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Collaborative Review – Prostate Cancer

A Critical Analysis of the Current Knowledge of Surgical Anatomy of the Prostate Related to Optimisation of Cancer Control and Preservation of Continence and Erection in Candidates for Radical Prostatectomy: An Update

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Abstract

Context: In 2010, we published a review summarising the available literature on surgical anatomy of the prostate and adjacent structures involved in cancer control and the functional outcome of prostatectomy.
Objective: To provide an update based on new literature to help the surgeon improve oncologic and surgical outcomes of radical prostatectomy (RP).
Evidence acquisition: We searched the PubMed database using the keywords radical prostatectomy, anatomy, neurovascular bundle, nerve, fascia, pelvis, sphincter, urethra, urinary continence, and erectile function. Relevant articles and textbook chapters published since the last review were critically reviewed, analysed, and summarised. Moreover, we integrated aspects that were not addressed in the last review into this update.
Evidence synthesis: We found new evidence for several topics. Up to 40% of the cross-sectional surface area of the urethral sphincter tissue is laterally overlapped by the dorsal vascular complex and might be injured during en bloc ligation. Denonvilliers fascia is fused with the base of the prostate in a horizontal fashion dorsally/caudally of the seminal vesicles, requiring sharp detachment when preserved. During extended pelvic lymph node dissection, the erectile nerves are at risk in the presacral and internal iliac area. Dissection planes for nerve sparing can be graded according to the amount of tissue left on the prostate as a safety margin against positive surgical margins. Vascular structures can serve as landmarks. The urethral sphincter and its length after RP are influenced by the shape of the apex. Taking this shape into account allows preservation of additional sphincter length with improved postoperative continence.
Conclusions: This update provides additional, detailed information about the surgical anatomy of the prostate and adjacent tissues involved in RP. This anatomy remains

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complex and widely variable. These details facilitate surgical orientation and dissection during RP and ideally should translate into improved outcomes.
Patient summary: Based on recent anatomic findings regarding the prostate and its surrounding tissue, the urologist can individualise the dissection during RP according to cancer and patient characteristics to improve oncologic and functional results at the same time.

1. Introduction

In 2010, we published a review on the current knowledge of the anatomy of the prostate and surrounding tissue with the aim of helping urologists better understanding the diverse structures encountered during radical prostatectomy (RP) and applying the current nomenclature for these structures correctly [1]. We now present an update, taking the most recent research results into consideration as well as the most recently published technical variations of RP and adding topics that we left out of the previous article.

2. Evidence acquisition

We searched the PubMed database to identify original and review articles in English that addressed the anatomy of the prostate and relevant structures adjacent to the prostate, with an emphasis on work published after the publication of our previous review (February 2010 to July 2015). The keywords used were *prostate, radical prostatectomy, anatomy, neurovascular bundle, nerve, fascia, pelvis, sphincter, urethra, urinary continence*, and *erectile function.* Relevant articles and textbook chapters were reviewed, analysed, and summarised, with the consensus of all authors.

3. Evidence synthesis

Regarding the pubovesical/puboprostatic ligaments, the accessory pudendal arteries, the vesicoprostatic muscle, and the periprostatic fascia, no new anatomic knowledge was acquired (Figs. 1–4). Consequently, we refer to the previous article for this information [1].

3.1. Dorsal vascular complex

The dorsal vascular complex (DVC) overlies the urethral sphincter ventrally. During its ligation, injury to the sphincter tissue is possible, resulting in potentially decreased postoperative continence. A recent study by Ganzer et al demonstrated that 37% and 30% of the cross-sectional urethral sphincter surface area are laterally overlapped by the DVC at the prostate apex and 5 mm distal to the apex, respectively. The DVC covers the urethral sphincter tissue laterally and dorsally (Fig. 3) [2]. In the case of transverse en bloc ligation of the DVC dorsal to its lateral limits, a substantial portion of the sphincter tissue might be included in the ligation and rendered nonfunctional. To avoid this problem, selective dissection and ligation of the DVC is strongly recommended [2,3].

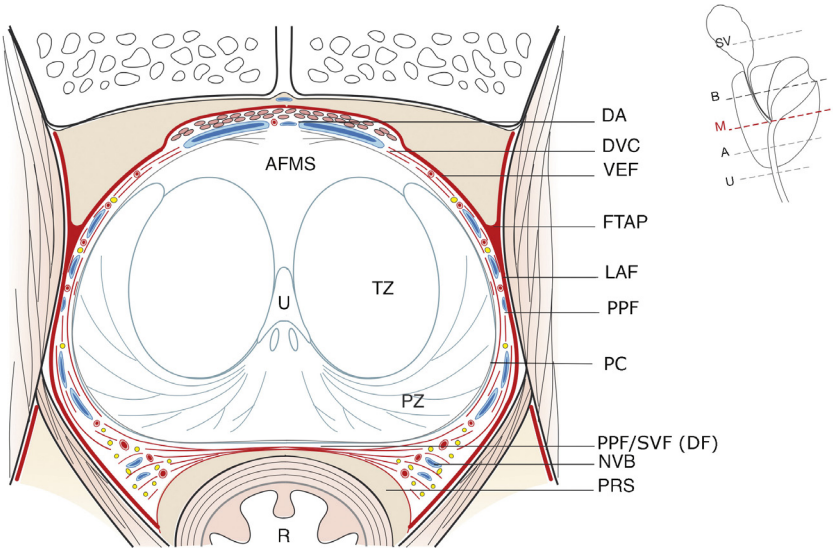

Fig. 1 – Axial section of prostatic and periprostatic fascia at midprostate.
A = apex; AFMS = anterior fibromuscular stroma; B = bladder; DA = detrusor apron; DF = Denonvilliers fascia; DVC = dorsal vascular complex; FTAP = fascial tendinous arch of pelvis; LAF = levator ani fascia; M = midprostate; NVB = neurovascular bundle; PC = pseudocapsule; PPF = periprostatic fascia; PPF/SVF = posterior prostatic fascia/seminal vesical fascia; PRS = perirectal space; PZ = peripheral zone; R = rectum; SV = seminal vesicle; TZ = transition zone; U = urethra; VEF = visceral endopelvic fascia.

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