



Enigmatic Traces Determined on Radical Perineal Prostatectomy Specimens: An Anatomohistological Study

Radikal Perineal Prostatektomi Spesmenlerindeki Gizemli İzler: Bir Anatomohistolojik Çalışma

Radikal Perineal Prostatektomi Cerrahi Sınır Histolojisi / Histology of Surgical Margin of the Radical Perineal Prostatectomy

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Özet

Amaç: Radikal perineal prostatektomi spesmenleri (RPP) üzerinde bulunan, onkolojik ve fonksiyonel sonuçları etkileyebilecek dokuların anatomohistolojik değerlendirilmesi. **Gereç ve Yöntem:** Tek cerrahin serisi olan 41 RPP spesmeni incelendi. Spesmenler apeksten basise doğru dilimlendi. Apeksten 1, orta prostattan 2 ve basisten 1 adet olmak üzere toplam 4 adet dilim seçildi. Bu dilimleri çevreleyen dokular, prostatın güncel anatomik ve patolojik verileri ışığında belirlenmiş 7 parametre açısından anatomohistolojik olarak değerlendirildi; "Dorsal venöz kompleks", "Çizgili kas (rabdosfincter)", "Periprostatik fasiyal doku", "Damar sinir paketi", "Düz kas (mesane boynu)", "Cerrahi sınır" ve "Kapsüler insizyon". **Bulgular:** Apeksten alınan dilimlerde dorsal venöz kompleks hiç gözlenmezken 39 (%95,1) hastada çizgili kas vardı. Orta prostattan alınan dilimlerde periprostatik fasiyal doku, özellikle rektum tarafında bulunan posterior kesitlerde olmak üzere, 36 (%87,8) hastada gözlemlendi. Yine orta prostatta damar sinir paketi 23 (%56) hastada gözlemlendi. Tüm basis dilimlerinde mesane boynuna ait düz kas lifleri vardı. Cerrahi sınır pozitifliği sadece 5 (%12,1) hastada vardı. Kapsüler insizyon 15 (%36,5) hastada gözlemlendi. **Tartışma:** Çalışmamız, RPP tekniği uygulanırken prostatla birlikte başka hangi dokuların çıktığını kantitatif olarak ortaya koymuştur. Spesmenlerin dorsal venöz kompleksi içermiyor olması pubovesikal kompleksin korunuyor olması açısından anlamlıdır.

Anahtar Kelimeler

Fasiya; Perineal; Prostatektomi

Abstract

Aim: An anatomohistological evaluation of tissue found on specimens of radical perineal prostatectomy which could influence oncological and functional outcome. **Material and Method:** A certain surgeon's batch of 41 RPP (Radical perineal prostatectomy) specimens were evaluated. The RPP specimens were dissected from apex to basis. The following slices were dissected: 1 from the Apex, 2 from the center of the prostate, and 1 from the basis. Totaling 4 selected slices. Tissue surrounding these slices were anatomohistologically evaluated working from the following 7 parameters determined in light of latest anatomical and pathological insight on the prostate: "Dorsal venous complex(DVC)", "Striated muscle(Rhabdosphincter)", "Periprostatic fascial tissue (PPFT)", "Neurovascular bundle(NVB)", "Bladder neck smooth muscle", "Surgical margins" and "Capsular incision". **Results:** Whilst no DVC was found in the dissected Apex slices, muscle striation was found with 39 (95,1%) of the patients. PPFT within central prostate sections was found with 36 (87,8%) of the patients, predominantly within posterior quadrants. Again within central prostate sections NVB was found with 23 (56%) of the patients. All basis slices were found to have bladder neck smooth muscle. Surgical margin positivity was found with only 5 (12,1%) of the patients. Capsular incision was found with 15 (36,5%) of the patients. **Discussion:** Our study provides a quantitative report of the extent to which other anatomical structures are extracted when removing the prostate from the perineum employing the RPP technique. That the specimen show no trace of DVC is significant in terms of pubovesical complex sparing.

Keywords

Facia; Perineal; Prostatectomy

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Introduction

Prostate cancer is the most common occurring form of cancer amongst the male populace of developed countries [1,2]. Radical prostatectomy (RP) allows for a 5 year cure rate of 90% [3]. With RP the primary objective is to leave absolutely no trace of cancerous tissue; however the threat of erectile dysfunction (ED) and urinary incontinence (UI) thwarts the possibility of aggressive surgery. Retropubic and perineal are the two main approaches adopted within the RP technique. The retropubic approach can be implemented through open surgery, laparoscopic or robot assisted laparoscopic techniques. Radical perineal prostatectomy (RPP) boasts significant advantages such as minimal invasion, reduced length of hospital stay, an earlier return of urinary control and a faster return to daily life in general [4,5]. However in spite of these advantages RPP isn't favored over other techniques. This tendency is mostly due to many urologists' lack of anatomical knowledge when it comes to the perineum. In recent years, thanks to a better understanding of pelvis and perineum anatomy and improved surgical techniques, morbidity rates of RP surgeries (perineal or retropubic) have diminished significantly [6,7]. However, incontinence and sexual dysfunctionality issues affecting patients wellbeing can still persist. Research into seminal vesicle and pubovesical complex sparing surgical procedures, which could influence functional outcomes are all aimed at determining the least anatomically damaging technique [6,8]. This study aims to provide an anatomical origin based quantitative description of tissue found on prostatectomy material attained through RPP surgery.

Material and Method

Within period 2006 through 2010, a certain surgeon's batch of 41 patients with prostate volumes of <80cc, Gleason scores of ≤ 7 and prostate specific antigen values of <10ng/ml underwent RPP surgery at our clinic. Based on Partin nomograms 2 patients were deemed high risk in terms of pelvic lymph node positivity. With these patients, since the retropubic approach would prove difficult due to morbid obesity and previous abdomen operations, laparoscopic pelvic lymph node dissection was employed. Perineal radical prostatectomy was preferred with those patients with negative pelvic lymph node values. Radical prostatectomy specimen was coated with India ink. Distal (apical) and proximal (bladder neck) surgical margins were sampled through conization. Next, starting from the apex the prostate was dissected into 3mm coronal cuts. Each slice was marked right-left, anterior-posterior and mapped for sampling. A number of slices were dissected depending on the size of the prostate but only 4 slices from each prostate were included in the study: slice 1 from the apex, slices 2 and 3 from the center, and slice 4 from the basis. With the urethra remaining the central point each slice was horizontally split into four sections and labeled: A and B anterior quadrants, C and D posterior quadrants (Figure 1). Tissue surrounding these quadrants were histologically evaluated working from the following 7 parameters determined in light of latest anatomical and pathological insight on the prostate: "Dorsal venous complex (DVC)", "Striated muscle (Rhabdosphincter)", "Periprostatic fascial tissue (PPFT)", "Neurovascular bundle(NVB)", "Bladder neck smooth muscle", "Surgical margins" and "Capsular incision". The slices were evaluated based on

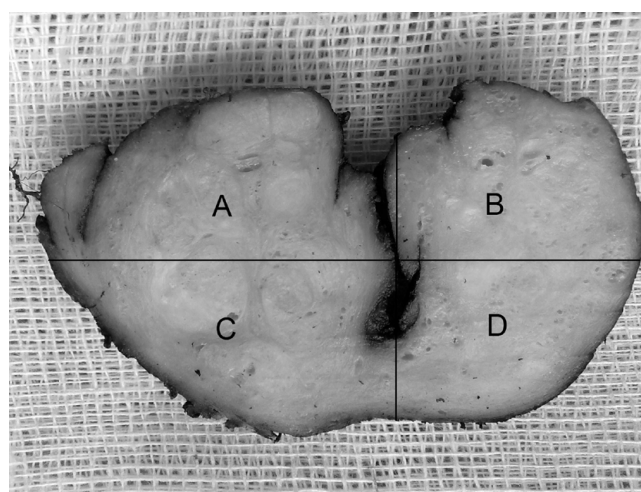


Figure 1. A,B,C,D quadrants on a slice. 1A means; Apex slice quadrant A, e.g.

parameters drawn from the anatomical structure of the section of the prostate from which they were dissected (Table 1). The structure consisting of multiple medium sized veins within the adipose and ligament tissue and apart from the main prostate tissue was deemed the DVC. The list of parameters were applied to each of the quadrants and assigned a value of histologically "existent" or "nonexistent". The histological evaluation was carried out by a single pathologist.

Table 1. Evaluated parameters for each slices

Slice 1 (Apex)	*Striated muscle *DVC (Dorsal venous complex) *Surgical margin
Slice 2 Slice 3 (Mid Prostate)	*PPFT (Periprostatic fascial tissue) *NVB (Neurovascular bundle) *Surgical margin *Capsular incision
Slice 4 (Bladder neck)	*Smooth muscle *Surgical margin

Results

The average age of the 41 patients who underwent RPP was $63,3 \pm 6,8$ years, and their average preoperational PSA values were 7,9ng/ml. Gleason1, Gleason2 and Gleason3 Score averages were respectively $3,2 \pm 0,4(3-4)$, $3,4 \pm 0,5(3-4)$ and $6,7 \pm 0,6(6-7)$. Clinical stage T1c (%73,2), and pathological stage T2c (%51,2) were predominant.

Dorsal venous complex

No medium sized or large veins were observed within the quadrants of apex slices.

Striated muscle (Rhabdosphincter)

Muscle striation was observed in apex slices dissected from 39 (95,1%) of the patients. Striated muscles were predominantly observed in quadrants A and B rather than within the posterior quadrants (Table 2).

Periprostatic fascial tissue (PPFT)

PPFT was observed in slices 2 and 3 dissected from 36 (87,8%) of the patients. PPFT was predominantly observed in quadrants C and D rather than within the anterior quadrants (Table 3).

Neurovascular bundle (NVB)

Table 2. Occurrence of striated muscle within slice 1 (Apex) quadrants.

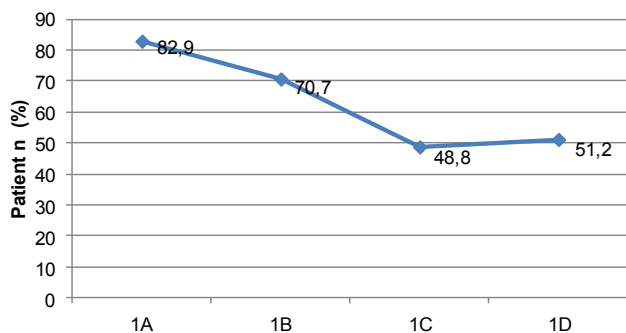
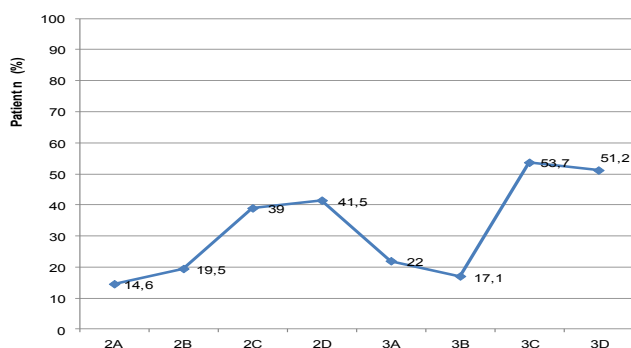
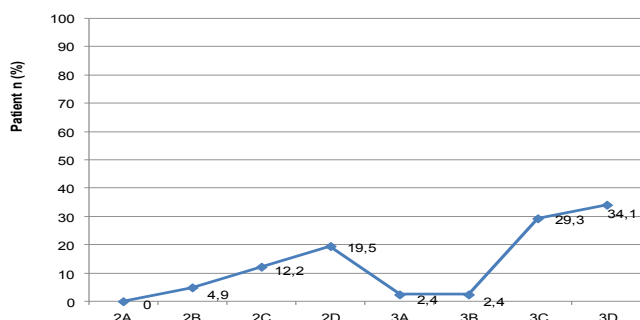


Table 3. Occurrence of PPFT (Periprostatic fascial tissue) within quadrants of slices 2 and 3.



NVB was observed in slices 2 and 3 dissected from 23 (57%) of the patients. NVB was observed predominantly in the posterior quadrants of slice 3 (Table 4).

Table 4. Occurrence of NVB (Neurovascular bundle) within quadrants of slices 2 and 3.



Bladder neck smooth muscle

Bladder neck smooth muscle tendons were observed in slice 4 of all specimens.

Surgical margin

Positive surgical margins were observed with 5 (12.1%) of the 41 patients. Positive surgical margins were observed for 3 patients in apex slice, for 1 patient in slices 2 and 3, and again for 1 patient in slice 4 (Table 5).

Capsular incision

Capsular incision was observed in slices 2 and 3 dissected from 15 (36,5%) of the patients (Table 6).

Discussion

The retropubic approach is still the most common approach

Table 5. Occurrence of positive surgical margins within quadrants of slices 2 and 3.

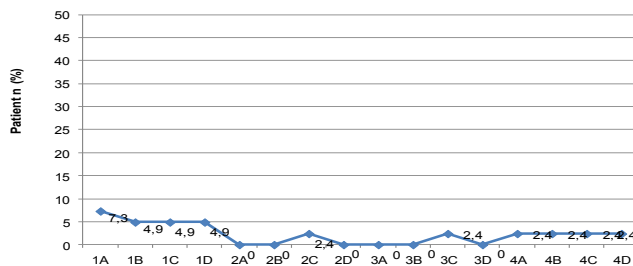
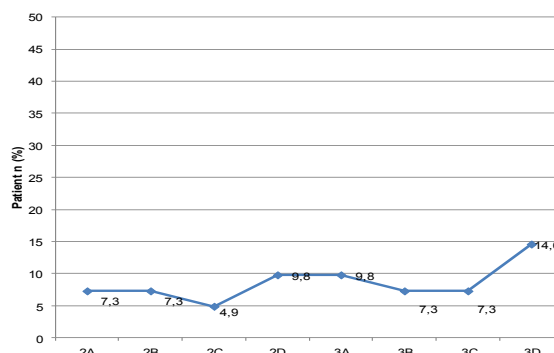


Table 6. Occurrence of capsular incision within quadrants of slices 2 and 3.



when employing radical prostatectomy, yet with a rising interest in minimally invasive surgery urologists are revisiting and reevaluating RPP. The desire today is to guarantee positive outcomes following radical prostatectomy surgeries, not only oncologically but also functionally. The lack of concrete improvement in postoperative outcomes is now an issue questioned by patients as well. Examining the specimen we've acquired we're able to distinguish traces of surgical errors and/or signs of surgical prowess which impact the functional and oncological outcomes of radical prostatectomy surgeries. In this respect our study sheds light on surgical techniques. A study by Martis et al. [9] comparing 100 RPP patients to 100 RRP patients revealed that those who underwent perineal prostatectomy were at an advantage in terms of length of hospital stay, transurethral catheterization period and intraoperative hemorrhage. No major differences were found in terms of surgical margin and continence but the perineal group was again found to be statistically better off when it came to the return of erectile functions. These differences in outcome stem from the different anatomical dissection methods employed with the two techniques. Intrafascial nerve sparing dissection presents much less risk with RPP as opposed to RRP. What counts most here is sparing the nerve whilst avoiding surgical margin positivity. Our study shows that RPP allows surgery with no impact on DVC. Thanks to this hemorrhage and venous thromboembolism is expected to be less with perineal prostatectomy. Also, as it allows to avoid contact with the pubovesical complex this approach is also preferable in terms of functional outcome [6,7]. Our study of slices dissected from the prostate showed a concentration of vascular nerve conduits particularly in posterior quadrants. One should keep in mind that when surgeons opt to go with the retropubic approach due to the patient being in a later stage and general technical difficulties they will be less likely to employ nerve sparing dissection. A cadaver study by Troy et al. [10] placed the pelvic plexus 5-10mm lateral to the prostate

and the NVB posterolateral to the prostate. Another study by Graefen et al. [11] showed that potency and continence was better spared with patients who underwent nerve sparing radical prostatectomy and that if implemented with care the nerve sparing technique was favorable in terms of cancer control. A study by Kubler et al. [12] on 265 patients who underwent RPP showed that use of the nerve sparing technique along with the age of the patient were important factors influencing the return of continence. A study by Van der Poel et al. [13] found that sparing of prostate lateral fascia coupled with the age of the patient were important predictors in foreseeing postoperative erectile functions, and no link was found between fascia sparing and positive surgical margins. Patients whose lateral fascias were better spared were found to have better erectile functions. Another paper by Van der Poel et al. [14] reveals that those patients whose lateral fascia are spared experience a quicker return of continence and that fascia sparing has a generally positive impact on continence. Another study conducted in our clinic showed a continence rate of 95,3% within the first year following RPP operations [15]. In a study through which they compared extrafascial and interfascial nerve sparing techniques in robot assisted laparoscopic prostatectomy Shikanov et al. [16] found no significant difference in terms of positive surgical margins, but potency and sexual functions were found to be statistically better for interfascial nerve sparing. Surgical margin positivity rates for robotic radical prostatectomy batches was recorded as 20,9% of which 54% was in the posterolateral region, 26% in the apex, and 20% in the basis. Surgical margin positivity appears to remain an issue with intrafascial antegrade techniques [16,17]. Even though surgical margin positivity occurs less with intrafascial techniques, our study along with other literature showed that surgical margin positivity occurred less frequently in specimens dissected via the perineal approach as opposed to those dissected via the retropubic approach [18]. Nargund et al. [19] also defined RPP as an economical technique in prostate cancer surgery and emphasized that it isn't yet time to abandon this technique. Another anatomical advantage perineal prostatectomy offers is the ability to dissect the apex under direct view. Through this study we've found that even if it involves intrafascial dissection, since it allows dissection of the apex and lateral under direct view, perineal prostatectomy actually involves less risk in terms of surgical margin positivity than current literature would suggest.

Muscle striation was found in 95,1% of the apex segments. The presence of such striated muscle may reveal the damage inflicted on the rhabdosphincter. On the other hand another study conducted by our clinic found that patients who underwent RPP exhibited a 1 years continence recovery rate of 95,3%. The relevance of these findings to rhabdosphincter damages is worthy of consideration. The study revealed the presence of smooth muscle tendons in the bladder neck quadrants of slice number 4 for all patients. This could mean that the cleavage plane between the bladder and the prostate is more complicated than previously assumed.

Conclusion

This study shows that the RPP technique allows for the anatomical dissection of the prostate in line with oncological prin-

ciples and sparing surrounding fascial tissue, vascular and nerve conduit. The presence of capsular incision with 36,5% of the patients could be interpreted as an unavoidable consequence of intrafascial dissection, yet that the rate of capsular incision isn't matched by a similar rate of positive surgical margins is noteworthy. We believe that comprehensive, prospective, and randomized studies based on the anatomohistological findings of this study could bring about seminal insight into both the anatomy of the prostate, and oncological and functional outcomes of prostate surgery.

Competing interests

The authors declare that they have no competing interests.

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