Urethral Sphincter and Neurovascular Bundles During Open Radical Retropubic Prostatectomy

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Abstract

Objectives: To describe a technique for open nerve-sparing radical retropubic prostatectomy.

Methods: The technique basically implies incising the levator and prostatic fasciae high anteriorly (1 and 11 o'clock positions) over the prostate, developing the plane between the prostatic capsule and prostatic fascia, and displacing the neurovascular network localized between the two fasciae laterally. This allows for a minimal-touch dissection of the external urethral sphincter and a very efficient dissection of the neurovascular bundles at the level of membranous urethra and prostatic apex.

Results: Forty-two patients underwent a bilateral nerve-sparing operation and were followed- up for 6 months. Six patients (14.3%) had positive margins: 4 patients had pT2 disease (in all, the positive margin was monofocal) and 2 patients had pT3 disease (both had multifocal positive margins). Continence (defined as being dry or having one pad remain dry for 24 hours) was achieved in 44% of patients at catheter removal, and in 60%, 72%, and 90% of patients at the 1-, 3-, and 6-month follow-up visits. Potency (defined as an erectile function domain score $\geq$26) was obtained in 15%, 40%, and 52% of patients at the 1-, 3-, and 6-month follow-up visits. All patients used a PDE5-inhibitor during the investigation period.

Conclusions: These preliminary results suggest that the high incision of the levator and prostatic fasciae may facilitate efficient preservation of the external urethral sphincter and the neurovascular bundles innervating the corpora cavernosa and the sphincter.

Keywords: Cavernous nerves; Nerve-sparing prostatectomy; Prostate; Prostatectomy; Prostatic neoplasms; Urethral sphincter

1. Introduction

Radical prostatectomy is commonly used to treat patients with clinically confined prostate cancer and a life expectancy of at least 10 years [1]. Candidates for radical prostatectomy not only aim to be cured of their disease but also wish to maintain a good postoperative quality of life. The objective of surgery is thus to remove the prostate entirely while leaving the external urethral sphincter and the neurovascular bundles running adjacent to the gland and encasing the cavernous nerve fibres intact. Walsh first clarified the surgical anatomy of the prostate and the technique of anatomical radical prostatectomy, with the summary of his 20-year experience being reported recently [2,3]. Other investigators subsequently proposed different techniques aimed at achieving the best possible rates of postoperative normal urinary continence and potency. Namely, the importance of removing the prostate while

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leaving in place a large portion of the levator and prostatic fasciae that cover the gland has been recently proposed, by using both open and robotic techniques [4–6]. We describe a technique that allows the prostate to be slipped out by detaching the prostatic capsule from the inner surface of the prostatic fascia.

2. Material and methods

Patients considered for radical prostatectomy at our institution are offered the opportunity to participate in a rigorous outcome research program, which involves the self- administration of many validated instruments both before surgery and during follow-up. The program has been approved by the Ethics Committee of University Vita-Salute San Raffaele, and all patients must provide written consent to participate.

For this study we only considered patients with prostate cancer and a cT1 (no palpable disease) or cT2 clinical stage (according to digital rectal examination), biopsy Gleason score $\leq$7, PSA $\leq$10 ng/ml, negative bone scan, negative chest roentgenogram and negative CT scan of abdomen and pelvis. Patients were also selected according to their age ($\leq$65 years), a score of the erectile function domain of the International Index of Erectile Function (IIEF) of $\geq$26, and a steady heterosexual relationship with a partner interested in sexual activity. Exclusion criteria included diabetes and the routine or sporadic preoperative use of PDE5-inhibitors to enhance the patient's sexual performance. Surgery was scheduled 6 weeks following prostatic biopsies. All patients were asked to bank 2 units of blood before surgery.

2.1. Surgical technique

Spinal anaesthesia combined with intravenous sedation with propofol is used, which allows reduction blood loss and acceleration of recovery in the early postoperative period [7]. Systolic blood pressure is maintained below 100 mmHg from skin incision until the prostate is removed and haemostasis is completed. During the same time interval, care is taken not to infuse more than 1000 ml of intravenous fluids to reduce the filling of veins branching from the Santorini's plexus and surrounding the prostate. The patient is placed supine on the bed with a 30- degree Trendelenburg position and with the lower limbs directed slightly downward.

A xenon headlight (LuxTec 9300XSP, Boylston, MA, USA) is used to improve illumination of the surgical field. Magnifying loupes (3.8–4.8×, Orascoptic Corporation, Middleton, WI, USA) with prismatic lenses are used to allow for better visualization of anatomical details. Surgical instruments with ultra-fine tips are used to reduce tactile damage to tissues. We have found the following instruments to be particularly helpful: fine-tip scissors to section the ligated Santorini's plexus (Jameson scissors, $10\frac{1}{4}''$, Sontec Instruments, Englewood, CO, USA, cat. no. 2400-335 curve PC gold); fine-tip dissecting scissors (Aesculap, Tuttlingen, Germany, cat. no. BC644R); fine-tip scissors to divide small vessels, thin fascial sheets, and the membranous urethra (Jameson scissors 9″, Sontec Instruments, cat. no. 2400-333 curve PC gold); and fine-tip dissecting right-angle clamps (Mixter Medicon Instruments, Tuttlingen, Germany, cat. no. 17.07.23) having tips specifically thinned by the Bioengineering Department of our university.

An 8- to 10-cm midline skin incision is used. Monopolar cautery is only used to control small bleeders of the subcutaneous tissue. From this step of the procedure to final closure of the wound, it is mandatory that neither mono- nor bipolar cauteries be used. The Retzius spaces are gently exposed and a standard Balfour retractor is placed. Care is taken to avoid excessive traction on the wound to minimize postoperative pain. Pelvic lymphadenectomy is performed when indicated.

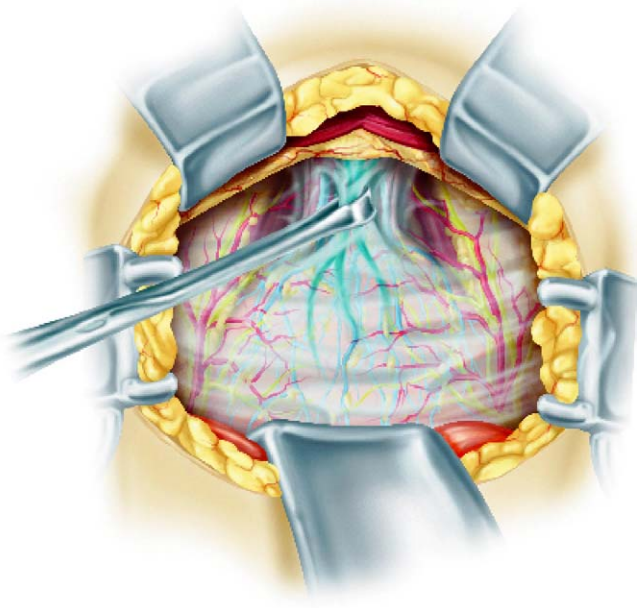

Fig. 1. An Allis clamp is used to grasp the superficial veins of the Santorini's plexus. Care is taken not to place the clamp too deeply to avoid damaging the prostatic apex and the urethral sphincter.

In the interest of clarity, hereafter we follow the anatomical nomenclature described by Walsh [2,3]. The levator fascia is incised sharply with fine-tip dissecting scissors along the arcus tendineus fasciae pelvis. Small veins located underneath the fascia and piercing through the levator ani muscles are often found. If needed, these are ligated with ultra-small clips (3-mm diameter) and sharply divided. Care is taken not to mobilize the levator ani muscles' fibres. The pubo-prostatic ligaments are divided sharply. A small Allis clamp is used to grasp the two medial borders of the incised levator fascia. This manoeuvre is used to pull together only the superficial components of the Santorini's plexus (Fig. 1). A small wet sponge stick is used to clean the grasped superficial Santorini's plexus of adipose tissue and to visualize the prostatic apex through its fascial coverings. A 3-0 monocryl suture on a UR-6 needle is passed distal to the Allis clamp. It is important to note that this suture is not used to control all branches of the Santorini's plexus, as it is passed quite superficially to avoid any damage to the urethral sphincter. This passage is repeated twice and the suture is tied while leaving the Allis clamp in place (Fig. 2). This manoeuvre allows the branches of the Santorini's plexus to be pulled together and facilitates its subsequent division. The Santorini's plexus is then sharply divided. We feel it is important to divide the plexus at the midline and proceed until the urethral sphincter is visualized. If the plexus is very wide, we place ultra-small clips to control the most lateral branches, which are divided subsequently. Doing this avoids these small branches retracting under the pubis symphisis, which makes them very difficult to control. A running suture with a 3-0 monocryl on a UR-6 needle is used to control bleeding from the deeper portion of the distal trunk of the Santorini's plexus. This suture must take only the Santorini's plexus; neither the urethral