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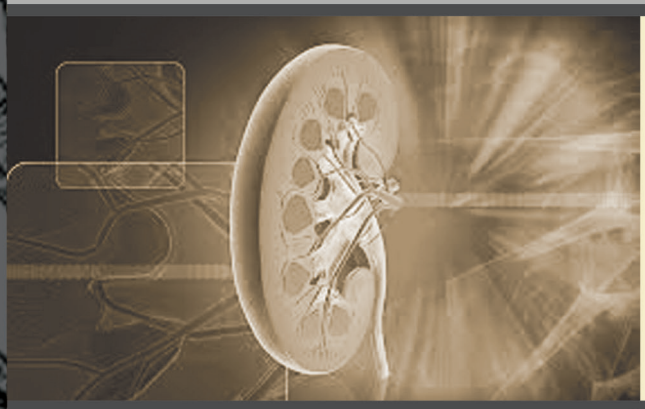

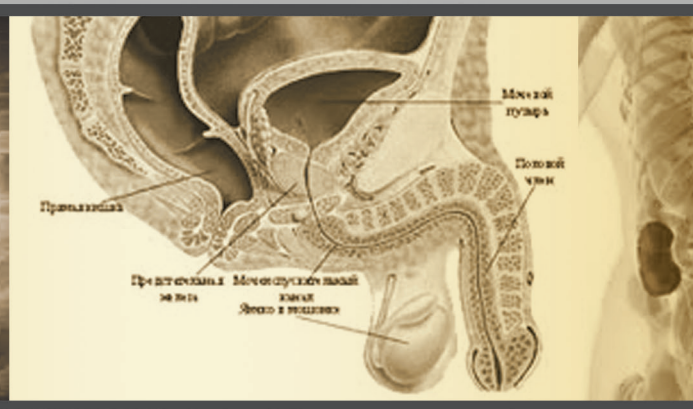

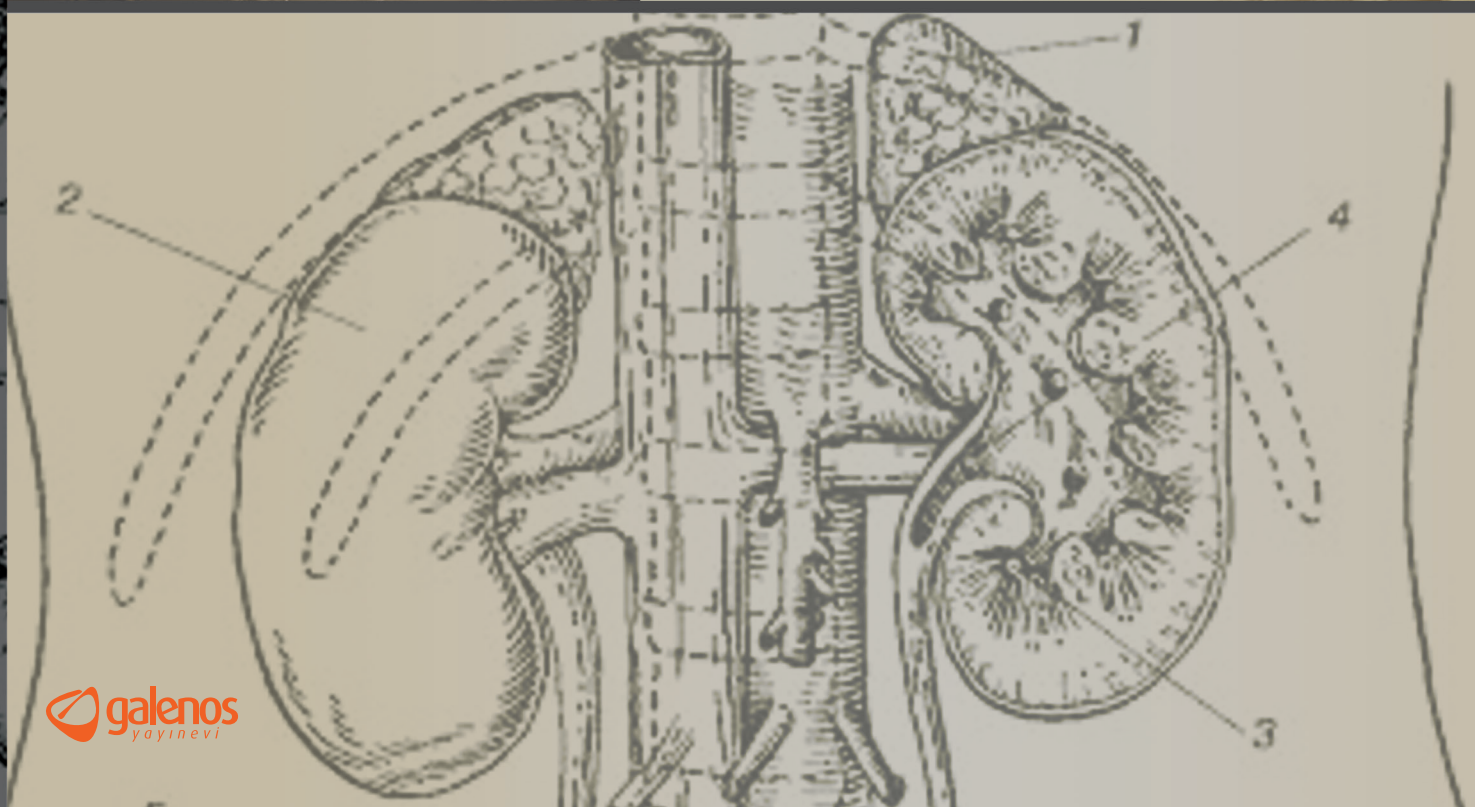

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REVIEW

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Does Prior Laparoscopic and Open Surgery Experience Have Any Impact on Learning Curve in Transition to Robotic Surgery?

Robotik Cerrahiye Dönüşümde Laparoskopik ve Açık Cerrahi Geçmişinin Öğrenme Eğrisi Üzerine Etkisi Var mıdır?

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ABSTRACT

It has been 15 years since the Food And Drug Administration approved the Da Vinci® robotic surgery system. Robotic applications are being used extensively in urology, particularly in radical prostatectomy. Like all high-tech products, this system also has a high cost and a steep learning curve, therefore, preventing it from becoming widespread. There are various studies on the effect of open surgery or laparoscopy experience on the learning curve of robotic surgery. Analyzing these interactions well will provide valuable information on making the training period of robotic system more efficient.

Keywords

Robotic surgery, laparoscopy, prostatectomy, learning curve

ÖZ

Da Vinci® robotik cerrahi sistemin Gıda ve İlaç Dairesi onayı almasının üzerinden 15 yıl geçti. Robotik uygulamalar, başta radikal prostatektomi olmak üzere ürolojide gittikçe artan yaygınlıkta kullanılmaya başlamıştır. Tüm ileri teknoloji ürünleri gibi bu sistemin de pahalı olmasının yanında öğrenme süresinin uzun olması, yaygınlaşmasının önündeki en önemli engellerdendir. Uygulayıcının açık cerrahi veya laparoskopi deneyiminin robotik sistemi öğrenme süresini ne şekilde etkilediğiyle ilgili farklı çalışmalar mevcuttur. Bu etkileşimin iyi analiz edilmesi, robotik sisteme ait eğitim sürecinin daha etkinleştirilmesi konusunda değerli bilgiler verecektir.

Anahtar Kelimeler

Robotik cerrahi, laparoskopi, prostatektomi, öğrenme eğrisi

Introduction

It has been more than 30 years since the first utilization of robotic technology with Puma 560 robot for obtaining a biopsy in neurosurgery in 1985 (1). During this period, robotic platforms, which were used in transurethral prostate resection and percutaneous renal entry in the beginning, could not find a distinctive place in urology practice due to being offline systems and working outside the surgeon's guidance and skills (2,3). Online robotic systems on the other hand, have the ability to mimic the surgeon's movements in real time during surgery. Since the Food And Drug Administration (FDA) approved the Zeus and Da Vinci® robotic platforms, which are controlled by a surgeon from a console, in 2000 and 2001, these systems are utilized in increasing frequency. According to a research performed in 2007, robotic radical prostatectomy (RRP) with Da Vinci®, pioneered in Vattikuti Urology Clinic, comprises 60% of all radical prostatectomies in the United States of America (4). Surely the number has increased today and it would not be wrong to assume that RRP replaced open prostatectomy.

Robotic surgery provides a 3D magnified image via a camera, therefore marking a prominent advantage. More importantly, special jointed robot arms (EndoWrist), inspired by human's wrist, allow hand motions in 7 different axes. Therefore, this enables the surgeon to perform various manipulations which are not possible in videoendoscopic surgery. Additionally, the system prevents the amplification of low amplitude movements caused by surgeon's tremor, thus eliminating one of the foremost disadvantages of laparoscopy. Costly installation and maintenance of the system, lack of tactile sense and a steeper learning curve compared to open surgery are the largest obstacles of robotic surgery, standing before its popularization.

Several years before the FDA's approval of robotic surgery applications, Clayman, Kavoussi and Schuessler took heart from the advantages of laparoscopic nephrectomy over open surgery, such as a reduced amount of blood loss, pain and reduced time of admission and they attempted laparoscopy in radical prostatectomy (5), however, the first results were rather discouraging. Working with rigid instruments in two dimensional images, prolonged surgery duration and increased perioperative complication rates have not given the impression that this method would be a viable alternative to open prostatectomy. Despite these, when Montsouris shared the oncological and functional results of 120 laparoscopic radical prostatectomy (LRP) cases in following years (2000), it is understood that the efficiency

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of this method could be increased in experienced hands, despite the prolonged surgery duration (6). In the succeeding years, this method has generated an increased interest and enthusiasm when the results of positive laparoscopic prostatectomy surgeries from different institutions arrived; but it was expressed that acceptable results could only be obtained after 80-100 cases for urologists with limited laparoscopic experience (7). Different methods have been attempted to resolve the long learning curve problem and it was stated that results obtained by open surgery can be achieved after performing 30-50 cases with practicing with training boxes and under the guidance of an experienced laparoscopist (8). Similarly, Menon et al. (9) have tried a different method and reported that an experienced open surgeon without any previous laparoscopic experience can work with robotic system to ease the steep learning curve of laparoscopy. In this study, after 40 robotic prostatectomy experiences the surgeon could achieve very good results such as an average of 256 ml blood loss, 0% transfusion rate, 17% positive surgical margins and an average surgery duration of four and a half hours which gradually declined.

Robotic system eases surgical interventions greatly compared to the laparoscopic method, thanks to its high-tech instruments. However, despite all that, its learning curve-time is considerably longer compared to open surgery. Although the learning curve does not have a standard description or measurement, it is generally accepted as the duration in which a surgeon completes a surgical intervention longer and harder than its standards because of his/her inexperience without any relationship with that particular surgeon's pre-clinic training and practical applications. The number of cases is used as a measurement rather than duration. End of the learning curve can be described as the surgeon's comfort when performing that procedure and doubtlessly learning speed and previous similar experiences of the surgeon is an aspect that affects the surgery duration as well as the procedure itself. The duration becomes pretty variable when the end of learning curve is defined as the surgeon being comfortable doing the procedure. Therefore, when providing data about learning curve, duration of surgery, amount of blood loss and surgical margin-positive rate in radical prostatectomy, the first and maybe the most frequently used surgical procedure, are used.

Widely accepted opinion point is that a surgeon, who even does not possess any laparoscopic experience, can achieve rather average surgery durations in a short time in robotic surgery. In Vattikuti Urology Institute experience, in which a structured RRP program was introduced in 2000, it took 18 cases to reach the surgery time of LRP (9). Similar results have been reported in succeeding studies. Ahlering et al. (7) reported that a surgeon who has no previous laparoscopic experience could reach 4 hours of RRP surgery time in 12 cases. Study results of wider series started to come out several years later, when the method became popular and the number of cases increased. In the first cases, operative duration for LRP and, after that, duration comparable to that for open radical prostatectomy (ORP) was achieved. Accordingly, it is possible to achieve 200 minutes of operative time after first 50 cases and then, 100 minutes after 150 cases in RRP, which is fairly acceptable (10). Minimum blood loss during surgery is a huge advantage of RRP over ORP, even in the first cases. After limited experience, 150-250 ml blood loss per case which does not require transfusion was reported. Surgical margin-positive rates in first series of RRP are pretty variable (13-45%). Although it is known that pathologic data are much variable in other methods and they are accepted as findings least related to learning time, considering the fact that the work is cancer surgery, the role of cancer control and oncological outcomes are undeniable in the validation of this new method. As much as its relationship with learning curve is little, many reports regarding the decline of surgical margin positivity come out with the increasing number of cases in the literature. In one of these, the first 100 RRP cases were separated into 3 parts each of 33 cases according to their surgery dates and it was detected that surgical margin positivity declines as 45%, 21% and 11%, from the first cases to the last, respectively (11). Badani et al. (12) also reported 7% surgical margin positivity in first 200 cases and 4% in last 200 cases in their T2 patients of over a number of 2700.

It would not be wrong to state that robotic surgery has postoperative oncologic outcomes similar to ORP in experienced hands. Oncological outcomes of series without longer follow-up results in the first years showed satisfying results in recent studies. In a study evaluating 1100 D'Amico high-risk prostate cancer patients, who underwent RRP between 2002 and 2013 at three tertiary care centers, the subjects were stratified into five novel risk groups according to regression tree analysis: very low risk [Gleason score (GS) ≤6], low risk: [prostate-specific antigen (PSA) ≤10 ng/ml; GS=7], moderate risk: (PSA ≤10 ng/ml; GS ≥8), high risk: (PSA >10 ng/ml; GS=7), and very high risk: (PSA >10 ng/ml; GS ≥8) and 10-year biochemical relapse-free survival rates in these groups were 86%, 70%, 36%, 31% and 26% ($p<0.001$), respectively. In the same period, clinical recurrence-free survival rates were 99%, 96%, 85%, 67% and 55%, respectively (13).

When we take a look at the post-RRP functional results, very high rates are observed. In their study including 500 patients who underwent RRP, Patel et al. (14) have reported continence rates of 89% and 95% at 3 and 6 months and a potency rate of 78% at the 12th month. To compare functional results with other methods is difficult due to the standardization of the cases, but it is observed that RRP provided results similar to that with ORP in many studies.

There have been many studies evaluating previous open surgery and laparoscopy experiences in order to obtain the admirable data of prostatectomy procedures performed via robotic surgery in a short time. Generally accepted idea is that a surgeon can achieve good outcomes with robotic surgery in a short time, even though he/she has no previous laparoscopy experience. However, there have been also numerous studies pointing out that a thorough laparoscopic experience curtails the learning period significantly. In a study the perioperative complications and early patient outcomes from initial 100 cases of robot-assisted laparoscopic radical prostatectomy performed by one of two surgeons, each with previous experience of more than 1000 LRP, were compared with LRP cases. Surgery time (153 min vs. 128 min) and blood loss 254 ml vs. 200 ml) were significantly higher in RRP group than in LRP group. All other parameters (catheterization time, positive surgical margins and continence rates) were reported to be similar. The authors commented that a good laparoscopy experience quells a steep learning curve of robotic surgery (15). In another quite similar study, the first 60 RRP and the last 60 LRP results of 3 surgeons with over 200 LRP experience were compared and it was reported that surgery time, blood loss volume and surgical margin positivity were significantly higher in patients who underwent robotic prostatectomy (153 mins-236 mins, 202 ml-244 ml and 12.5-31.6%, respectively). However,

potency and continence rates were similar with each other or in favor of robotic surgery (16). On the other hand, in another study in which first 50 robot-assisted laparoscopic prostatectomy (ARP) and first 50 open radical retropubic prostatectomy (ORRP) results of a surgeon without previous laparoscopy experience was evaluated, operative time and blood loss volume were found to be lower in ARP than in ORRP, meanwhile complication, surgical margin positivity, continence and potency rates were found to be similar. It was commented that open surgery results can be achieved in first 50 robotic cases (17). The argument of the authors who claim it is not possible for a surgeon with limited open surgery experience to complete the learning curve in a short period of time such as robotic 50 cases is as follows: it is possible for a surgeon with limited number of open prostatectomy experience to achieve a shorter learning period, but this period can be higher for a more experienced surgeon who aims for higher standards to reach his/her older results. In a study, which has the precise results for this comment, an author who had an experience with over 2500 open prostatectomy has stated that he could not achieve similar results before 150 robotic procedures and he could not feel that sense of comfort and confidence comparable to that with open surgery until after 250 robotic procedures (18).

When the effects of open and laparoscopic surgery experiences on the learning time of robotic surgery are assessed separately, it is difficult to claim any positive or negative effect of the presence or absence of any experience over one method. The facts that preoperative data of the cases are non-homogeneous and their personal characteristics are variable (age, hand skill and predisposition to learn, etc.) render this nearly impossible.

Meanwhile, there are well designed studies in urology literature in which the two methods are compared in the same study. In one of these, performance of 10 medical students and 10 surgical trainees and fellows who were given 3 laparoscopic and robotic training box-based tasks was compared. It was found that both groups had better performance with robotic surgery compared to that with laparoscopic surgery, but this result was more significant in medical students without previous laparoscopy experience. Therefore, it was concluded that robotic surgery may be learned easier without laparoscopy experience due to technical advantages (19). A similar study was performed with Da Vinci® simulator by inexperienced assistants, specialists without laparoscopy experience and surgeons with laparoscopy experience have participated in the study. Performance was evaluated by calculating the ratio of the sum of scores for each exercise over the number of repetitions needed to complete the exercise with at least an 80% score. Surgeons with laparoscopy experience performed more repetitions compared to the specialists without laparoscopy experience. In conclusion, the authors stated that laparoscopy experience has a negative effect in robotic surgery learning period (20).

No matter how well they are designed, results of studies performed with training boxes or simulators may differ from the real life. A good example for this fact is a recent study, in which perioperative, oncological, and functional outcomes of 355 RRP performed by 3 surgeons from the same clinic (surgeon A: experienced in open prostatectomy, surgeon B: experienced in both open surgery and laparoscopy and surgeon C: experienced only in laparoscopy) were compared. Although other data were similar, it was stated that surgeon C had the shortest surgery time by far (A: 219 mins, B: 245 mins and C 193 mins), B and C were superior to A according to postoperative 12 months continence rates (A: 61%, B: 83% and C: 85%). At the end, it was concluded that previous laparoscopic experience has positive effect on learning curve parameters of robotic surgery but it is too early to comment on the better continence outcomes (21).

Da Vinci® surgical system gives urologists a chance for a perfect minimally invasive dissection, extirpation and reconstruction in 4 hours surgery time with a short period of learning curve independently from any previous open or laparoscopic surgery experience. Its long-term oncological follow-up outcomes are similar with that of open surgery. Non-homogenous distribution of patient groups makes it harder for a comparative study of the cases with different surgical methods. Postoperative continence and potency rates show significant variability. Maybe the best description of learning and mastering robotic surgery comes from Menon (22): "Robotic radical prostatectomy, like golf, is easy to learn, but hard to master".

Ethics

Informed Consent: Consent form was filled out by all participants.

Peer-review: Internal peer-reviewed.

Authorship Contributions

Concept: Cüneyt Adayener, Tolga Okutucu, Cemil Uygur, Design: Cüneyt Adayener, Tolga Okutucu, Cemil Uygur,

Data Collection or Processing: Cüneyt Adayener, Tolga Okutucu, Cemil Uygur, Analysis or Interpretation: Cüneyt Adayener, Tolga Okutucu, Cemil Uygur, Literature Search: Cüneyt Adayener, Tolga Okutucu, Cemil Uygur, Writing: Cüneyt Adayener, Tolga Okutucu, Cemil Uygur.

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ORIGINAL RESEARCH
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Role of Transition Zone Index in the Prediction of Clinical Benign Prostatic Hyperplasia

Klinik Benign Prostat Hiperplaziyi Öngörmede Transizyon Zon İndeksinin Yeri

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What's known on the subject? and What does the study add?

Role of transition zone index in the prediction of clinical benign prostatic hyperplasia.

ABSTRACT

Objective

The objective of this study was to determine the role of the transition zone (TZ) index (TZI) in the prediction of clinical benign prostatic hyperplasia (BPH) in patients who underwent transurethral prostatectomy (TUR-P) and to analyze the correlation between the amount of resected tissue and TZ volume (TZV).

Materials and Methods

Twenty-six male clinical BPH patients with obstructive complaints and 17 male benign prostate enlargement (BPE) patients without any complaints were included in the study. Both the groups were over the age of 50. Clinical BPH patients underwent complete TUR-P. Statistical analysis was done with SPSS. Sensitivity, specificity, positive and negative predictive values of TZI-as a method of assessing clinical BPH-were measured.

Results

There was a statistically significant difference in prostate volume, uroflowmetry patterns, prostate-specific antigen (PSA), International prostate symptom score (IPSS), TZV and TZI between the two groups. There was a correlation between TZV and the amount of resected tissue ($r=0.97$; $p<0.0001$). TZI also correlated with IPSS, quality of life (QL) and maximum flow rate (MFR) ($r=0.58$, $p<0001$; $r=0.56$, $p<0.000$; $r=-0.70$, $p<0.0001$, respectively).

Conclusion

TZI >0.40 has a high level of sensitivity and specificity in the prediction of clinical BPH among patients who undergo TUR-P due to obstructive symptoms and reported as BPH. There is a strong correlation between the amount of resected tissue and TZV. TZI is a valuable tool in diagnosis, and TZV gives valuable information about the patient to the surgeon.

Keywords

Clinical benign prostatic hyperplasia, transurethral prostatectomy, tissue amount, transition zone volume, transition zone index

ÖZ

Amaç

Transüretral prostatektomi (TUR-P) yapılan hastalarda transizyon zon indeksinin (TZİ) klinik benign prostat hiperplazisini (BPH) öngörmedeki rolünü ve rezeke edilen doku miktarı ile transizyon zon volümü (TZV) arasındaki korelasyonu araştırmaktır.

Gereç ve Yöntem

Obstrüktif yakınması olan 26 klinik BPH'lı ve yakınması olmayan benign prostatik büyümesi (BPE) olan 17 erkek hasta çalışmaya alındı. Her iki grup 50 yaş üzerindeydi. Klinik BPH'lı hastalara komplet TUR-P yapıldı. SPSS ile istatistiki çalışma yapıldı. Klinik BPH tanısı öngörmede TZİ için duyarlılık, özgüllük, pozitif öngörü değeri ve negatif öngörü değerleri ölçüldü.

Bulgular

Prostat volümü, üroflowmetri paternleri, prostat spesifik antijen (PSA), Uluslararası prostat semptom skoru (IPSS), TZV, TZİ iki grup arasında istatistiki olarak farklıydı. TZV ile rezeke edilen doku miktarı arasında korelasyon vardı ($r=0,97$, $p<0,0001$). TZİ ile IPSS, yaşam kalitesi (QL) ve maksimal akım hızı (MFR) arasında korelasyon tespit edildi (sırasıyla; $r=0,58$, $p<0001$; $r=0,56$, $p<0,000$; $r=-0,70$, $p<0,0001$).

Sonuç

Obstrüktif yakınması nedeniyle TUR-P yapılan ve patolojisi BPH olarak rapor edilen hasta grubunda klinik BPH'yı öngörmede TZİ'nin 0,40 üstündeki değerlerinin duyarlılığı ve özgüllüğü oldukça yüksektir. Rezeke edilen doku ile TZV arasında yüksek korelasyon vardır. TZİ tanı koymada ve TZV ise hasta hakkında cerraha değerli bilgiler sunmaktadır.

Anahtar Kelimeler

Klinik benign prostat hiperplazisi, transüretral prostatektomi, doku miktarı, transizyonel zon volümü, transizyonel zon indeksi

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Introduction

Benign prostatic obstruction (BPO) or benign prostatic hyperplasia (BPH), which is more commonly used, is one of the factors that lead to lower urinary tract symptoms (LUTS) in elderly men (1). BPH primarily develops in the transition zone (TZ) (2). TZ volume (TZV) differs between patients with and without BPH (3). An increase in TZV is paralleled by age (4,5). The tissue resected either by transurethral prostatectomy (TUR-P) or open surgery is the TZ.

The correlation between BPH and TZV and TZ index (TZI) has been examined in the literature (6,7,8).

In this study, the role of the TZI in the prediction of clinical BPH in patients who undergo TUR-P is determined and the correlation between the amount of resected tissue and TZV is analyzed.

Materials and Methods

Twenty-six male patients who applied to the urology outpatient clinic with obstructive symptoms and diagnosed with clinical BPH and 17 male patients who applied to the urology outpatient clinic and diagnosed with BPE without obstructive symptoms were enrolled in the study.

Prostate specific antigen (PSA), uroflowmetry, urea and creatinine tests were done and transrectal ultrasonography (TRUS) and abdominal ultrasonography (USG) were performed. Patients with the following manifestations were excluded: malignancy, neurogenic bladder, systemic neurological disease, post void residual urine (PVR) over 350 ml, urethral stenosis, pelvic radiation, previous prostatic surgery, bladder stone, and previous medical therapy due to infravesical obstruction symptoms.

The enrollment criteria were as follows: obstructive symptoms, International Prostate Symptom Score (IPSS) 13 and above, quality of life (QL) score 3 and above, maximum flow rate (MFR) 10 ml/sec and below, prostate weight 15 gram and above, voiding volume in uroflowmetry 150 ml and above, and age 50 and above. This group of patients was deemed as clinical BPH group.

Patients over the age of 50, without obstructive symptoms, with IPSS and QL scores of 12 and below and 2 and below, respectively, were deemed as the control group. Informed consent was taken from all patients.

Patients with a voiding volume of 150 ml and above were subjected to uroflowmetry analysis twice. Uroflowmetry was made using a Dantec Menuet 3.1 water cystometry device. MFRs were recorded.

Abdominal USG was performed to examine the upper urinary system and to determine PVR.

Zonal distribution of prostatic hyperplasia was evaluated using TRUS. Prostate volume and TZV were measured. Measurements were made using Siemens Sonoline SL-1 device and Siemens Endo-P5/7.5 MHZ multiplanar transrectal transducer. Prostate was scanned in transaxial and longitudinal planes and measured.

Prostate volume and TZV were automatically calculated by the ellipsoid formula (π/6 x width x length x depth). The ratio of TZV to the total prostate volume was calculated. This is the TZI. TZV was multiplied by coefficient 1 to calculate the weight. (9).

The same physician evaluated all the patients (MG, M.D.). TUR-P procedure was performed in all clinical BPH patients by the same surgeon (ZK, M.D.).

SPPS was used for statistical analysis. Distribution of data was evaluated. Patient data were presented as an arithmetic mean + 1 standard deviation. Correlation analysis was made. The Mann-Whitney U test was used for the data that follow nonparametric distribution, and Student's t-test was used for the data that follow parametric distribution.

Sensitivity, specificity, positive and negative predictive values (PPV) (NPV) of TZI-as a method of assessing clinical BPH-were measured and coherence analysis was made. Kappa statistics was used for coherence.

Results

Clinical BPH patients with obstructive symptoms were classified as group A and BPE patients without any symptoms were classified as group B. The mean age difference between the two groups was not statistically significant. However, MFR, prostate volume, PSA, TZV and TZI were different in two groups and the difference was statistically significant.

The breakdown of the tested parameters in both groups is in given Table 1.

Patients with a PSA level between 4 and 10 ng/ml were evaluated by PSA-density and age-adjusted PSA. TRUS-guided biopsy was performed. Patients with malignancy were excluded.

Correlation among the parameters tested is given in Table 2.

Correlation between the amount of resected tissue and TZ calculated before the surgery are given in Table 3. The highest correlation is reported in TZV.

Cut-off values and accuracy rates for TZI are given in Table 4.

The mean TZV in patients who underwent TUR-P was 28.62 cc (minimum 6, maximum 86), and the mean resected tissue amount was 26.27 gr (minimum 8, maximum 75). There was a strong correlation between these two parameters. ($r=0.97$, $p<0.0001$; Pearson correlation). The weight of the tissue was calculated in grams by multiplying TZV by coefficient 1.

Discussion

TZ is the primary zone for BPH (2). TZV and TZI are parameters directly correlated with BPH. These parameters give information on the clinical status of BPH.

The size, weight and shape of the prostate always keep the attention of urologists. The size of the prostate is generally measured to decide for the method of surgery. Prostate size is important to plan the surgery, to envisage the length of the procedure, to know the amount of tissue to be resected, and to schedule the surgery (10). Today, thanks to TRUS, the prostate can be examined in details (9). Although the central and peripheral glands cannot be differentiated clearly in young patients in sonography, it is easily recognizable when BPH is developed (11,12). TZ is mildly hypo-echoic in sonography. Its border with peripheral zone can be easily recognized (13,14).

Table 1. Mean parameters and statistical significance as per the groups

		Clinical BPH	BPE	p
Age		66.0±7.9 (50-81)	60.5±7.43 (50-75)	Ns[a]
IPSS		20.2±7.0 (13-35)	4.9±4.1 (0-13)	<0.00001[b]
QL		3.7±0.9 (3-6)	1.1±0.8 (0-3)	<0.00001[b]
MFR (ml/sn)		8.6±1.6 (3-10)	21.8±6.6 (14-38)	<0.00001[b]
PSA (ng/ml)		3.43±3.23 (0.1-10)	1.38±0.83 (0.3-4)	<0.01[b]
Prostate volume	Abdominal USG (cc)	58.8±28.4 (10-126)[c]	36.1±18.5 (11-77)[d]	<0.005[b]
	TRUS (cc)	49.5±28.0 (15-161)[c]	29.1±10.3 (15-48)[d]	<0.001[b]
TZV (cc)		28.62±24.1 (6-86)	9.9±4.9 (3-32)	<0.00001[b]
TZI		0.6±0.1	0.3±0.1	<0.00001[b]
Tissue amount (cc)		26.27 (8-75)		

[a]No statistical significance, [b]Mann-Whitney U, [c, d]No statistical difference between the volumes, BPH: Benign prostatic hyperplasia, BPE: Benign prostate enlargement, IPSS: International Prostate Symptom Score, QL: Quality of life, MFR: Maximum flow rate, PSA: Prostate-specific antigen, USG: Ultrasonography, TZV: Transition zone volume, TZI: Transition zone index, TRUS: Transrectal ultrasonography

Table 2. Correlation between the tested parameters and transition zone index and transition zone volume (Pearson method)

	IPSS	QL	MFR	Abdominal USG	TRUS	TZV-TZI
TZV						
r	0.22	0.30	-0.46	0.78	0.96	0.72
p	0.11	0.03	0.001	0.0001	0.0001	0.0001
TZI						
r	0.58	0.56	-0.70	0.54	0.56	0.72
p	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001

IPSS: International Prostate Symptom score, QL: Quality of life, MFR: Maximum flow rate, USG: Ultrasonography, TRUS: Transrectal ultrasonography, TZV: Transition zone volume, TZI: Transition zone index

Table 3. Correlation between the tissue amount and other parameters (Pearson method)

	Abdominal USG	TRUS	TZV	TZI
Tissue amount				
r	0.73	0.95	0.97	0.55
p	0.001	0.0001	0.0001	0.002

USG: Ultrasonography, TRUS: Transrectal ultrasonography, TZV: Transition zone volume, TZI: Transition zone index

Intraprostatic structure is clearly explored by TRUS. Along with this development, now the focus is on TZ, which is the primary zone for BPH. Greene demonstrated that TZV was larger in patients with BPH (3). Collins classified (4) TZV based on age groups and demonstrated that prostate volume, TZV and TZI show a parallel increase with aging. TZI is 0.36 when the patient is 20 years old. However, it is 0.60 when the patient is over the age of 50. A similar increase was also revealed by Liu (5).

TZV and TZI have been used in many studies. For instance, in one study, TZV was used to evaluate the outcomes of the medical therapy (15,8). Follow-up of patients given finasteride or dutasteride therapy was based on the changes to be observed in the levels of TZV and MFR. The possibility of responding to therapy was 38% in patients with a TZI below 0.51, whereas it was 100% in patients with a TZI above 0.51. It is concluded in this study that follow-up based on TZV in patients receiving finasteride treatment is accurate (15).

Table 4. Accuracy rates for transition zone index based on various cut-offs

TZI	Sensitivity	Specificity	PPV	NPV	Coherence (Kappa analysis)
	%	%	%	%	%
0.25	0	31	0	70	24 (48)
0.30	0	25	0	64	22 (6)
0.35	0	19	0	47	16 (2)
0.40	97	91	97	64	86 (70)
0.45	91	87	94	82	90 (80)
0.50	100	68	76	100	84 (68)
0.55	100	56	61	100	74 (2)
0.60	100	54	58	100	72 (45)

TZI: Transition zone index, PPV: Positive predictive values NPV: Negative predictive values

It is demonstrated that TZI accurately predicts acute urinary retention in BPH patients, and that it might be helpful to decide for medical therapy or surgery (16,17), and that it has a PPV for the progression and severity of the disease (18), and that it predicts the necessity of TUR-P procedure (19). It is confirmed that TZI and TZV predict the efficiency of TUR-P procedure pre-operatively (7), and that more than 60% of the TZV should be resected to benefit from TUR-P (20).

A recent study confirmed that MFR improvement is much better with combined medical therapy in BPH patients with a TZI of over 0.50. Multivariate analysis demonstrates that TZI is the strongest independent factor predicting the increase in MFR (21).

In our study, the mean TZV was 28.62 mL and the weight of the resected tissue was 26.27 g. There is a strong correlation between these two parameters (r=0.97, p<0.0001). The difference in between was only 2.35 (10%). Tissue loss during resection was the cause of this difference (22).

Another study using TZV as a method of assessment indicated a correlation between TUR-P and the amount of resected tissue (23). A study comparing TUR-P and open prostatectomy demonstrated a correlation between TZV and tissue amount. In this study, 120 patients underwent TUR-P. The mean TZV and the mean removed tissue weight were found to be 25.43 mL and 22.9 g, respectively. The difference between TZV and resected tissue weight was only 2.53 (11%) (24). Another study confirms that TUR-P is strongly correlated with TZV and TZI, although the same study indicates that prostate volume is ineffective in the prediction of efficiency of TUR-P procedure (7). All the studies listed above underline the correlation between TZV and weight of the resected tissue. Our study confirms a strong correlation in between as well (Table 3).

Kaplan et al. (6) did one of the first studies exploring the role of TZV and TZI in the diagnosis of BPH. This study was focused on American Urological Association symptom score index, prostate and TZV measurements by TRUS and urodynamic analysis. The authors concluded that there was a strong correlation with TZI, if the cut-off value for TZI was 0.50. Our study revealed a similar result for TZI. There is one more recent study on the same subject. In this study, it is reported that TZI ≥0.50 has a strong correlation with MFR improvement (21).

The reliability and relevance of TZI, which is calculated by dividing TZV by total prostate volume, draws great interest among the scientific circles. The rationale behind is as follows: TZ is enlarged macroscopically and creates a static mass, which causes obstruction leading to symptomatic BPH.

In our study, the correlation coefficient between MFR and TZI was higher than TZV (r=-0.70; r=-0.46, respectively). The correlation of TZI with IPSS, QL, MFR was much stronger than the correlation between TZV and the parameters in question. This is an indication that TZI has a stronger predictive role when compared to TZV (Table 2).

There was no significant correlation between IPSS and TZV, whereas IPSS correlated with TZI (r=0.58, p<0.0001). There was a similar correlation between QL and TZV and TZI. In other words, the increased volume, per se, does not cause symptoms. Increased TZV in total volume (TZI) leads to the formation of symptoms.

Our study revealed there was statistically significant difference in TZI between clinical BHP group and control group. According to our results, the cut-off value for TZI is 0.40 or 0.45, 0.40 has the highest sensitivity and specificity, whereas, 0.45 has the highest coherence, and Kappa analysis is almost perfect. If 0.50, 0.55 and 0.60 are taken as the cut-off values for TZI, the NPV and sensitivity increase up to 100%, however, specificity decreases. Specificity reaches its peak value, when TZI is 0.40 and 0.45. When the cut-off value is 0.40, 3% of patients are left undiagnosed and 10% of patients are misdiagnosed (Table 4). Another study revealed that patients responded to medical therapy 100% when the cut-off value for TZI was over 0.51 (15). Yet another study reported a strong correlation when the cut-off value for TZI was 0.50 (6). The same cut-off for TZI, 0.50, was also confirmed in the most recent study (21). Our cut-off values 0.40 and 0.45 are in line with the above-cited studies.

A cut-off value of 0.40 for TZI has high sensitivity and specificity. TZI with a cut-off value of 0.40 and above is a reliable factor predicting clinical BPH.

There is a strong correlation between resected tissue and TZV. This parameter gives valuable information to the surgeon. It helps not only to predict the length of TUR procedure to schedule surgeries, but also to plan the surgery in patients with high volumes.

Correct diagnosis with a single examination is the ultimate goal of every physician. It is the optimum goal in terms of cost and patient compliance. Efforts will continue to reach this goal. In a recent study, it has been demonstrated that there was a correlation between BHP and resistive indices of prostate and urethral blood flows. The authors concluded that resistive index of prostate blood flow might be used for diagnostic purpose (25). In the same study the rate of diagnosis was reported to be 97% with this single examination.

Radiological examination of TZ, being the primary zone for BPH, which leads to lower urinary tracts symptoms, gives valuable information. Findings following a detailed examination of TZ will help to have a better clinical prediction. We believe that studies with larger series of patients including control group comprised of controls under the age of 50 will highlight the real predictive value of TZI and/or TZV.

Study Limitations

Our study has some limitations to be pointed out; namely, the small patient population and the age of the patients in the control group.

Conclusion

TZI predicts clinical BPH with high sensitivity and specificity in patients with obstructive symptoms who underwent TUR-P and reported as BPH. The strong correlation between TZV and resected tissue gives the surgeon valuable information about the patient before the surgery.

Ethics

The study were approved by the Yüksek İhtisas Training and Research Hospital of Local Ethics Committee (2011-KAEK-25 2016/15-14), Informed Consent: Consent form was filled out by all participants.

Peer-review: Internal peer-reviewed.

Authorship Contributions

Concept: Muhammet Güzelsoy, Ziya Kirkali, Design: Muhammet Güzelsoy, Ziya Kirkali, Data Collection or Processing: Muhammet Güzelsoy, Analysis or Interpretation: Muhammet Güzelsoy, Ziya Kirkali, Literature Research: Muhammet Güzelsoy, Writing: Muhammet Güzelsoy, Ziya Kirkali.

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Abdominal or Transrectal Ultrasonographic Prostate Volume and Cystoscopic Prostatic Urethral Length Measurements to Determine the Surgical Technique for Prostatectomy in Patients with Benign Prostate Hyperplasia

Benign Prostat Hiperplazisi Hastalarında, Prostatektomi için Cerrahi Tekniği Belirlemede, Abdominal veya Transrektal Ultrasonografik Prostat Hacmi ve Sistoskopik Prostatik Üretral Uzunluk Ölçümleri

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What's known on the subject? and What does the study add?

The prostate volume (PV) is the most important parameter while taking a decision about surgical technique in case of needed. The aim of this work is to determine the most accurate technique about PV between 3 techniques that we used. If succeded this, it can be gave more information about surgical technique and hospitalization process to the patients, and also the preparation of the operation room to the operation team.

ABSTRACT

Objective

We aimed to determine the most suitable technique for prostate volume (PV) measurement to decide for the most appropriate surgical approach - endoscopic or open - by establishing the relationship between imaging techniques and the resected tissue weight (RTW).

Materials and Methods

Sixty men aged 49-95 years with lower urinary tract symptoms, who were scheduled for transurethral resection, were enrolled. The relationship of RTW with PV determined by preoperative abdominal ultrasonography as well as transrectal ultrasonography (TRUS) performed at the table just before surgery, and prostatic urethral length (PUL) measured at the time of cystoscopy was analyzed. Two groups were established with respect to PV, (less than or equal to 75 cc and greater than 75 cc, respectively), and according to PUL (less than or equal to 2.5 cm and longer than 2.5 cm, respectively). Statistical analyses were performed between the groups to identify the best correlation between resected tissue weight and pre-surgical volume determination methods.

Results

The strongest correlation between RTW and prostatic volume measurements was established for the TRUS measurements (r=0.79; p<0.001). The coefficients of the abdominal and transrectal ultrasonographic volume and PUL were 0.127, 0.287 and 0.219, respectively.

ÖZ

Amaç

Biz bu çalışmada, prostatektomi açısından en uygun cerrahi yaklaşıma -endoskopik veya açık- karar vermek için, görüntüleme teknikleri ve rezeke edilen doku ağırlığı arasındaki ilişkiyi kullanarak, prostat hacim ölçümleri için en uygun tekniği belirlemeyi amaçladık.

Gereç ve Yöntem

Transüretral rezeksiyon planlanan, alt üriner sistem yakınmaları bulunan, 49-95 yaşlarında 60 hasta çalışmamıza dahil edildi. Rezeke edilen doku ağırlığı, abdomimal ve cerrahi öncesi masada ölçülen transrektal ultrasonografi (TRUS) prostat boyutları ve sistoskopi esnasında ölçülen prostatik üretral uzunluk arasındaki ilişki incelendi. Prostat hacimleri açısından, 75 cc'den küçük eşit ve büyük ve de prostatik uzunluk ölçümlerine gore de 2,5 cm'den kısa ve uzun olmak üzere 2 grup oluşturuldu. Bu iki grup arasında, rezeke edilen doku ağırlığı ve cerrahi öncesi hacim ölçüm yöntemleri arasında en iyi ilişki belirlemek için istatistiksel analiz yapıldı.

Bulgular

Rezeke edilen doku ağırlığı ile prostatik hacim ölçümleri arasındaki en güçlü ilişki TRUS ölçümleri ile olanla saptandı (r=0,79; p<0,001). Abdominal ve TRUS prostat hacimleri ve prostatik üretra uzunluk katsayıları, sırasıyla, 0,127, 0,287 ve 0,219 idi.

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ABSTRACT

Conclusion

Determination of PV by TRUS was found to be more accurate than abdominal ultrasonographic and cystoscopic measurements. Therefore, TRUS measurement of volume on the table at the time of surgery appears to be more suitable than other methods for the selection of the most suitable surgical technique especially in case of pre-operative difficulty for deciding the most appropriate surgical approach.

Keywords

Prostatectomy technique, transrectal ultrasonography, prostate volume, prostatic urethral length

ÖZ

Sonuç

Prostat volümlerinin TRUS ölçümleri, abdominal ultrasonik ve sistoskopik ölçümlerden, gerçek boyutlara daha yakın olarak saptadığı anlaşıldı. Dolayısıyla, cerrahinin hemen öncesinde masada bakılan, prostat hacminin TRUS ölçümlerinin belirlenmesi, diğer yöntemlere göre, özellikle en uygun cerrahi yaklaşımın belirlenmesi güç olgularda, cerrahi yöntem kararının verilmesinde daha uygun bir yol gibi görünmektedir.

Anahtar Kelimeler

Prostatektomi tekniği, transrektal ultrasonografi, prostat hacmi, prostatik üretral uzunluk

Introduction

Benign prostatic hyperplasia (BPH) is a chronic complex disease that is commonly associated with lower urinary tract symptoms (LUTS). Although benign, BPH often negatively affects health and quality of life (QoL). About 30% of patients suffering from LUTS require surgery either because of insufficient palliative treatment with medication and/or disease progression (1). BPH is present in up to 50% of men over 60 years of age and nearly 88% of those 80 and older (2). Treatment options for BPH have expanded dramatically over the past two decades with the development of new strategies, including medical and minimally invasive treatments. However, surgical management of BPH, including transurethral resection of the prostate (TURP) or open prostatectomy (OP), is indicated for patients with acute urinary retention, persistent or recurrent urinary tract infections, significant hemorrhage from the prostate, bladder calculi, ongoing symptoms refractory to medical therapy and/or renal failure as a result of chronic bladder obstruction (3); in some circumstances, it is performed according to patient's preference.

The choice of surgical options is important with respect to post-operative outcomes. TURP is associated with a short hospitalization and convalescence period, but increased rates of transurethral resection (TUR) syndrome and repeat surgery. On the other hand, OP is associated with a long hospitalization and convalescence period and increased bleeding rates but decreased retreatment rates because of more complete removal of the prostate (3). One of the most important parameters in choosing the treatment option is prostate volume (PV). Although the decision depends on surgical experience, OP should be considered when the estimated prostate weight is more than 75 g (3). Therefore, pre-operative accurate PV determination is important.

We aimed to identify the most suitable technique for PV measurement in order to choose the most suitable surgical technique, TURP or OP, by establishing the relationship of pre-surgical volume determination methods and the resected tissue weight (RTW).

Materials and Methods

The study was designed as a non-randomized prospective cohort analysis. A total of 60 men aged 49-95 years with LUTS who were scheduled for TURP between September 2013 and December 2014 by one surgeon (AD) with a previous surgical experience of more than 500 TURP, were enrolled in this study. Following the Regional Ethics Committee approval, informed consent was obtained from all patients. Evaluation of patients included digital rectal examination, International Prostate Symptom Score (IPSS) and QoL assessments, urine analysis and urine culture, free and total prostate specific antigen (PSA) and free to total PSA ratio, uroflowmetry and post-voiding residual urine (PVR) determination, abdominal ultrasonography and transrectal ultrasonography (TRUS) on the table at the time of surgery, and cystoscopic evaluation for the measurement of the prostatic urethral length (PUL) and to understand if there is a urethral stricture or not before making the final decision about surgical technique. Inclusion criteria for surgical treatment were IPSS greater than 10, maximum flow rate (Qmax) less than 10 ml/sec, PVR greater than 200 cc, a history of acute urinary retention more than 2 times, a history of recurrent urinary tract infection, and active macroscopic haematuria of prostatic origin not responsive to 5 alpha-reductase treatment. The exclusion criterion was presence of a urethral stricture.

PUL between the bladder neck and verumontanum was measured by cystoscopy. When the length of the resectoscope was not enough to reach the bladder neck, OP was performed.

Success criteria for this study were defined by Qmax values and, a maximum urinary flow rate (Qmax) greater than 15 ml/sec at the post-operative 3rd month was evaluated as success.

The measurements were done in parallel. PV evaluation by preoperative abdominal ultrasonography and TRUS and PUL measurement by cystoscopy were done to determine the most accurate PV determination associated with the RTW.

We formed two groups with respect to PV according to abdominal ultrasonography and TUS measurements, which were less than or equal to 75 cc and greater than 75 cc for groups 1 and 2, respectively, and according to PUL less than or equal to 2.5 cm and longer than 2.5 cm, for groups 1 and 2, respectively; statistical analyses were performed between the groups.

Statistical Analysis

The results are presented as mean±standard deviation. Data were analyzed using SPSS-16.0 for Windows (SPSS, Inc., Chicago, IL USA). Statistical analyses of the means of continuous variables were performed with the Student's t-test. The Pearson correlation test was used for determination of the correlation between prostatic volume measurements and RTW and then, data were analyzed using step-wise linear regression models. A value of less than 0.05 was considered statistically significant.

Results

A total of 60 men with LUTS with a mean age of 68.9±9.4 years (minimum: 49; maximum: 95), who were going to be operated, were enrolled into the study. Pre-operative and post-operative IPSS, QoL scores, uroflowmetric parameters; Qmax, average flow rate (Qave), and PVR and hemoglobin levels were analyzed using paired t-tests. All differences between the groups were statistically significant ($p<0.05$) and the patients experienced

significant improvements in all measures of BPH-related signs and symptoms including IPSS, QoL, Qmax, Qave, and PVR (Table 1).

In group 1, there were 37, 38 and 31 patients, for abdominal ultrasonographic PV, transrectal ultrasonographic PV and PUL measurements, respectively. In group 2, there were 23, 22 and 29 patients, respectively (Table 2). Operation times and RTWs were significantly different between the groups ($p<0.05$) (Table 2).

The PVs, according to abdominal ultrasound and TRUS measurements were significantly different ($p<0.05$) (Table 3).

Pearson's correlation was used to determine the relationship of RTW with PV measurements by abdominal ultrasonography and TRUS and PUL by cystoscopy. All correlations were significant but the strongest correlation was established for the TRUS measurements ($r=0.79$; $p<0.001$) (Table 4).

The correlations between the prostatic measurements (which were obtained by abdominal ultrasonography, TRUS and cystoscopic PUL) and RTWs were analyzed using a linear regression stepwise method. Adjusted R square was established as 63.7%, and the ANOVA produced significant results ($p<0.001$). The coefficients of the abdominal and transrectal ultrasonographic PV and PUL were 0.127, 0.287 and 0.219, respectively. According to these statistical results, the only variable that was consistently associated with RTW was TRUS measurements ($p<0.001$) (Table 5).

The results of uroflowmetry have shown that the amount of resected tissue in each group was above the uroflowmetric success criteria (Table 6).

No serious complications, such as TUR syndrome, blood transfusion or incontinence were identified during the follow-up period.

Discussion

Despite many minimally invasive techniques for BPH management, TURP is still the standard of care for removal of tissue from the transition zone of the prostate. TURP has been performed in prostates of between 30 and 80 mL in approximately 95% of the cases (2). However, there is no strong evidence in the literature regarding the upper size limit of a prostate suitable for TURP (2,4). OP should be considered when the prostate is estimated to have a volume of more than 80 mL, as well as in some mandatory situations related to patients' co-morbidities, such as ankylosis of the hip or other orthopedic conditions preventing proper positioning for TURP, and in men with recurrent or complex urethral conditions, such as urethral stricture or previous hypospadias repair, in order to avoid urethral trauma associated with TURP (3,4).

Table 1. Pre-operative and post-operative results with regard to some parameter

Parameters	Pre-operative results	Post-operative results	p
IPSS	26.85±3.80	4.93±2.14	0.001
Quality of life	4.9±0.11	1.52±0.1	0.001
Qmax (ml/S)	4.97±0.56	22.76±0.73	0.001
Qave (ml/S)	2.25±0.16	9.38±0.33	0.001
PVR (ml)	306.161±161.24	45.67±19.15	0.001
Hb (g/dl)	13.9±1.98	12.47±1.92	0.001

IPSS: International Prostate Symptom Score, Qmax: Maximum flow rate, Qave: Average flow rate, PVR: Post-voiding residual, Hb: Hemoglobin

According to the European Association of Urology (EAU) guidelines, OP should be performed for prostates greater than 80 mL (4). The correct choice of surgical technique for prostatectomy depends on an accurate measurement of the PV. For that purpose, the features of prostatic measurement by various techniques, such as abdominal ultrasonography, TRUS, computed tomography (CT) and magnetic resonance imaging (MRI) have been studied in the literature.

The current study has shown that there is a significant difference in terms of PV between abdominal and transrectal measurements of the prostate. Our results yielded mean PVs of 67.81±33.4 and 52.61±25.06 for abdominal and transrectal measurements, respectively ($p<0.001$). The finding presented in Table 3 that abdominal ultrasonography tends to result in an over-estimation of PV compared to TRUS is in accordance with clinical experience.

In order to understand which one of these methods should be preferred in decision making for the choice of surgical technique, the correlation between RTW and PV measurement techniques were investigated. Our data showed that TRUS measurements were most closely associated with RTW (Pearson's r for TRUS=0.79, $p<0.001$; linear regression coefficient for TRUS=0.287, $p<0.001$). On the other hand, the Pearson values between abdominal US and TRUS results are quite small. According to our results, TRUS measurements of PVs were less but operation times and RTWs were greater than abdominal ultrasonographic and PUL measurements. These results indicate that TRUS PV determination may be a useful guide for the choice of surgical technique.

Although some studies in the literature and the EAU guidelines define the upper limit of the PV for TURP as 80 mL (1,4,5), according to our results, the upper limit of PV for TURP depends on the size of the resectoscope. The maximum volume of the prostate in this study was 208 mL, 150 mL and 5 cm for abdominal ultrasonography, TRUS and PUL measurements, respectively. TURP was successfully performed for a case in which a total of 51 g of prostatic tissue was resected in 100 minutes without any serious complications such as TUR syndrome or blood transfusion. There were 22 patients who had prostates greater than 75 mL according to the TRUS measurements; their mean operation time was 71.11±16.72 min and the mean RTW was 33.11±13.56 g. In this study, the results of uroflowmetric parameters in those who had prostates greater than 75 mL showed that TURP can be performed successfully in this group.

Table 2. Comparison of prostatic size measurements in terms of operation time and resected tissue weight according to group

Method	Prostatic measurements		Operation time (minimum)		Resected tissue weight (g)		
	Group 1	Group 2	Group 1	Group 2	Group 1	Group 2	p
Abdominal ultrasonography	48.7±14.1 cc	98.2±32.4 cc	48.2±10.4 n=37	65±17.0 n=23	16.3±5.39	28.6±21.8	0.001
Transrectal ultrasonography	38.0±12.6 cc	75.6±22.7 cc	52.2±13.89 n=38	71.11±16.72 n=22	17.66±5.23	33.11±13.56	0.001
Cystoscopic prostatic urethral length	2.05±0.37 cm	3.44±0.5 cm	44.76±9.8 n=31	60.79±15.6 n=29	13.95±4.35	23.37±9.08	0.001

Table 3. Comparison of abdominal and transrectal ultrasonography measurements in terms of prostatic size

Parameter	Abdominal ultrasonographic measurement	TRUS measurement	p
Prostatic size (cc)	67.81±33.4	52.61±25.06	0.001

TRUS: Transrectal ultrasonography

Table 4. The correlation between prostatic size measurements and resected tissue weight according to the measurement methods

	Pearson's	p
Abdominal ultrasonography - resected tissue weight	0.77	0.001
TRUS - Resected tissue weight	0.79	0.001
Cystoscopic prostatic urethral length - resected tissue weight	0.7	0.001

TRUS: Transrectal ultrasonography

Table 5. The correlation of the prostatic measurements with linear regression

Prostatic measurements	Coefficient of linear regression	p
Abdominal ultrasonography	0.127	0.64
Transrectal ultrasonography	0.287	0.001
Cystoscopic prostatic urethral length	0.219	0.09

Dependent variable: Resected tissue weight, adjusted R square: 63.7%, ANOVA: p<0.001

Table 6. The results of uroflowmetric parameters at the post-operative 3rd month (p<0.05)

Uroflowmetric parameters	Group 1 n=38	Group 2 n=22	p
Qmax (mL/sec)	23.08±6.45	22.22±4.11	0.58
Qave (ml/sec)	9.5±2.87	9.04±2.12	0.44
PVR (mL)	43.2±19.2	48.63±18.7	0.36

Qmax: Maximum flow rate, Qave: Average flow rate, PVR: Post-voiding residual

According to a study by Aus et al. (6), TRUS successfully estimated PV, similar to our results. In addition, the transition zone volume predicted the expected resection weight of adenomas and, to some extent, the operation time and blood loss. According to their conclusion, these calculations may be used for more accurate pre-operative planning.

Tewari et al. (7) have also recommended TRUS measurements based on the results of their study. They compared PVs between TRUS and MRI measurements and their results showed that TRUS was as accurate as MRI (8).

PV is an important parameter for guiding the management of patients with BPH and delivering clinical trial endpoints. According to our results, RTW is most closely associated with TRUS measurements. In order to avoid the discomfort of TRUS during probe insertion, it can be performed just before the surgery under anesthesia.

Study Limitations

Weaknesses of the study: The choice of RTW as the gold standard is understandable from a practical perspective, but is certainly not infallible as RTW is in large part affected by intraoperative factors including bleeding and surgeon experience. Other reference standards such as total PV as measured by CT scan, MRI, or pathological measurement following OP should be discussed.

Conclusion

TRUS measurements of PVs better correlate with RTW than those of the abdominal ultrasonographic and cystoscopic PUL. For that reason, TRUS measurements of PV are more suitable than abdominal and cystoscopic PUL measurements with respect to choosing the most suitable surgical technique.

Ethics

Ethics Committee Approval: Following the Regional Ethics Committee approval, Informed Consent: Informed consent was obtained from all patients.

Peer-review: Internal peer-reviewed.

Authorship Contributions

Concept: Aslan Demir, Design: Aslan Demir, Data Collection or Processing: Aslan Demir, Mert Ali Karadağ, Kürşat Çeçen, Analysis or Interpretation: Aslan Demir, Mert Ali Karadağ, Kürşat Çeçen, Literature Research: Aslan Demir, Writing: Aslan Demir, Levent Türkeri.

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The Importance of Preventive Physiotherapy in Patients Diagnosed with Prostate Cancer

Prostat Kanseri Tanılı Hastalarda Koruyucu Fizyoterapinin Önemi

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What's known on the subject? and What does the study add?

Only 5.8% of prostate cancer (PCa) patients invited to this study participated in preventive physiotherapy applications. The reason why the participation rate is very low, PCa patients may have not enough knowledge and awereness about physiotherapy. It is expected that awareness of patients will increase as long as physiotherapy and rehabilitation area improves in PCa.

ABSTRACT

Objective

Prostate cancer (PCa) is observed in men aged 50 years and older. The incidence increases in parallel to aging. Survival rate for PCa increases with effective screening programs and therapies. Elongated life expectancy may lead to a decrease in quality of life, muscle strength and physical activity level; an increase in fatigue and sleep problems. To preclude the occurrence of these symptoms, the preventive physiotherapy approaches may be used in PCa patients. The aim of this study was to investigate the attitude of patients with PCa towards preventative physiotherapy approaches.

Materials and Methods

Patients who were diagnosed with PCa in Gazi University Faculty of Medicine, Department of Urology were invited to participate in the preventive physiotherapy services provided in Gazi University, Faculty of Health Sciences, Department of Physiotherapy and Rehabilitation, Oncologic Rehabilitation Unit.

Results

Three hundred forty-four patients were invited, only 20 (5.8%) patients participated in the study. Twenty (5.8%) patients did not attend the appointment despite agreeing to participate in the study. Other 304 (88.4%) patients did not join the study for several reasons.

Conclusion

The reason for low participation rate may be inadequate information of PCa patients about preventive physiotherapy. The results of this study highlight the need for making preventive physiotherapy applications recognizable for PCa patients.

Keywords

Physiotherapy and rehabilitation, awareness, cancer rehabilitation

ÖZ

Amaç

Prostat kanseri (PKa) 50 yaş ve üzeri erkeklerde görülmektedir. Görülme sıklığı artan yaş ile doğru orantılı olarak artmaktadır. Uygulanan tarama programları ve tedaviler sayesinde PKa hastalarının sağkalım oranları yükselmektedir. Artan yaşam beklentileri bu hasta grubunda yaşam kalitesi, kas kuvveti ve fiziksel aktivite düzeyinde azalmaya; yorgunluk ve uyku problemlerinde artmaya neden olabilir. Bu semptomların oluşmasını önlemek amacıyla PKa hastalarında koruyucu fizyoterapi yöntemleri uygulanabilir. Bu çalışmanın amacı, PKa tanılı hastaların koruyucu fizyoterapiye olan yaklaşımlarını incelemektir.

Gereç ve Yöntem

Gazi Üniversitesi Tıp Fakültesi, Üroloji Anabilim Dalı'nda PKa tanısı alan hastalar, Sağlık Bilimleri Fakültesi Fizyoterapi ve Rehabilitasyon Anabilim Dalı Onkolojik Rehabilitasyon Ünitesi'nde uygulanan koruyucu fizyoterapi hizmetlerine katılmaları önerilerek çalışmaya davet edildi.

Bulgular

Davet edilen 344 kişiden sadece 20'si (%5,8) çalışmaya katıldı. Yirmi (%5,8) hasta çalışmaya katılmayı kabul etmesine rağmen randevusuna gelmedi. Geriye kalan 304 (%88,4) hasta çeşitli sebeplerden dolayı çalışmaya katılmadı.

Sonuç

Katılım oranının bu kadar düşük olmasının sebebi PKa hastalarının koruyucu fizyoterapi hakkında yeterli bilgiye sahip olmamaları olabilir. Bu çalışmanın sonuçları, PKa hastalarında koruyucu fizyoterapi uygulamalarının daha tanınır hale getirilmesinin gerekliliğini vurgulamıştır.

Anahtar Kelimeler

Fizyoterapi ve rehabilitasyon, farkındalık, kanser rehabilitasyonu

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Introduction

Usually seen in men over age 50, prostate cancer (PCa) is the second most commonly diagnosed type of invasive cancer in Turkey, after lung cancer (1). It metastasizes to external iliac, obturatory and internal iliac lymph nodes (2), lumbosacral vertebrae, and the pelvic bone (3). According to the Public Health Institute of Turkey Health Statistics Yearbook 2016, crude age-adjusted rate for PCa is 33.7 per 100.000. This value increases with age; and may be as much as 410.7 per 100.000 in men aged 85 and older (1). Screening programs have reduced PCa mortality and increased survival rates in developed countries (4). Five-year survival rates have reached as high as 99% because of early treatment. However, because of prolonged survival, patients now have to deal with the effects of cancer and cancer treatment (5).

PCa can be clinically classified into the following groups: localized, locally advanced, and metastatic (6). In the literature, available treatments for PCa according to stage include active surveillance, radical prostatectomy, external-beam radiation therapy, androgen deprivation therapy (ADT), brachytherapy, cryotherapy, high-intensity focused ultrasound, and chemotherapy (7). In recent studies, radiofrequency (8), immunotherapy (9) and targeted therapies (10) are also mentioned.

Problems that arise in patients with PCa include erectile dysfunction- and urinary incontinence-associated decrease in quality of life due to radical prostatectomy and radiotherapy (11). In addition, sarcopenia (12), fatigue (13), sleep problems (14), and decreased muscle mass and strength (15) due to chemotherapy and androgen deprivation therapy are also seen. Today, physiotherapy and rehabilitation methods increasing the quality of life become more important to reduce the negative effects of treatment complications (16). Moreover, because of the age at diagnosis, elderly patients with PCa may also have geriatric problems (balance and gait disorders, muscle weakness, orthostatic hypotension, increased risk for fractures, and decrease in cardiopulmonary function) along with cancer-related problems (17,18).

Preventive rehabilitation approaches reduce potential disabilities and involves patient education. Additionally, they include promotion and protection of health, treatment, and rehabilitation (19). Moreover, they promote physical and general health condition of the patient. Preventive approaches implemented before the potential disability develops are expected to reduce the severity or duration of the disability. Therapeutic exercises before early diagnosis and treatment are usually for preventive purposes (20). However, in PCa patients, it has been reported that activities focused on the prevention of potential modifiable risk factors (i.e. physical inactivity) are insufficient (21). These preventive approaches seek to balance the side effects of surgery, chemotherapy, or radiotherapy by increasing the cardiopulmonary capacity, strength and functionality (20). The aim of this study was to examine PCa patients' attitude towards preventive physiotherapy and its applications. With this aspect, this is the first study on preventive physiotherapy in patients with PCa.

Materials and Methods

Patients diagnosed with PCa in the urology outpatient clinic at Gazi University Faculty of Medicine were recommended to take part in preventive physiotherapy services held at Faculty of Health Sciences, Department of Physiotherapy and Rehabilitation, Oncologic Rehabilitation Unit between March 2014 and January 2015. The patients were invited to take part in the study either face-to-face at the outpatient clinic, or on the phone after being informed. The patients were informed by the physiotherapist and invited to take part in the preventive physiotherapy sessions on a volunteer basis.

The steps of the oncology rehabilitation follow the changes in the patient's functional status independent from cancer stage or treatment, and focus on loss of function. The patients were classified into 4 categories of treatment according to classification made by Dr. Dietz (22,23):

1. Preventive,

2. Restorative,

3. Supportive,

4. Palliative rehabilitation.

Patients without mobility and balance problems due to cancer or cancer treatment and could independently mobilize were included in the study to receive recommendations on preventive physiotherapy. Patients requiring active oncology rehabilitation and those with metastases were excluded from the study.

As a part of the preventive physiotherapy interventions, the patients were told that they would receive information on detailed physiotherapy evaluations for determining their current status, and physiotherapeutic approaches towards possible future problems. A brochure titled "Prostate Cancer and Exercise" was prepared, and the patients were informed that they would receive it. This brochure included information about the goals of physiotherapy and rehabilitation in PCa, the need for/benefits of exercise in PCa, how and why patients should start doing exercises, and which type of exercises they should be doing. Also, patients with urinary incontinence were informed that they would be taught Kegel exercises as a home treatment program.

Statistical Analysis

Number of patients and the frequency of their symptoms were presented as percentages using SPSS version 15.0.

Results

Records of 383 patients diagnosed with PCa in the urology outpatient clinic were evaluated. It was found that 33 patients had metastases, and 6 had passed away. A total of 344 patients were invited to participate in the study, but 304 (88.4%) refused participation for various reasons. The most cited reason was never having heard of the term "physiotherapy" and not knowing which interventions it includes. One hundred-eighty-eight (54.7%) patients refused to take part in the study saying that it would not solve their current problem. The leading problem was erectile dysfunction. One hundred-six (30.8%) of patients did not want to participate in to the study for not living in the same city and difficulties in transportation. Ten (2.9%) patients mentioned not having time for the study. Twenty (5.8%) patients accepted the invitation but did not come to the appointment. The

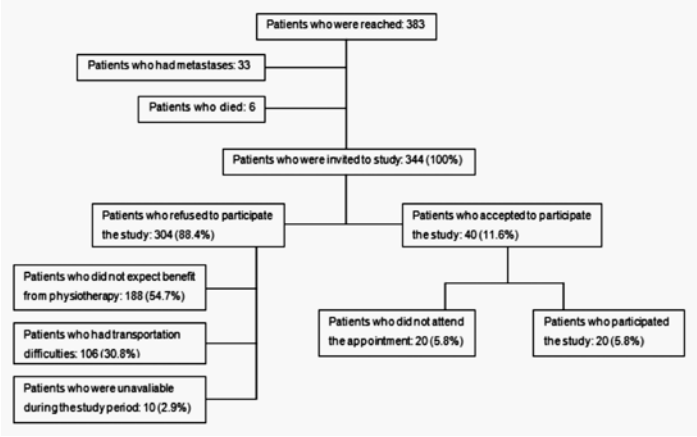

Figure 1. Number of invited patients and their percentage

study was completed with 20 (5.8%) patients (Figure 1).

The mean age of the subjects was 65.5±6.7 years, and the mean body mass index was 29.93±3.76 kg/m^2. The most reported symptoms were erectile dysfunction (85%, n=18), urinary incontinence (35%, n=7), fatigue (20%, n=4), frequent urination (15%, n=3), incomplete bladder emptying (10%, n=2), and fecal incontinence (5%, n=1).

Discussion

At the end of this study, we observed that 94.2% of the PCa patients invited to the study did not take part in the physiotherapy interventions. The fact that PCa patients heard the term "physiotherapy" for the first time when they were informed about the study and they did not have enough knowledge about the role and benefits of physiotherapy in cancer rehabilitation may explain their hesitation about taking part in the study. This has significantly reduced the rate of participation.

There have been various studies evaluating PCa awareness and knowledge on prevention of PCa in the current literature. One of two studies, both run on black people, has reported that participants' awareness of PCa was poor and the other one has reported moderate level of awareness (21,24). Apart from lack of education on PCa, it may be postulated that knowledge and information about preventive approaches are also insufficient. The fact that activities for avoiding potential modifiable risk factors (i.e. physical inactivity) are not known well enough (21) emphasizes the importance of preventive physiotherapy in PCa. Studies on physiotherapy awareness performed in Turkey have focused on students instead of patient groups (25). Therefore, awareness of patient groups about physiotherapy practices in general has not been illuminated.

Low study participation, despite the patients received information about the role of and need for physiotherapy in PCa, may be due to different expectations of patients. It is known that the most important information that PCa patients want to have include treatment options, disease stage, risks and benefits of the treatment, and side effects of treatments (26,27,28). This may be the same for patients we reached out to for this study. This study consisted of effective methods to prevent the most important function-related problems that the PCa patient group may have, however, the patients invited to the study preferred to focus on problems they had at that moment. Particularly, erectile dysfunction which has a direct effect on quality of life is a common side effect of usual PCa treatments like radical prostatectomy, external radiotherapy, and ADT (29). 54.7% of the 344 patients who were invited to the study mentioned that they did not want to participate because it would not help with erectile dysfunction. Although there are applications for the treatment of erectile dysfunction in the field of physiotherapy and rehabilitation (30), the fact that we focused on possible future problems instead of current ones in the context of preventive physiotherapy may have affected participation rate. Elderly patients, who were considered geriatric patients ignored the benefits of preventive physiotherapy and rehabilitation interventions by not accepting the invitation to participate in this study.

The results of a systematic review and meta-analysis support the hypotheses that exercise approaches improve PCa-related quality of life and fatigue, submaximal physical fitness, and lower body strength (31). Another review involving observational epidemiological studies has shown associations between physical activity and PCa risk. Moreover, it has been reported that there was an association between advanced or aggressive disease and risk of death from PCa (32). A prospective study on the other hand has shown that the risk of PCa was increased in physically inactive black men (33). Considering these causes, it becomes obvious that PCa patients should be informed about positive effects of physical activity and exercise during the course of PCa.

Globally, the literature in the field of physiotherapy and rehabilitation in PCa dates back to 1987 (34). In Turkey, however, the first study in this field was made as a master thesis in 2015 (35)." The fact that PCa patients in Turkey are informed late about interventions by physiotherapists may have caused lower knowledgeability about this subject in this patient group. As the field of physiotherapy and rehabilitation in PCa develops, we expect patient awareness to increase too.

Study Limitations

The reasons for low patient participation and patient knowledgeability about physiotherapy may be evaluated in detail with questions. However, as the study was planned, this low level of participation was not foreseen as we did not know how low patient awareness on physiotherapy was, and thus did not use a detailed measuring tool including these questions.

Conclusion

At the end of this study, the low knowledgeability of PCa patients about physiotherapy and its scope may have reduced the participation in preventive physiotherapy interventions. Additionally, we observed that PCa patients were more focused on the current situation and their current symptoms and, did not regard possible future problems as important enough. This study has shown that PCa patients should be informed more about preventive physiotherapy interventions.

Ethics

Ethics Committee Approval: This study was carried out according to Gazi University Ethics Committee's report number 77082166-604.01.02-6837, date March 11th, 2014, Informed Consent: Participants filled in an informed consent form.

Peer-review: Internal peer-reviewed.

Authorship Contributions

Concept: Kadirhan Özdemir, İlke Keser, Design: Kadirhan Özdemir, İlke Keser, Data Collection or Processing: Kadirhan Özdemir, İlke Keser, İlker Şen, Mustafa Özgür Tan, Analysis or Interpretation: Kadirhan Özdemir, Literature Research: Kadirhan Özdemir, Writing: Kadirhan Özdemir, İlke Keser.

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Effect of Temperature and Humidity on Serum Prostate Specific Antigen Levels in Asymptomatic Male Population

Asemptomatik Erkek Popülasyonunda Sıcaklık ve Nemin Serum Prostat Spesifik Antijen Düzeylerine Etkisi

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What's known on the subject? and What does the study add?

Prostate specific anigen (PSA) is still the only available proven laboratory test in clinician's hands for prostate cancer screening. However, many factors can cause a change in serum levels of PSA. This study is undertaken to determine the possible effect of climate parameters on individuals' PSA levels.

ABSTRACT

Objective

To determine the possible effect of climate parameters on prostate specific anigen (PSA) levels.

Materials and Methods

Among 2.150 males, 757 individuals participating in a general check-up service at our hospital group in the past one year were enrolled in this study. The mean age was 48.52 and all the individuals underwent PSA screening tests, abdominal ultrasonography examinations including prostatic evaluation, and urine examinations including microscopic evaluation. The data on climate parameters including daily minimum and maximum temperatures and their average values as well as daily moisture levels were obtained from the records of the Turkish State Meteorological Service, including 2 meteorological stations existed in the Anatolian part of İstanbul. First of all, the differences in climatic parameters between the two stations were analyzed. Then, the relationship of PSA levels with daily minimum, maximum and average temperatures along with moisture levels recorded by the two stations was statistically evaluated.

Results

The mean age of the subjects was 48.52 (15-90) years and the percentage of individuals in age groups below 30, 31-40, 41-50 and over 50 were 5.2%, 23.2%, 31.8%, and 39.8%, respectively. The mean prostate volume measured by ultrasonography was 30.52 ml which increased with age in compatible with the literature. The mean PSA value was 1.19 ng/ml in all age groups. PSA values were higher in older participants and in those with larger prostate volume. Only PSA and mean humidity levels were statistically different between the two stations ($p<0.05$). When all parameters of temperature and humidity were grouped according to the

ÖZ

Amaç

Prostat spesifik antijenin (PSA) prostat kanseri tanısındaki hassasiyetini arttırmak amacıyla PSA düzeylerini etkileyebilecek faktörler literatürde araştırılmaktadır. Bu çalışmada, bireylerin PSA değerleri üzerinde sıcaklık ve nem gibi iklimsel parametrelerin olası etkisi araştırılmıştır.

Gereç ve Yöntem

Son 1 yıl içinde check-up yapılan 15-90 yaş aralığındaki 757 erkek retrospektif olarak değerlendirildi. Çalışma grubuna alınan bireylerin rektal muayene, abdominal ultrasonografi, idrar analizi ve serum PSA düzeyleri tespit edildi. İklimsel veriler (nem ve sıcaklık) Devlet Meteoroloji Kurumu kayıtlarından İstanbul Anadolu yakasındaki iki farklı istasyon (Kartal-Göztepe) baz alınarak elde edildi. İklimsel verilerden günlük minimum, maksimum ve ortalama sıcaklıklar ve yine günlük nem seviyeleri hastaların yaşadıkları lokasyona göre sorgulandı, yaşadığı lokasyona yakın olan meteoroloji istasyon verilerine göre düzenlendi ve iki gruba ayrılarak not edildi. İki istasyon arasındaki iklimsel parametreler analiz edildi ve karşılaştırıldı. Yine 2 istasyonun nem düzeyleri, günlük minimum, maksimum ve ortalama sıcaklıklar ve deneklerin PSA düzeyleri arasındaki ilişki karşılaştırıldı.

Bulgular

Çalışma grubunda ortalama yaş 48,52 (15-90) bulundu. Değerler <30 yaş, 31-40, 41-50 ve >50 yaş gruplarında hasta dağılımı sırasıyla %5,2, %23,2, %31,8 ve %39,8 idi. Ortalama ultrasonografik prostat büyüklüğü 30,52 (10-185) ml saptandı. Tüm yaş grupları için ortalama PSA 1,19 ng/ml idi. İki farklı lokasyonda sıcaklık parametreleri ortalama değerleri ile PSA seviyeleri arasında anlamlı fark saptanmadı ($p>0,05$). İki istasyon arasında PSA ve ortalama nem seviyeleri arasında ise istatistiksel anlamlı

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ABSTRACT

months and seasons, it was found that there was no statistically significant difference in PSA levels between the groups (p>0.05 for all parameters). As for months and seasons, a statistically significant difference was observed between four seasons in all parameters of temperatures and humidity levels (p<0.001), but this finding was not valid for alterations in PSA levels in these seasonal intervals. No significant relationship was found between the presence of white blood cells in urine and PSA levels and seasons seemed to have no statistically significant effect on the presence of leukocytes in urine (p>0.18 and p>0.5, respectively).

Conclusion

Since any proven effect of climate on PSA will increase the sensitivity of PSA in diagnosing prostate cancer and may prevent the decision of an unnecessary biopsy, humidity with a possible influential effect on serum PSA level according to our study definitely needs clarification and confirmation. Therefore, future studies including large number of subjects with detailed data facilitating calculation of thermal sensation are needed to give clearer answers to this topic.

Keywords

Prostate specific antigen, prostate cancer, effect of climat, prostate specific antigen screning

ÖZ

fark saptandı (p<0,05). Sıcaklık ve nem düzeylerinin tüm parametreleri ay ve mevsim olarak gruplandığında, deneklerin PSA düzeylerinde istatistiki olarak anlamlı fark olmadığı görüldü (p<0,001). İdrarda lökosit varlığı ile PSA düzeyleri arasında bir ilişki görülmedi (p>0,18). Ayrıca mevsimlerin idrarda lökosit varlığı üzerinde etkisi de gösterilemedi (p>0,5).

Sonuç

PSA üzerinde farklı iklimsel parametrelerin etkisi prostat kanserinin teşhisinde PSA'nın hassasiyetini arttıracak bir bulgu olabilir. Araştırmamızda saptanan nem oranının PSA düzeylerine olası etkisi, gelecekte daha fazla sayıda denek içeren ve nemin sıcaklığa etkisi ile oluşan hissedilen sıcaklık (termal duyumsama) kavramının da ele alınacağı çalışmalarla daha net ortaya konulabilir.

Anahtar Kelimeler

Prostat spesifik antijen, prostat kanseri, iklim etkisi, prostat spesifik antijen taraması

Introduction

Prostate specific antigen (PSA) has been used for early detection of prostate cancer (PCa) with no other competitor, yet proved to be superior (1,2,3).

However, the fact that PSA is an organ-specific protein rather than a cancer-specific marker, causes this blood-test to possess some limitations, especially in the case of deciding to perform a related diagnostic prostate biopsy.

Therefore, contributory tests and evaluations have been used to increase the sensitivity of PSA based on the evidence that PSA levels can be affected by various other factors, such as prostatitis, urinary tract infection, and benign prostatic hyperplasia (BPH) (4,5,6).

As for PCa, in most cases when diagnosed, it grows slowly leading to a consequence that most men die due to causes other than PCa before the cancer becomes clinically evident and there is still no level 1 evidence that PSA screening reduces mortality due to PCa (7,8).

This is the fact that, indeed, the reasons for the ongoing debates about over-treatment of PCa originate from aggressive screening strategies. It is, then, the physician who should redress the balance between over and under diagnosis of PCa with the help of the patient informed well about the risks. This strategy refers to opportunistic screening rather than mass screening, hence, individualized risk-adapted strategy.

From the point of view of this opportunistic screening strategy, sometimes follow-up of low-risk patients with consecutive PSA tests before deciding a biopsy may become a reasonable solution relieving the concerns of the physician.

The question "does the climate affect the PSA level along with the other well-known factors like BPH, etc.?" has arisen for the very reason here, attempting to obtain an unaffected PSA at the right time and at right weather conditions of the individual's habitat.

City of İstanbul is located in a transitional climatic zone and, therefore, the Köppen-Geiger classification system defines the climate of this city as the mixture of three characteristic world climates: borderline Mediterranean climate, humid subtropical climate and oceanic climate (9).

This climatic variation generating especially fluctuations in temperature and humidity comes with dissimilarities in comparison with the uni-characteristic climates of many other world cities. High humidity is the other characteristics of this city reaching the level of %80 especially in the mornings.

In this research, we studied the effect of İstanbul's climate on PSA levels by using a population of male individuals performed a general check-up program that comes into service by our hospital group during a one year period.

Materials and Methods

Among 2.157 males, 757 individuals participating in a general check-up service at our hospital group during the year of 2012 were enrolled in this study. Serum PSA level was measured from the blood already taken for check-up program. Prostatic evaluation was performed using transabdominal ultrasonography. Urine samples were also obtained for urine analysis including microscopic evaluation. Ultrasonographic data was utilized to assess the size of the prostate. Microscopic urine examinations were evaluated for the presence of leukocytes for the reason that increased numbers may be related to the presence of infection. Study approval was obtained from the Acıbadem University Ethics Committee at the beginning of the study.

The data on climate parameters including daily minimum and maximum temperatures and their average values as well as daily humidity levels were obtained from the records of the Turkish State Meteorological Service, including 2 meteorological stations (Göztepe and Kartal stations) located in the Anatolian side of İstanbul. The aim

of evaluating the records of the two stations was not to miss the temperature changes between different regions of this big city and to calculate the variances if existed. Another parameter calculated by using this data was the average previous ten days' values of each meteorological parameter, assuming that 2.8 days of PSA half-life should renew the production in 10 days. The units for temperatures were Celsius degree and percentage (%) for humidity.

The region of the city where the participants spent their most of daily time were questioned and noted. Individuals declaring a region out of the coverage of the two stations were excluded from the study.

Having any lower urinary tract symptom suspicious for urinary infection was another exclusion criterion. The symptoms were supposed to interfere with the baseline PSA level of the participant. The other exclusion criterion was the presence of abnormal pathologic digital rectal examination.

First of all, the difference in climatic parameters between the two stations were analyzed. Then, the relationship of PSA levels with the daily minimum, maximum and average temperatures along with humidity levels recorded by the stations were statistically evaluated.

The presence of leukocytes in urine examination was presumed to be related with urinary infection including prostatitis. Therefore, a possible effect of leukocyturia on PSA levels and relationship of temperature and humidity with the number of leukocytes in urine examination were statistically investigated.

The data are expressed as mean, median, maximum and minimum values as descriptive statistics. The Mann Whitney-U test was used for comparing two groups and the Kruskal Wallis test was used for comparing more than two groups' measures. A two-sided p value of less than 0.05 was considered statistically significant in all analyses. The statistical software SPSS 21.0 (IBM Company, USA) was used for the analysis.

Results

Among 2157 males, a total of 757 participants were enrolled in the study after the exclusion criteria was applied as written in the section materials and method. The mean age of the subjects was 48.52 years (range: 15-90) and the percentage of individuals in age groups of below 30, 31-40, 41-50 and over 50 years was 5.2%, 23.2%, 31.8%, and 39.8%, respectively. The mean prostate volume measured by ultrasonography was 30.52 ml which increased with age in compatible with the literature.

The mean PSA level was 1.19 ng/ml in all age groups. PSA values were higher in elderly participants and in those with larger prostatic sizes (Diagram 1, Table 1).

Table 1. Prostate spesific antigen values were higher at older participants and at participants with larger prostatic sizes

		PSA (ng/ml)
		Mean
Age	<30	0.759
	31-40	0.756
	41-50	0.906
	>50	1.748

PSA: Prostate spesific antigen

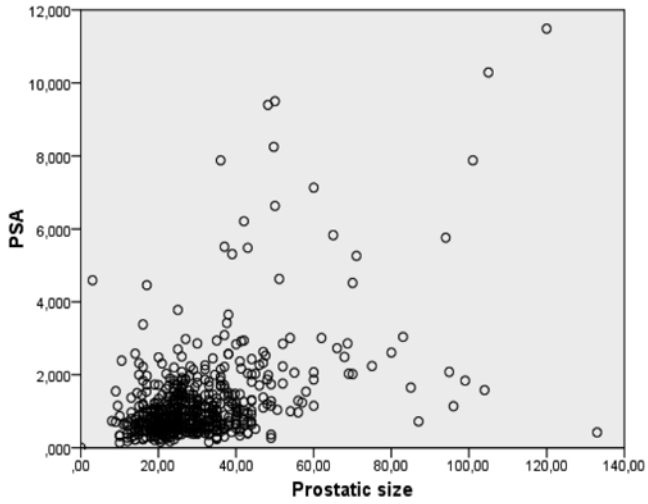

Diagram 1. Prostate spesific antigen values were higher at older participants and at participants with larger prostatic sizes
PSA: Prostate spesific antigen

Statistical Analysis

For statistical, analysis, the Mann Whitney-U test was used to compare the parameters between the two meteorological stations for the reason that quantitative data could not provide the provision of regular distribution from the parametric terms.

According to this analyze, only PSA and mean humidity levels were statistically different between the two stations ($p<0.05$). The average PSA level was 1.201 ng/ml at Göztepe station while 1.118 ng/ml at Kartal station. The average humidity values from Göztepe and Kartal stations were 71.3 and 69.3, respectively. Other parameters including age, prostate volume, creatinine levels and temperature were not statistically different between two stations.

As for months and seasons, a statistically significant difference was observed in all parameters of temperatures and humidity levels between four seasons ($p<0.001$) but this finding was not valid for alterations in PSA levels at these seasonal intervals (Table 2A, 2B). PSA levels and prostate volumes did not change during seasons and months correspondingly ($p>0.5$).

Moreover, PSA levels in all participants did not change above and below the mean values of each weather parameter, including temperatures and humidity ($p>0.05$ for all parameters) (Table 3).

As for presence of white blood cells (WBC) in microscopic urine examinations, this finding was more frequent in older age groups with larger prostates ($p<0.05$) (Table 4).

However, the presence of WBC in urine did not affect PSA levels significantly and seasons seemed to have no statistically significant effect on the presence of leukocytes in urine ($p>0.18$ and $p>0.5$, respectively).

Discussion

A few number of researches with conflicting results have been performed regarding the investigation of climatic effects on PSA. The first study was from the French arm of the European Randomized Study of Screening for Prostate Cancer which revealed that total PSA

Table 2A, 2B. As for months and seasons, a statistically significant difference between four seasons at all parameters of temperatures and humidity levels were observed (p<0.001) but this finding was not valid for alterations of prostate specific antigen levels at these seasonal intervals

Table 2A

		Frequency	Percent	Valid percent	Cumulative percent
Valid	Winter	214	28.3	28.3	28.3
	Spring	195	25.8	25.8	54.0
	Summer	151	19.9	19.9	74.0
	Autumn	197	26.0	26.0	100.0
	Total	757	100.0	100.0	

Table 2B.

	Seasons			
	Winter	Spring	Summer	Autumn
	Mean	Mean	Mean	Mean
Maximum temperatures[a]	9.1	17.6	30.9	23.0
Average maximum temperatures[b]	9.6	16.9	30.3	23.6
Minimum temperatures[c]	3.0	9.1	21.2	15.2
Average minimum temperatures[d]	3.50	8.45	20.89	15.76
Humidity (%)	75.8	70.1	64.2	70.9
Average - humidity[e]	75.5	70.0	65.0	71.3
Mean temperatures[f]	5.5	12.6	25.3	18.5
Average - mean temperatures[g]	5.91	12.08	25.04	18.92
Prostate volume (ml)	31.63	32.67	28.25	28.93
Creatinine (mg/dl)	0.90	0.92	0.94	0.93
PSA (ng/ml)	1.362	1.196	1.164	1.046
Age	49	50	47	48

a, c, f: Daily maximum, minimum and average temperatures, b, e, d, g: Average of previous ten days' temperatures of maximum, minimum, average daily values and humidity levels, PSA: Prostate specific antigen

levels were statistically significantly correlated with insolation, that is the monthly accrual in hours of sunshine during which the intensity was higher than 120 Watt.m-2 (10).

Then, another study found out that PSA levels were slightly higher during cold weather conditions. However, the small magnitude of alterations did not allow the authors to recommend to change the prostate biopsy indications according to climate conditions (11).

Seasonal variations in PSA levels were found to be apparent in another study performed by Connolly et al. (12) although age-adjusted PSA levels were deprived of the seasonal effect. The season of spring seemed to increase total PSA, which was not meanwhile correlated with daily, weekly or monthly hours of sunshine, rainfall or mean temperature in the study.

A study from Britain based on a huge number of data claimed that there was no pattern in PSA levels by time of year, air temperature or levels of sunlight in their cohort (13).

Table 3. Prostate specific antigen levels in all participants did not change above and below the mean values of each weather parameter, including temperatures and humidity (p>0.05 for all parameters)

		PSA (ng/ml)	
		Standard deviation	Mean
Maximum temperatures[a]	Below mean	1.149	1.158
	Above mean	1.137	1.185
Average maximum temperatures[b]	Below mean	1.141	1.147
	Above mean	1.143	1.193
Minimum temperatures[c]	Below mean	1.169	1.159
	Above mean	1.118	1.182
Average minimum temperatures[d]	Below mean	1.137	1.150
	Above mean	1.146	1.191
Average minimum temperatures[d]	Below mean	1.075	0.997
	Above mean	1.203	1.309
Average humidity[e]	Below mean	1.069	1.031
	Above mean	1.205	1.278
Mean temperatures[f]	Below mean	1.160	1.161
	Above mean	1.125	1.181
Average mean temperatures[g]	Below mean	1.144	1.161
	Above mean	1.140	1.182

a, c, f: Daily maximum, minimum and average temperatures, b, e, d, g: Average of previous ten days' temperatures of maximum, minimum, average daily values and humidity levels, PSA: Prostate specific antigen

The aim of our study was to evaluate basically the climatic effect on PSA levels at the cohort of İstanbul's male inhabitants. Our data at the participants' side included a wide range of age groups, prostate volume on ultrasonography, digital prostate examinations, and history of symptoms. The data of climate's side consisted of lowest, highest and mean daily temperatures with daily humidity levels.

The difference between our study and the previous ones was the development of study protocol on the basis of climatic data and participants' evaluation. The former was differently consisted of daily humidity levels and calculated average previous ten days' values of each parameter. Humidity is known to alter the wind-chill temperature and to have an effect on PSA. Ten days' average was calculated to strengthen real exposure of climate on participants while duration of 10 days was determined according to four times the PSA's half-life. However, neither the humidity levels nor the mean temperature of previous 10 days was shown consequently to have effect on the PSA significantly when the whole data was analyzed.

As for the latter difference, that is the participants' evaluation, these individuals had no significant symptoms and the reason for having these tests and examinations was just to be checked-up. We believe that this leads to a more refined population to be evaluated. The fact that every participant had ultrasonography, urine examination and physical evaluation also prompted refine determination about the relationship of PSA with climate.

Table 4. As for presence of white blood cells in microscopic urine examinations, this finding was more frequent in older age groups with larger prostates (p<0.05)

	WBC[x] in urine examination									
	Exist (>4-5/hpf)					Absent				
	Mean	SD	Median	Minimum	Maximum	Mean	SD	Median	Minimum	Maximum
Age	48	12	47	15	86	51	13	51	20	90
Maximum temperatures[a]	19.2	9.1	19.5	1.3	38.6	19.5	9.1	19.5	0.0	38.6
Average maximum temperatures[b]	19.2	8.8	19.5	1.2	35.4	19.3	8.6	20.0	3.9	35.2
Minimum temperatures[c]	11.3	7.6	12.0	-3.7	25.8	11.7	7.6	12.0	-37	25.8
Average minimum temperatures[d]	11.35	7.37	11.90	-1.65	24.95	11.69	7.44	13.00	-1.65	24.65
Humidity	70.7	9.7	71.1	6.3	90.4	71.0	9.6	71.7	46.8	89.9
Average humidity[e]	70.8	7.4	71.4	6.4	88.0	71.3	7.7	72.4	47.1	88.0
Mean temperatures[f]	14.5	8.2	15.3	-2.4	29.4	14.9	8.2	15.0	-2.5	29.4
Average - mean temperatures[g]	14.65	7.91	15.00	-0.05	28.50	14.87	8.08	15.85	0.10	29.05
Prostate volume (ml)	29.68	16.52	25.00	8.00	166.00	33.24	20.42	30.00	0.00	185.00
Creatinine	0.92	0.15	0.91	0.51	1.73	0.92	0.15	0.90	0.60	0.78
PSA	1.147	1.984	0.812	0.003	41.520	1.362	1.484	0.900	0.003	11.490

[a, c, f]: Daily maximum, minimum and average temperatures, [b, e, d, g]: Average of previous ten days' temperatures of maximum, minimum, average daily values and humidity levels, [x]; WBC: White blood cells, SD: Standard deviation, PSA: Prostate specific antigen

The only statistically significant difference in our study was between humidity and PSA levels when the two meteorological stations were taken into account. This is the first evidence that humidity may affect PSA. This may be explained by the concept of relative temperature and thermal sensation which is defined as how hot the weather feels to the average person, because humidity is well-known to be a strong component when to evaluate thermal sensation along with the other factors like metabolic rate, clothing, air temperature, mean radiant temperature and air velocity (14). Therefore, when all of these factors are taken into account along with humidity in the future studies, PSA-climate relation may be shown on a stronger scientifically proven basis.

The incidental finding of leukocytes in urine seemed to have no effect on PSA levels. This finding, along with the result that seasonal temperature changes and humidity did not correlate with leukocyturia, may be an evidence that raises doubts about anticipating cold exposure-urinary infection-leukocyturia-rising PSA engagement at all times unless the patient has urinary symptoms. The individuals in our study group had no urinary symptoms at all.

Conclusion

This research originating from our small number of daily clinical observations which brought us to a hypothesis that İstanbul's mixed transitional climate may affect PSA levels did not put an end-point to debates about PSA-climate relationship even if it proves that the temperature parameters are uninfluential in PSA levels except humidity. On the contrary, from evolving out of humidity-PSA relationship, it leads to a conclusion that thermal sensation of individuals must be evaluated to reach to more precise results in future studies.

Since any proven effect of climate on PSA will increase the sensitivity of PSA in diagnosing PCa and may prevent the decision of an unnecessary biopsy, humidity with a possible influential effect on serum PSA level according to our study definitely needs clarification and confirmation. Therefore, future studies including large number of subjects with detailed data facilitating calculation of thermal sensation are needed to give clearer answers to this topic.

Ethics

Informed Consent: A retrospective study.

Peer-review: Internal peer-reviewed.

Authorship Contributions

Concept: Murat Tuğrul Eren, Hakan Özveri, Design: Murat Tuğrul Eren, Hakan Özveri, Data Collection or Processing: Murat Tuğrul Eren, Hakan Özveri, Erdal Coşgun, Analysis or Interpretation: Murat Tuğrul Eren, Hakan Özveri, Erdal Coşgun, Literature Research: Murat Tuğrul Eren, Hakan Özveri, Writing: Murat Tuğrul Eren, Hakan Özveri.

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Ureteroscopy Outcomes, Complications and Management of Perforations in Impacted Ureter Stones

İmpakte Üreter Taşlarında Üreteroskopinin Sonuçları, Komplikasyonları ve Gelişen Perforasyonlara Yaklaşım

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What's known on the subject? and What does the study add?

This study was designed for to critical review of the management complicated patients whom ureter stone is impacted. Because we think impacted ureter stone managament, especially on complicated cases, must be different from patients whom stone is ordinay.

ABSTRACT

Objective

To evaluate ureteroscopy (URS) outcomes and management of perforations in impacted ureteral stones.

Materials and Methods

We retrospectively evaluated data from 81 patients who had undergone URS for impacted ureteral stones. Per-operative complications were evaluated visually and retrograde ureterography was performed when needed. Injuries of less than 50% around the ureter were classified as minor perforation and greater levels, as major perforation. Perforations were treated by double-j stent or a primary repair with consideration of the perforation grade.

Results

The stone-free rate was 69% on the first URS attempt and 79% at the end of 3 months. Complications occurred in 34 (42%) patients. Minor perforation occurred in five patients and only double-j insertion was performed at the end of the procedure. Permanent ureteral stricture occurred in four of five patients. Three patients were treated by open ureterolithotomy, fibrotic segment resection and ureteroureterostomy due to major perforations. Transient or permanent ureteral stricture occurred in none of the three patients. The stricture rate was significantly higher in patients who were treated with double-j stent (80% vs. 0% p=0.028) although they had lower perforation rate. Upper location, bigger size (>10 mm) of the ureteral stones and not using smash and go strategy were found to be significant predictors of complications.

Conclusion

URS for impacted ureteral stone has low success and high complication rates, especially for proximal and big stones. The conservative treatment may fail and result in stricture when perforation is present. Therefore, perforation treatment must be done by fibrotic segment excision and ureteroureterostomy.

Keywords

Impacted ureter stone, ureteroscopy, ureter stricture

ÖZ

Amaç

İmpakte üreter taşı olan hastalara yapılan üreteroskopinin sonuçlarını ve gelişen perforasyonların yönetimini değerlendirmeyi amaçladık.

Gereç ve Yöntem

İmpakte üreter taşı için opere edilen 81 hastanın verileri retrospektif olarak incelendi. Operasyon sırasında gelişen komplikasyonlar görsel olarak değerlendirildi, gereğinde retrograd üreterografi çekildi. Perforasyonun üreter çevresinin %50'sinden küçük olduğu yaralanmalara minör, büyük olmasına da majör perforasyon denildi. Perforasyonun evresine göre sadece double-j stent ile veya açık onarımla tedavi yapıldı.

Bulgular

İlk seansta tam taşsızlık oranı %69 olarak bulunurken, 3. ayın sonunda bu oran %79 idi. Komplikasyon 34 (%42) hastada gelişti. Minör perforasyon beş hastada gelişti. Bunların tamamına işlem sonunda double-j stent kondu. Bu beş hastanın dördünde (%80) kalıcı darlık gelişti. Major perforasyon gelişen üç hasta ise açık operasyona geçilerek fibrotik segment rezeke edilip taş alındıktan sonra uç uca anastomoz yapılarak tedavi edildi. Bu üç hastanın hiçbirinde darlık gelişmedi. Striktür oranı sadece double-j ile tedavi edilenlerde perforasyon oranı daha düşük olmasına karşın anlamlı olarak daha yüksekti (%80'e karşı %0 p=0,028). Taşın üst lokalizasyonda ve 10 mm'den büyük olması, kır-bırak stratejisinin kullanılmaması da komplikasyonları predikte eden faktörler olarak tespit edildi.

Sonuç

İmpakte üreter taşlarında, özellikle üst lokalizasyonda ve 10 mm'den büyük olanlarda, üreteroskopi düşük başarı ve yüksek komplikasyon oranına sahiptir. Perforasyon geliştiğinde ise konservatif tedavinin başarı şansı çok düşüktür. Bu nedenle perforasyon geliştiğinde açık operasyona geçilerek fibrotik segment rezeke edilmeli ve uç uca anastomoz yapılmalıdır.

Anahtar Kelimeler

İmpakte üreter taşı, üreteroskopi, üreter striktürü

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Introduction

Treatment of ureter stones are determined by stone size, localization, impaction, severity of symptoms, degree of obstruction, renal function and accompanying urinary tract infection (1). The term "impacted stone" is identified by calculi that remain in the same position for at least one month and cause ureteral obstruction with no visualization of contrast medium beyond the stone on intravenous urography (IVU) or sensor guide cannot pass around the stone (2).

Shock wave lithotripsy (SWL) and ureteroscopy (URS) are most common treatment methods for ureteral stones with low complication and high success rates (3,4,5). However, success rate of SWL is not high in impacted ureteral stones, because there is not enough area around the stone for expansion by virtue of inflammation and edema (6,7,8). Therefore, the first choice must be URS in impacted ureter stones (9). The URS success rate is higher than SWL, but its complication rate is high. Ureteral perforation and ureteral stricture are worrying complications due to unclear management (10).

We aimed to share our experience with URS outcomes and management of complications associated with impacted ureteral stones.

Material and Methods

We retrospectively evaluated data from patients who had undergone URS for impacted ureteral stones between 2008 and 2014. Patients whose data was insufficient and whose follow-up time was less than 3 months were excluded. The size of the opaque stones was measured by direct radiography and non-opaque ones, by computed tomography. The long axis was accepted definitive stone size. Stone surface area was calculated by the formula: length x width x π x 0.25. Preoperatively, routine blood and urine tests were done in all patients. Urine culture was performed in patients whose urine tests were abnormal. Antibiotics were given to the patients according to the results of the antibiotic susceptibility testing. Operation was done afterwards when urine culture was negative. Routine antibiotic prophylaxis was performed in all patients in whom culture was negative. All operations were performed under general anesthesia. Firstly, 8 Fr ureteroscope was used for accessing to ureter stones. It was exchanged to 6 Fr ureteroscope if access could not be achieved. Balloon dilatation was used when the access was not gained by 6 Fr ureteroscope. A guidewire with sensor tip was used for access to the ureter through ureteroscope. A flexible 7.5 Fr ureteroscope was used when access has not been gained by semirigid ureteroscopes for middle and proximal ureter. Laser or pneumatic power sources were used for lithotripsy. Stone-free was accepted as all stones were cleaned using basket or n-trap or broken to a maximum size of 3 mm by a smash and go method. A double-j stent was inserted in all patients at the end of the operation. All of the operation was performed by only one urologist or senior trainee under the supervision of the same urologist.

The Clavien-Dindo classification was used to classify complications. Per-operative complications were evaluated visually and retrograde ureterography was done when needed. Perforations were treated by double-j stent insertion or a primary repair with consideration of the perforation grade. Classification of the ureter injury was done by referencing the Organ Injury Scaling prepared by the American Association for the Surgery of Trauma (11). According to this classification, injury involving less than 50% of circumference of the ureter is grade 2, and a greater level is classified as grade 3. We classified minimal extravasation as grade 2, manifest extravasation and non-visible kidney as grade 3 on retrograde ureterography. Grade 2 perforation was classified as minor and grade 3 perforation, as major. A double-j stent was inserted for minor perforations, and open repair was performed in patients with major perforations.

IVU was performed in patients who had hydronephrosis 3 months later. If hydronephrosis persisted, IVU would be repeated 6 months later. It was accepted as ureteral stricture when stenosis was observed in the same location on both IVU. Balloon dilatation and double-j stent insertion were performed at least twice. If a stricture was not corrected at the end of both procedures, it was accepted as permanent. Stricture excision and ureteroureterostomy were performed in patients who had permanent stricture.

Statistical Analysis

Patient demographics, stone location, size and surface area, power source for lithotripsy, lithotripsy strategy, operation success, complications, and management of complications were evaluated. SPSS 15 for Windows (Chicago, Il) was used for statistical analysis. The Mann-Whitney U and Pearson's chi-squared tests were performed. A p value of less than 0.05 was considered statistically significant.

Results

A total of 81 patients were included in the study. Patient demographics and operative findings are shown on Table 1. The stone-free rate was 69% on the first session of URS. The stone-free rate was 79% at the end of 3 months with SWL (five patients), re-URS (two patients) and percutaneous nephrolithotomy (PNL) (one patient). Open or laparoscopic ureterolithotomy was performed in the remaining 17 patients whenever stones could not be accessed. The median follow-

Table 1. Patients' demographic and descriptive data

Mean age ± SD (years) (minimum-maximum)	39±16 (6-76)
Gender (male/female)	41/40
Laterality (right/left)	39/42
Location	Proximal: 31 (38%)
	Middle: 16 (20%)
	Distal: 34 (42%)
Mean stone size ± SD and surface ± SD	11.5±5.2 mm and 102±94 mm^2
Power source	Laser: 22 (27%)
	Pneumatic: 42 (52%)
	None: 17 (21%)
"Smash and Go" strategy performed	34 (42%)
Success rate with URS and SWL	1th day: 69% 3rd month: 79%
Complication number (n)	34 (42%)
Median follow-up (months) (minimum-maximum)	7 (3-86)

SD: Standard deviation, URS: Ureteroscopy, SWL: Shock wave lithotripsy

up time was 7 (3-86) months for all patients and 12 (3-86) months for complicated patients.

Complications occurred in 34 (42%) patients. Grade 1 or 2 complications occurred in 12, grade 3a in 11, grade 3b in ten patients, and grade 4 in one patient (Table 2). The details for grade 3a complicated patients are as follows: hematoma in the bladder was evacuated in one patient, SWL was performed on five patients due to stone migration, and minor perforation occurred in five patients and only double-j insertion was performed at the end of the procedure. Permanent ureteral stricture occurred in four of five patients. Three of four patients were treated by excision of the fibrotic segment and open ureteroureterostomy. Due to patient's age and co-morbidity, regular double-j stent changing was performed with 6 month intervals in the other patient.

Grade 3b complicated patients' details are as follows: URS was performed in one patient for steinstrasse. Percutaneous drainage and double-j insertion were performed in one patient due to urinoma. Stone migration was treated by flexible URS in two patients and by PNL in one patient. Three patients were treated by open ureterolithotomy, fibrotic segment resection and ureteroureterostomy due to major perforations. Transient or permanent ureteral stricture occurred in none of the three patients.

Permanent stricture occurred in four of five patients who were treated only by double-j stenting, and in none of the three patients who were treated with an open procedure. This was statistically significant (80% vs. 0% p=0.028). Ureteral stricture was determined in four patients but no perforation occurred. Stone size was greater than 10 mm in these patients. These patients were treated by balloon dilatation and double-j insertion, and permanent stricture did not occur in any of them.

Table 2. All of complications of ureteroscopy classified according to modified Clavien classification system

Grade	Complication	N (%)
I	Mucosal injury	5 (6.1)
	Hematuria	2 (2.5)
II	Blood transfusion	1 (1.5)
	Urinary tract infection	4 (4.9)
IIIa	Bladder hematoma	1 (1.5)
	Minor perforation	5 (6.1)
	Stone migration*	5 (6.1)
IIIb	Urinoma	1 (1.5)
	Steinstrasse	1 (1.5)
	Stone migration*	3 (3.7)
	Major perforation	3 (3.7)
IIIb.d**	Ureteral avulsion	2 (2.5)
IVa	Organ failure	0
IVb	Urosepsis	1 (1.5)
V	Death	0
Total		34 (42)

*Stone migration was classified as IIIa when treated with SW or IIIb with re-ureteroscopy, percutaneous nephrolithotomy or open procedure, **Two patients were classified as IIIb.d because of nephrectomy, URS: Ureteroscopy, PNL: Percutaneous nephrolithotomy

Ureteral avulsion occurred in two patients. The stones were at proximal locations and were larger than 10 mm in these patients. End-to-end anastomosis and omental wrapping was performed in one patient as an emergency procedure. We performed nephrectomy two days later due to ureter necrosis seen on contrast-enhanced computed tomography. Ureteral substitution was performed using ileum in the other patient, but nephrectomy was performed due to abscess and non-response to medical treatment. Therefore, these patients were classified as Clavien IIIb.d.

In the univariate analysis, upper location (p=0.001) and large size (>10 mm) (p=0.014) of the ureteral stones were found to be a significant predictor of complications. Furthermore, we have seen that a smash and go strategy was preferred for non-complicated patients (p=0.026). Age, gender, lateralization, operator, balloon dilatation performance, and power source were not significance factors for the prediction of complications (Table 3).

Discussion

The choice of therapy for a ureteral stone depends on the stone size and location. However, appropriate treatment for impacted stones is not yet clear. SWL treatment success is 67% at the end of the first month (12). The semi-rigid URS success rate is about 80% with the additive procedures of SWL and re-URS at end of 3 months (12,13). Our success rate was 69% in the first procedure and 79% with SWL and re-URS. The results show that impacted ureteral stones might necessitate additive procedures.

The complication rate is high in URS for impacted stones. Stone size and location are the most predictive factors for complication. Brito et al. (14) reported that complication was not seen in situation with a stone size smaller than 5 mm, but complication was seen with stones larger than 5 mm, and complication rate was the highest in situations with stones larger than 10 mm. We have seen that the complication rate is 2 fold higher in stones larger than 10 mm than in smaller stones (53% vs. 26% p=0.01). Another study also showed that proximal location increases the complication risk by about 2 fold (13).

Table 3. Association between of pre or intraoperative parameters and complication rates

	Complicate (n=34) (%42)	Non complicate (n=47) (%58)	p value
Gender (male)	18 (53)	23 (49)	.31
Age	40.5±18	38±14	.40
Laterality (right)	18 (53)	21 (45)	.72
Location (proximal)	22 (64)	9 (19)	.001*
Stone size (>10 mm)	25 (73)	22 (47)	.014*
Mean stone size ± SD (mm) and surface ± SD (mm^2)	14±5.5 (110±65)	8.5±4.5 (50±26)	.001*
Operator (urologist)	24 (71)	30 (64)	.12
Balloon dilatation	3 (9)	3 (6)	.23
"BSmash and Go"	9 (27)	25 (53)	.026*
Power source (laser)	8 (24)	14 (29)	0.35

*p value is significant at <0.05 level, SD: Standard deviation

Flexible URS can be used for proximal ureter stones to decrease complication rate and increase success rate. Success rate increase by flexible URS, but complication rate does not (13). It has been seen in our study and elsewhere that the choice of power source for lithotripsy, laser or pneumatic, does not change the complication rate (13,15).

Stricture rate is 0.1-0.3% in URS series (16,17). However, the rate is high in impacted stones. Stricture may occur if a patient was treated for impacted ureter stone despite no perforation being present. Ureteral stricture pathophysiology is not clear yet. Ureteral injury, large caliber URS use and thermal damage may be reasons for stricture (10). Chronic inflammation, interstitial fibrosis and urothelial hypertrophy were determined to be around impacted stones in histological studies (4,6). Calcium oxalate crystals were determined to be in the stricture area in patients who had remaining stones. This finding has shown that remaining stones can trigger stricture formation (6,18). Therefore, smash and go strategy can decrease complication rates, but can also cause ureteral stricture due to remaining stones in patients with impacted ureteral stones. Furthermore, urine extravasation can cause retroperitoneal fibrosis and ureteral stricture (19). Ureteral stricture can occur with impacted stones regardless of complication development (10). However, perforation increased the stricture rate about 14 fold in our study (5.6% vs. 80%). Brito et al. (14) reported that perforation rate was 55% in impacted ureteral stones and stricture would be at a rate of 75% if perforation occurred. Permanent stricture occurred in four of five patients in whom the ureter was perforated and treated only by double-j stent, but stricture occurred in none of the three patients treated with open procedures in our study. Ureteral stricture occurred in 4 of 71 (5.6%) patients in whom the ureter was not perforated. Four patients were treated only with balloon dilatation and double-j stent. This shows that management of perforation must be different for impacted stones. Open ureteroureterostomy can prevent stricture regardless of the perforation size, and balloon dilatation cannot treat strictures in patients in whom ureter perforation is present. However, balloon dilatation is sufficient in treating ureteral stricture not due to perforation.

Alternative methods for the treatment of impacted ureter stones have been sought due to high complication and low success rates. Antegrade percutaneous URS was done for proximal ureter stones. The success rate was high (85-100%), but complication (20%) and perforation (9%) rates were also high (20,21). Ureterolithotomy, open or laparoscopic, has a high success rate (90-100%) and low complication (2-10%) and stricture rates (0-1%) (22,23,24). The European Association of Urology guidelines recommend alternative methods, such as antegrade URS or ureterolithotomy, for impacted ureter stones as a first choice based on the physician's experience; but open and laparoscopic ureterolithotomy are expensive treatment methods (1).

Avulsion is the most terrible complication. Treatment options are as follows: Boari flap, psoas hitch, transureteroureterostomy, auto-transplantation, ileal interposition and appendix interposition. We have done end-to-end anastomosis in one case, and ileal interposition in one case. Both of them failed and we had to do nephrectomy. End-to-end anastomosis has been successful in one of three cases in the literature and it is not recommended (25,26). Auto-transplantation is the most promising method for proximal avulsion. Ileal or appendix interposition will do if auto-transplantation is not possible (27).

The retrospective nature and low number of patients may be a limitation of our study. It is overcome by multi institutional working.

Conclusions

URS for impacted ureteral stone has low success and high complication rates. It is not an appropriate method especially for proximal and large stones. Patients must be informed about complications. Open or laparoscopic ureterolithotomy may be recommended for patients who have large stones or stones at proximal locations. The conservative treatment, a double-j stent insertion, may fail and finalize as stricture when perforation is present. Therefore, perforation treatment must be done by fibrotic segment excision and ureteroureterostomy.

Ethics

Ethics Committee Approval: Ethics committee approval was not obtained because this was a retrospective study. Informed consent: Written informed consent was not obtained from patients because this was a retrospective study.

Peer-review: Internal peer-reviewed.

Authorship Contributions

Concept: Göksel Bayar, Orhan Tanrıverdi, Design: Göksel Bayar, Orhan Tanrıverdi, Data Collection or Processing: Kaya Horasanlı, Ayhan Dalkılıç, Analysis or Interpretation: Orhan Tanrıverdi, Kaya Horasanlı, Literature Research: Göksel Bayar, Kaya Horasanlı, Writing: Göksel Bayar, Ayhan Dalkılıç.

Conflict of Interest: No conflict of interest was declared by the authors.

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CASE REPORT
ENDOUROLOGY

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A Rare Complication of the Treatment of Simple Renal Cysts: Nephrostomy Catheter Breakage after Alcohol Treatment and Laparoscopic Management

Basit Böbrek Kistlerinin Tedavisinde Nadir Görülen Bir Komplikasyon: Nefrostomi Kateterinin Alkol Tedavisi Sonrası Kopması ve Laparoskopik Tedavisi

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ABSTRACT

The prevalence of simple renal cysts increases with age. Simple renal cyst aspiration and sclerotherapy with percutaneous nephrostomy catheter is frequently used in urological practice. This method can be applied under local anesthesia and various complications of this method have been reported. In this paper, we report an unusual complication of this method; the distal part of the nephrostomy catheter had separated after renal cyst aspiration and laparoscopic procedure was used to remove the end part of the catheter which remained within the cyst wall in the pararenal area.

Keywords

Simple cyst, alcohol, laparoscopy

ÖZ

Basit böbrek kistleri görülme sıklığı yaş ile artar. Perkütan nefrostomi kateteri ile böbrek kist aspirasyonu ve kist duvarları içine sklerozan madde enjeksiyonu üroloji pratiğinde sık kullanılan bir yöntemdir. Lokal anestezi altında uygulanan bu yöntemin çeşitli komplikasyonları bildirilmiştir. Bu olgu sunumunda perkütan nefrostomi yöntemine ait beklenmedik bir komplikasyon olan kist aspirasyonu sonrası nefrostomi kateterinin distal uç kısmının kopması ve pararenal lojda kistik duvarın içinde kalan bu kateter ucunun laparoskopik yöntemle çıkarılması sunulmuştur.

Anahtar Kelimeler

Basit kist, alkol, laparoskopi

Introduction

Simple renal cysts are non-neoplastic disease of renal parenchyma. The prevalence of simple renal cysts among individuals aged 40 and 60 years and older is 20% and 33%, respectively. No treatment for simple renal cysts is required in asymptomatic patients. It is necessary to treat renal cysts causing flank pain, hypertension, hematuria, infection, and collecting system compression. In the literature, aspiration technique with percutaneous nephrostomy catheter with or without sclerosing agent, open cyst excision and recently reported laparoscopic cyst excision methods are used for the treatment of simple renal cysts.

One of these methods, percutaneous nephrostomy is easily applicable but major complications, such as bleeding that may require blood transfusion, septicemia, pleura, liver, spleen and colon injuries have been reported in the literature. In this report, removal of the distal part of the nephrostomy catheter that was separated in the retroperitoneal area was managed by laparoscopic technique.

Case Presentation

A 57-year-old female patient with a left renal cyst has been followed for 15 years. She had an increasing left flank pain for the past six months. Abdominal ultrasound demonstrated an anechoic cyst measuring 53x51 mm in the lower pole of the left kidney. Using ultrasound guidance, percutaneous nephrostomy catheter was placed into the cyst under local anesthesia and clear cyst fluid was aspirated. Percent of ninety-six alcohol was used as sclerosing agent and the nephrostomy catheter was clamped for 20 minutes. The catheter was removed on the first day. When the catheter was removed, it was observed that the distal part remained in the patient. On plain radiography, radiopacity indicating the tip of catheter was observed. Computed tomography showed, catheter laying in posterolateral cortex in the left kidney (Figure 1a, b). Laparoscopic removal of the catheter was decided. At first, a 10 mm trocar was placed into the abdomen using the Hasson technique. Then, two 5 mm trocars were

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Figure 1a. Radiopacity of the separated part of the catheter in plain radiography

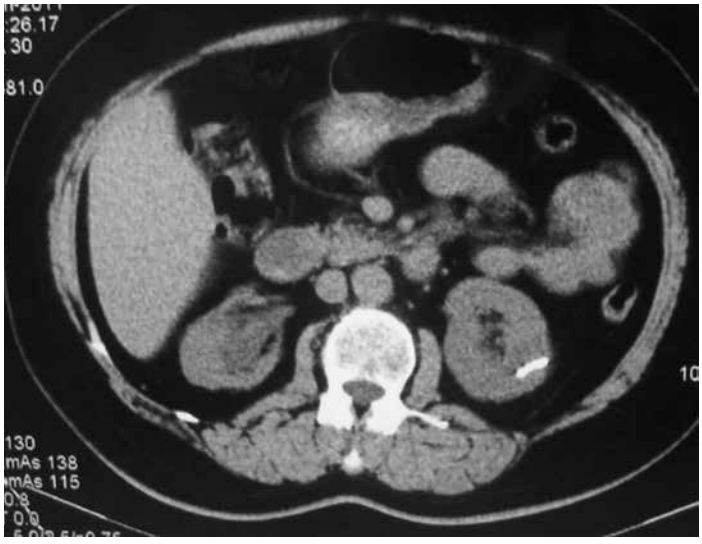

Figure 1b. Catheter in the cyst wall, posterior to the kidney in abdominal computed tomography

placed superior to the spina iliaca anterior superior and inferior to the 12th costa in the anterior axillary line. After the colon was deviated, adhesions were seen in the retroperitoneal region. The tissue surrounding this region was very fibrotic due to the alcohol treatment. The wall of the cyst was opened and the catheter was observed. After sharp and blunt dissection, the catheter was removed via 5 mm port (Figure 2a, b). Drainage catheter was not placed.

Discussion

The kidneys are among organs that cysts are detected frequently (1). Renal cysts detected incidentally or after symptoms must classified according to the Bosniak classification because of malignancy potential or other incidents. Category 1 and 2 cysts according to the Bosniak classification are considered as simple renal cysts; type 3 and 4 are as complicated renal cysts. Simple renal cysts appear in 5% of all abdomen ultrasounds performed with any reason in all age groups. This kind of renal cysts are usually unilateral, originated

Figure 2a. Postoperative view of trocar localizations

Figure 2b. Postoperative view of nephrostomy catheter and separated distal part

from the collecting ducts and typically located in the cortex (2). The purpose of the treatment of simple cysts is to resolve the symptoms e.g. flank pain and/or complications, such as hemorrhages, infection, hydronephrosis and hypertension. Percutaneous cyst aspiration with or without sclerotherapy under ultrasound guidance and open or laparoscopic cyst excision are treatment of choices. The average rate of recurrence and residual cyst after percutaneous aspiration has been reported to be 30%. Local and systemic complications following sclerotherapy due to alcohol injection and close monitoring have been reported (3). In the open renal cyst decortication method, morbidity and mortality rates arising from laparotomy are high. Disadvantages of laparoscopic procedure include risks of vascular and intraperitoneal organ injury, and difficulty in kidney mobilization. Lower renal cyst recurrence rates, shorter hospitalization time and lower mortality and morbidity rates featured laparoscopic approach (3).

Percutaneous nephrostomy under ultrasound guidance is described approximately 40 years ago (4) and performed in drainage of the upper urinary system in obstructive uropathy due to supra-or infra-vesical obstruction, drainage of pyonephrosis, and drainage of hemorrhages after percutaneous nephrolitotomy up to date. Besides, it is a minimally invasive procedure alternative to the open or laparoscopic cyst excision methods in simple renal cyst treatment.

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The rates of hemorrhage and septic shock after percutaneous nephrostomy are 1-4% and 1-9% (5), respectively. Other major complications include failure of procedure, and liver, spleen, colon, and pleura injuries. Urine extravasation and urination with clot are considered to be minor complications. In the literature, extreme complications, such as misplacement of nephrostomy catheter into the renal vein, inferior vena cava (6), and right atrium (7) have been reported. In our case report, unity/integrity of the catheter was destroyed and the distal end remained in the pararenal region. This kind of complication has not been previously reported and separated distal end was considered as a foreign body. Foreign bodies, such as intrauterine devices for contraception that displaced to another space, forgotten sponge and surgical instruments, and sharp foodstuff that may cause perforation of the gastrointestinal system cause more than 1500 operations annually (8). Intra-or extra-abdominal foreign bodies cause local irritation and local and systemic infection. Therefore, these foreign bodies must be treated properly as soon as identified. Features, location, symptoms of foreign body and general situation of the patient manipulate the treatment option, but the purpose has to be extraction of the foreign body in a single session. For this purpose, endoscopic, laparoscopic or open surgical techniques may be performed.

The abdominal cavity and retroperitoneal space are better evaluated in the laparoscopic method and reflection of the light provides metallic foreign body to be distinguished easily from other tissues. Laparoscopy, as a minimally invasive technique with small incisions, allows lower rates of postoperative infection, pain and postoperative morbidity. Therefore, we used laparoscopic method to remove the part of the nephrostomy catheter. In this case, transperitoneal approach was used considering the risk of complication due to possible adhesions.

Ethics

Informed Consent: Consent form was filled out by all participants.

Peer-review: Internal peer-reviewed.

Authorship Contributions

Surgical and Medical Practices: Barbaros Başeskioğlu, Concept: Barbaros Başeskioğlu, Design: Barbaros Başeskioğlu, Data Collection or Processing: Ali Ülgen, Analysis or Interpretation: Barbaros Başeskioğlu, Ali Ülgen, Literature Search: Ali Ülgen, Writing: Barbaros Başeskioğlu.

Conflict of Interest: No conflict of interest was declared by the authors.

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CASE REPORT
UROONCOLOGY

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Primary Renal Synovial Sarcoma: A Rare Case Report

Böbreğin Renal Sinoviyal Sarkomu: Nadir Bir Olgu Sunumu

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ABSTRACT

Synovial sarcoma (SS) is mainly derived from soft tissues. Primary renal SS is a very rare malignancy with around 60 cases reported in the literature. We report a renal mass which was undistinguishable from urothelial carcinoma clinically and pathologically but diagnosed as a primary renal SS at the definitive pathological diagnosis.

Keywords

Pathology, kidney, sarcoma, synovial sarcoma, kidney neoplasms, kidney tumor

ÖZ

Sinovyal sarkom (SS) esas olarak yumuşak dokudan gelişmektedir. Primer böbrek SS çok nadir bir kanserdir ve literatürde yaklaşık 60 olgu bildirilmiştir. Kesin patolojik tanısı primer renal SS olan klinik ve patolojik olarak ürotelyal karsinomdan kolay ayrılamayan renal kitle raporlanmıştır.

Anahtar Kelimeler

Patoloji, böbrek, sarkom, sinovyal sarkom, böbrek neoplazmları, böbrek tümörü

Introduction

Synovial sarcomas (SS) account for 5-10% of adult soft tissue sarcomas and occur mostly in the proximity of large joints (1,2,3). These tumors are rarely diagnosed in unexpected sites, including the thoracic and abdominal wall, head and neck region, retroperitoneum, bone, lung, or prostate (4,5). Primary renal SS is a very rare malignancy with around 60 cases reported in the literature and first described by Argani et al. (6) in 1999 and published by Argani et al. (1,6). Primary renal SS constitutes a subtype of the cases identified as embryonal sarcoma of the kidney and can clinically mimic an advanced renal cell carcinoma, making the correct diagnosis challenging. It is also difficult to differentiate pathologically from other spindle cell histologies of the kidney such as adult Wilms tumors, sarcomatoid renal cell carcinoma, hemangiopericytoma and undifferentiated carcinoma (7). It requires immunohistochemical (IHC) staining and cytogenetic analysis for diagnosis (8). More than 90% of cases of SS are seen the chromosomal translocation t(x;18) (p11;q11). CD99, smooth muscle actin, CD34, epithelial membrane antigen, cytokeratin, S100, and B-cell lymphoma 2 (BCL2) are used in IHC staining (9,10). We report a renal mass which was undistinguishable from urothelial carcinoma clinically and pathologically but diagnosed as a primary renal SS at the definitive pathological diagnosis.

Case Presentation

Forty seven years old man investigated for left flank and abdominal pain lasting for several months. Abdominal ultrasonography revealed a left renal mass and computed tomography (CT) reported a 90x70x60 millimeters solid mass. Open radical nephrectomy was performed with transperitoneal approach. Pathology was reported transitional cell carcinoma (tumor invaded the renal calyx, ureteral surgical margins was positive). Ureterectomy and bladder cuff excision was performed for the stump of ureter after 2 weeks. Pathology was reported as non-neoplastic tissue. Two months later CT was performed because of the mechanical ileus. Multipl metastatic lesions was revealed at the lung, para-aortic area, paravertebral area and around the spleen. The patient was operated, splenectomy was performed and retroperitoneal mass was resected. Histomorphological findings was found to be identical compared with first nephrectomy material. In examined section tumor mass is observed atypical spindle-shaped cells forming bundles and diffuse growth pattern. And also trabecular pattern areas were observed in myxoid tumors and hemangiopericytoma. Tumor is highly cellular appearance and comprised of cells containing several nucleolus. A panel of immunohistochemistry was performed periodic acid-Schiff (PAS), glicogene, CK7, CK19, reticulin, BCL2, CD99, Wilms

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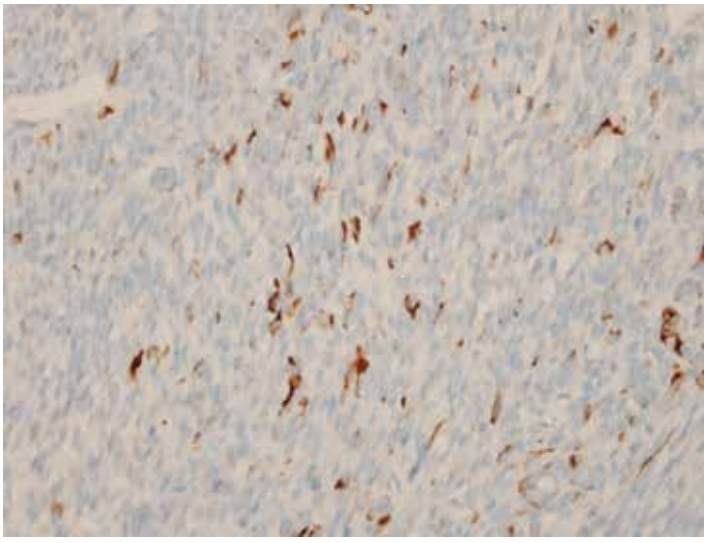

Figure 1. Histological appearance the cells are stained cytoceratin 7 with immunohistochemical (immunohistochemistery x400)

tumor-1 (WT1), desmin, caldesmon, synaptophysin, chromogranin, CD34, CD31, CK20 and S100. The tumor cells were positive for CK7, CK19, BCL2, actin and focally positive for reticulin (Figure 1). WT1 and CD99 had been stained with focal cytoplasmic granules diffusely positivity. There was no reaction to PAS, glicogene, desmin, caldesmon, chromogranin, synaptophysin, CK20, S100, CD34 and CD31. According to these findings a diagnosis of monophasic spindle cell SS was done. One months later, CT showed liver metastasis and a 15x10 cm mass that invades in the field of operation. A few lymphadenopathy (as 2.5x1 cm) and a 4.5x4 cm mass in the left adrenal area was also detected. A single dose doxorubicin was administered. Patient's general condition deteriorated and died after one month.

Discussion

Primary renal SS is a very rare tumor and comprises 1-3% of all malignant renal neoplasms (11). It has shown a gender ratio male to female: 1.7:1, a mean age at diagnosis of 37 years (ranging between 13 and 67) and mean tumor diameter of 11 cm (ranging 3-21 cm) (12). The diagnosis of SS are always problem, due to rarity and similar clinical presentation and imaging with other sarcomas. These tumors have 3 morphological variants: monophasic, biphasic and poorly-differentiated (10). The monophasic variant has difficulty in differentiating from other spindle cell sarcomas because of having only an epithelial or spindle cell component. The biphasic variant can be diagnosed with epithelial and spindle component. Poorly-differentiated subtype has undifferentiated round cells with hyperchromatic nuclei and frequent mitoses (13).

Diagnosis of SS is not possible without ancillary diagnostic techniques such as IHC and cytogenetic studies. Histopathological diagnosis is difficult. Cytogenetic studies have shown a characteristic t(x;18) (p11;q11) chromosomal translocation, over 90% of cases, as a diagnostic indicator of SS as well as cytogenetic or molecular methods have been used in order to detect it. Fluorescence in situ hybridization analysis are reported to be positive around 95% in the *SYT* gene translocation in SS but it is not apply to our case. IHC markers have been investigated in cases of SS but not to shown specific markers for diagnoses SS. WT1 expression is always found adult Wilms' tumor but not in primary tumors unlike in our case. Furthermore, malignant peripheral nerve sheath tumor is typically positive for S100, while primary renal SS are negative (14). The gold standart diagnostic study for SS is to demonstrate of *SYT* gene translocation (15,16).

The rate of metastasis on admission seems to be low. Firstly managed through surgery, there is no consensus about the role of chemotherapy on these cases, either as neoadjuvant or adjuvant therapy (7,12).

Clinically and histologically primer renal SS could not be easily diagnosed and it should be included in the differential diagnosis of a solid renal neoplasm.

Ethics

Informed Consent: Written informed consent was obtained from patients who participated in this study.

Peer-review: Internal peer-reviewed.

Authorship Contributions

Surgical and Medical Practices: Mehmet Sinan Başay, Concept: Taha Numan Yıkılmaz, Okan Baş, Design: Taha Numan Yıkılmaz, Okan Baş, Ali İhsan Arık, Data Collection or Processing: Taha Numan Yıkılmaz, Okan Baş, İsmail Selvi, Analysis or Interpretation: Taha Numan Yıkılmaz, Okan Baş, Emine Bezer, Literature Research: Emine Bezer, Mehmet Sinan Başay, Writing: Taha Numan Yıkılmaz.

Conflict of Interest: No conflict of interest was declared by the authors.

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CASE REPORT
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Can Ambicor® Penile Prosthesis be Used in One Piece in Patients with Inadequate Cavernous Structure? Our Experience of Two Cases

Ambicor® Penil Protez, Kavernöz Alan Yetersizliği Olan Olgularda Tek Parça Olarak Kullanılabilir mi? İki Olguluk Tecrübe

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ABSTRACT

Penile prosthesis implantation, which is practiced with high satisfaction and success rates in patients with erectile dysfunction today, is an invasive procedure carried out by implanting various models of the prostheses into the cavernosal tissue. Penile prosthesis implantation may sometimes prove difficult in cases with small penis in size and diameter. In this article, we present the method we used in two patients in whom two-pieces Ambicor® penile prosthesis implantation was planned but could not be carried out due to the insufficient size and diameter of the penile cavernous structures.

Keywords

Erectile dysfunction, penile prosthesis, Ambicor®

ÖZ

Günümüzde erektil disfonksiyonlu hastalarda yüksek memnuniyet ve başarı oranları ile uygulanan penil protez implantasyonu çeşitli modellerdeki protezlerin kavernozal doku içerisine yerleştirilmesi şeklinde yapılan invaziv bir işlemdir. Boyut ve çap olarak küçük penisi olan olgularda penil protez implantasyonu uygulanması kimi zaman zorluklar oluşturabilir. Biz bu yazımızda iki parçalı Ambicor® penil protez implantasyonu için operasyona aldığımız ancak penil kavernozal yapılarının boy ve çap olarak yetersiz olmasından dolayı protez implantasyonu tam olarak yapılamayan iki olguda uyguladığımız yöntemi sunduk.

Anahtar Kelimeler

Erektil disfonksiyon, penil protez, Ambicor®

Introduction

In the treatment of erectile dysfunction, penile prosthesis implantation is an indispensable treatment practiced in selected patients who have not benefitted from medical treatments, such as phosphodiesterase inhibitor drugs and intracavernosal injections, and who have not used these medication therapies due to their side effects. Although implantation of the prostheses available in various models is an invasive procedure, it is a satisfactory surgical method for both the patient and the partner when used in suitable patients. Two-piece inflatable Ambicor® penile prostheses of American Medical System (AMS) include two cylinders and a pump. When the pump is activated, the fluid moves from the reservoir to the cylinders and becomes rigid. Bending the cylinders from the midsection ensures the prosthesis to return to flaccid state. In cases with insufficient penis size and diameter, two-piece Ambicor® penile prostheses of AMS may be implanted with a different modification like we made.

Case Presentation

Case 1

A 58-year-old patient presented to our clinic with the complaint of erectile dysfunction for the past seven years. The patient, aside from suffering insulin-dependent diabetes mellitus for ten years, did not have any other comorbidities and received medical therapy with phosphodiesterase type 5 inhibitor and intracavernosal medications from which he did not benefit. International Index of erectile function-5 (IIEF-5) (1) score was 6. The fasting blood glucose and hemoglobin A1c (HbA1c) levels in the patient using insulin for five years were regulated. Penile color Doppler ultrasonography was consistent with mild venous leakage.

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Case 2

A 64-year-old patient presented to our clinic with the complaint of erectile dysfunction for six years, which could not have been solved by medical therapies. The patient suffering insulin dependent diabetes mellitus and hypertension for thirteen years had an IIEF-5 score of 5. The fasting glucose and HbA1c levels in the patient were found to be normal. Penile color Doppler ultrasonography confirmed arterial and venous insufficiency.

Luteinizing hormone, prolactin, testosterone, and thyroid hormone levels in both patients were assessed normal. Likewise, psychological causes of erectile dysfunction were ruled out by performing a preoperative psychiatric evaluation in both patients. Thereupon, by deciding on performing penile prosthesis implantation, the patients were informed about the types of prostheses and their advantages and disadvantages in detail. After dilating the cavernous tissues with bougies, two-piece Ambicor® penile prosthesis was tried to be implanted into the spaces formed. However, since the cavernous tissues were very thin and short in diameter, two pieces of the prosthesis could not be implanted into the dilated cavernous spaces together. Therefore, the tubule of the one piece of the Ambicor® prosthesis was clipped and cut, and it was transformed into a one-piece inflatable prosthesis. After cutting and dilating the intracavernosal septum, one-piece inflatable Ambicor® penile prosthesis was implanted into the intracavernosal space, and the operation was completed properly (Figure 1, 2, 3). The patients were discharged on postoperative day 3 and were advised not to have sexual intercourse for two months. The results of first week, first month, and second month postoperative follow-up of the patients were normal. The implanted penile prostheses were activated at the end of the second month and observed to be functioning normally. In the first year follow-up, the patients were evaluated with patient assessment form of modified Erectile Dysfunction Inventory of Treatment Satisfaction (2) and it was found out that the patients could use the prostheses without any problem and that both patients and their partners were fully satisfied.

Discussion

Penile prostheses have improved parallel with the developments in technology, and the increase in their quality and reliability has provided less complications and more patient satisfaction leading to their frequent use in patients with erectile dysfunction.

There are three types of penile prostheses including semi-rigid (malleable, non-inflatable, non-hydraulic), mechanic and inflatable (inflatable, hydraulic) ones. The advantages of semi-rigid prostheses include easy implantation, the patient not being dependent on hand skill, low risk of mechanic failure, and being cheap; whereas the disadvantages include the penis being constantly firm not similar to normal erection and flaccidity, being difficult to conceal and having a high risk of erosion. Inflatable prostheses provide a more natural appearance to the penis when in flaccid state. They ensure rigidity as much as malleable prostheses do in erective state. Two distal pieces of two-piece inflatable prosthesis of AMS (Ambicor®) are made of rigid silicon. The cylinders of these prostheses are connected to a scrotal pump. When this pump which is implanted into the intrascrotal cavity is activated, the fluid transfers from mid-section of the cylinder into the central chambers and form rigidity. The prosthesis is deflated when the mid-section of the prosthesis is bent and the fluid moves

Figure 2. Both cavernous corpus were dilated together and the prosthesis was implanted

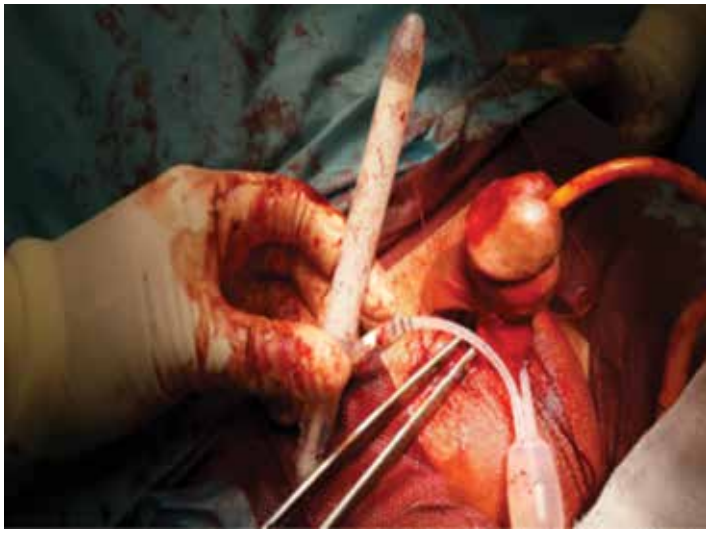

Figure 1. Both cavernous corpus were dilated together and the prosthesis was implanted

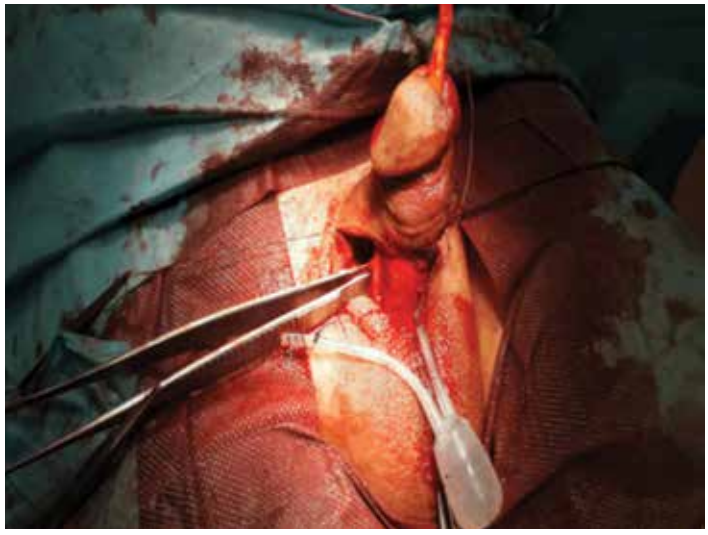

Figure 3. One piece of the prosthesis formed with the help of hemoclips by cutting the intracavernosal septum was implanted into the penis

back to the cylinder reservoirs. Three-piece inflatable prostheses are more sophisticated devices than semi-rigid prostheses with higher patient satisfaction. However, the disadvantages of these devices include the probability of mechanical failure and using more complex operative techniques during implantation. These devices consist of two cylinders implanted into the cavernous tissue; a pump placed into the scrotum, and a reservoir implanted into the Retzius cavity or the peritoneum (3). Three-piece prostheses are softer than semi-rigid or two-piece prostheses and they have a cosmetically better appearance in deflated state.

Even though patient and partner satisfaction is as high as 97% after penile prosthesis implantation, important complications seen in the perioperative and postoperative periods show that prosthesis implantation is a critical operation (4,5,6). The most important complications seen in the perioperative period is related to the urethra, bladder and bowel. Urethral injuries occur during the dilatation of the corpus cavernosum. Bladder and bowel injuries can occur during the implantation of the reservoir into the Retzius cavity blindly. Laparotomy and cystoscopy may be needed in these types of injuries (7). In addition, other complications, such as cavernous perforation, mechanical dysfunction, malposition, constant pain, and erosion can be seen. In the postoperative period, infection that can be encountered in 1.7-15% of patients is an important complication requiring the removal of the prosthesis (8,9).

There are some cases in which two-piece Ambicor prostheses are preferred. These cases include patients having radical prostatectomy or cystoprostatectomy performed, patients whose Retzius cavity is peritonealized and whose reservoir is likely to cause erosion to the adjacent organs, patients who had undergone or who are still a candidate for renal transplantation, patients having bilateral inguinal herniography performed (especially the ones using mesh), and patients who are candidates for penile prosthesis implantation due to erectile dysfunction caused by spinal cord damage. In these patients, enough space cannot be provided for the reservoir, resulting in spontaneous deflation of the prosthesis (10).

Penile prosthesis implantation can be performed in Peyronie's disease accompanied by erectile dysfunction. Tunica albuginea incision and excision can be used in cases with serious curvature and plaque. Sliding technique, where tunical excision and grafting are performed on dorsal-ventral penis, has been described in patients whose corpus cavernosum is short and has been modified to become suitable for penile length prosthesis implantation (11). The studies on this issue in the literature are on cases that are accompanied by Peyronie's disease (11,12,13,14,15). Peyronie's disease did not accompany in our cases, however, only one of the cylinders of the prosthesis could be implanted due to the fact that the penile length of our cases was short and the diameter of the corpus cavernosum was totally insufficient. Using grafting techniques in patients in whom the diameter of corpus cavernosum is totally insufficient is non-effective for the use of the prosthesis and is a risky situation in terms of its technical application. Therefore, one piece of a two-piece penile prosthesis can be disconnected and inflated and be used as a one-piece penile prosthesis with high success and satisfaction rates.

In our clinic, during the operation of two patients suitable for two-piece Ambicor® penile prosthesis implantation, it was observed that the penile corpus cavernosum was small in size and diameter. The smallest size of two-piece Ambicor® penile prosthesis was tried to be implanted into the corpus cavernosum implanted into the corpus cavernosum dilated with bougie, however, it was not possible. Implanting semi-rigid or three-piece inflatable penile prosthesis was considered, but it could not be implanted as it was not covered by the social security institution. Accordingly, by blocking it with hemoclips, we cut the tube of one of the cylinders of the two-piece Ambicor® penile prosthesis which was implanted into the cavernous tissue. A one-piece inflatable Ambicor® penile prosthesis was obtained ultimately and it could be easily implanted into the dilated penile cavernous tissues by impairing in the intracavernosal septum. During the operation, it was observed that the activated prosthesis provided sufficient rigidity in the penis and maintained a position comfortably inside the penis. During the follow-up, the patients stated that they were using the prostheses effectively and with high satisfaction which ultimately demonstrated that this method could be applied easily with Ambicor® two-piece penile prostheses in compulsory cases.

Prosthesis implantation is a method that can be employed with high satisfaction levels in suitable patients. Explaining the types of prosthesis, implantation methods, potential complications, and the advantages and disadvantages of the prosthesis to be implanted to the patient and the partner preoperatively can eliminate the problems regarding patient and partner satisfaction which will be encountered in the postoperative period. While choosing either semi-rigid or inflatable prostheses, we are of the opinion that it would be beneficial to use the products of reliable brands that employ advanced technology in order to reduce complication risks. Besides, it will be more appropriate if the patient and the physician decide on the type of the prosthesis by considering the socio-cultural quality and economic level of the patient.

Both cases presented in this study were patients with organic erectile dysfunction and insufficient penis size and diameter, in whom two-piece Ambicor® prosthesis implantation was not possible. In patients with a small penis, in whom two-piece Ambicor® prosthesis implantation is planned, this method can be performed successfully if it is mandatory. While deciding on penile prosthesis implantation and during the procedure, it would be wise for the urologist to take these possibilities into consideration.

Ethics

Informed Consent: Consent form was filled out by all participants.

Peer-review: Internal peer-reviewed.

Authorship Contributions

Surgical and Medical Practices: Fatih Akdemir, Önder Kayıgil, Emrah Okulu, Concept: Fatih Akdemir, Önder Kayıgil, Emrah Okulu, Design: Fatih Akdemir, Önder Kayıgil, Emrah Okulu, Data Collection or Processing: Fatih Akdemir, Önder Kayıgil, Literature Search: Fatih Akdemir, Önder Kayıgil, Writing: Fatih Akdemir, Önder Kayıgil.

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J Urol Surg 2016;4:148-152

Andrology

doi: 10.4274/jus.2016.03.031

Re: Penile Low Intensity Shock Wave Treatment is able to Shift PDE5i Nonresponders to Responders: A Double-Blind, Sham Controlled Study

Kitrey ND[1], Gruenwald I[2], Appel B[2], Shechter A[3], Massarwa O[2], Vardi Y[4]

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J Urol 2016;195:1550-1555.

EDITORIAL COMMENT

The therapeutic mechanism of extracorporeal low-intensity shock wave treatment (LIST) is not clear yet, but the acoustic energy of LIST stimulates the penile tissue by causing micromechanical effects and microtrauma. Animal studies have shown that shock wave energy improved nerve stimulated erection in diabetic rats, increased the endothelial content of penile tissue, improved the smooth muscle content, and up-regulated the expression of growth factors (1-2). In this study, the authors investigated the effect of LIST in patients with severe erectile dysfunction who are PDE5i nonresponders and compared with sham controls. The median change in International Index of Erectile Function-Erectile Function score and Erection Hardness Score was significantly high in treatment group compared to sham group. In conclusion, LIST treatment is effective in patients with severe erectile dysfunction. The accumulation of clinical data on LIST may alter the algorithm of erectile dysfunction treatment in near future.

Emre Bakırcıoğlu, MD

Andrology

doi: 10.4274/jus.2016.03.032

Re: Use of Testicular Versus Ejaculated Sperm for Intracytoplasmic Sperm Injection Among Men with Cryptozoospermia: A Meta-analysis

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Fertil Steril 2016;105:1469-1475.e1

EDITORIAL COMMENT

In this meta-analysis, the authors compared outcomes of intracytoplasmic sperm injection (ICSI) using ejaculated versus testicular sperm in men with cryptozoospermia. They also assessed the number of oocytes and maternal and paternal ages. The analysis of a total of 272 ICSI cycles and 4,596 injected oocytes in 5 cohort studies included. Pregnancy and fertilization rates were not statistically different between testicular and ejaculated sperm groups. Although maternal age and paternal age were higher in testicular sperm group, there was no significant difference in the number of oocytes retrieved between the groups. In conclusion, the meta-analysis of 5 studies showed no better pregnancy outcome using testicular sperm for ICSI compared to ejaculated sperm in men with cryptozoospermia.

Emre Bakırcıoğlu, MD

doi: 10.4274/jus.2016.03.033

Re: Surgery Versus Radiotherapy for Clinically-localized Prostate Cancer: A Systematic Review and Meta-analysis

Wallis CJ[1], Saskin R[2], Choo R[3], Herschorn S[4], Kodama RT[4], Satkunasivam R[4], Shah PS[5], Danjoux C[6], Nam RK[7]

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Eur Urol 2016;70:21-30. doi: 10.1016/j.eururo.2015.11.010.

EDITORIAL COMMENT

Radical treatment options for patients with clinically-localized prostate cancer include radical prostatectomy and radiotherapy. Since there is no level 1 evidence comparing the efficacy of these two modalities, Wallis and coworkers conducted a systematic review and meta-analysis to compare the data on overall and prostate cancer-specific survival among patients treated with radiotherapy or radical prostatectomy for clinically-localized prostate cancer. Nineteen studies were selected and up to 118.830 patients were pooled. Of note, only two studies provided "dose-escalated" external beam radiotherapy treatments to all radiotherapy patients. The risk of overall (10 studies, aHR 1.63, 95% confidence interval 1.54-1.73, $p<0.00001$; $I^2=0\%$) and prostate cancer-specific (15 studies, aHR 2.08, 95% confidence interval 1.76-2.47, $p<0.00001$; $I^2=48\%$) mortality were higher for patients treated with radiotherapy compared with those treated with surgery. Subgroup analyses by risk group, radiation regimen, time period, and follow-up length did not alter the direction of results. They concluded that radiotherapy for prostate cancer is associated with an increased risk of overall and prostate cancer-specific mortality compared with surgery based on observational data. The methodological limitations of observational studies should be considered while interpreting the results. The ProtecT trial and SPCG-15 trial comparing radical prostatectomy to radiotherapy among patients with low/intermediate and high-risk cancer respectively are awaited.

Özgür Yaycıoğlu, MD

doi: 10.4274/jus.2016.03.034

Re: Current Standard Technique for Modern Flexible Ureteroscopy: Tips and Tricks

Giusti G[1], Proietti S[2], Villa L[3], Cloutier J[4], Rosso M[1], Gadda GM[1], Doizi S[4], Suardi N[1], Montorsi F[5], Gaboardi F[1], Traxer O[4]

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Eur Urol 2016;70:188-194.

EDITORIAL COMMENT

The prevalence of urinary stone disease is increasing worldwide. The dissemination of the clinical use of the ultrasound has increased the rate of diagnosis of stones at an earlier stage, thus, has increased the expansion of the indications for flexible ureterorenoscopy (fURS). With the advancements in flexible ureteroscopy (FU), more successful outcomes are being reported. The most recent EAU guidelines state that fURS can be the first choice of treatment for all stones smaller than 2 cm. Especially for the lower pole stones, the stone-free rate is better than that with extracorporeal shock wave lithotripsy. For stones larger than 2 cm, staged procedures may be necessary. This paper recommends a standardized technique for fURS which is aimed to decrease the rate of possible complications and increase the success rate. Endourological techniques are widely adopted by most of the urological surgeons, hence fURS is an expansion of our surgical armamentarium. In this paper, an experienced group recommended some tips and tricks for each step of the procedure.

The authors recommended general anesthesia over spinal anesthesia for two reasons: larger tidal volume during spinal anesthesia may cause movement, which can make the procedure harder. Secondly, the duration of the spinal anesthesia may be too short for some cases.

Placement of ureteral access sheath (UAS) should be done under fluoroscopic guidance and proper force should be applied. Ideally, the distal tip of the UAS should be just below the ureteropelvic junction.

For preventing functional deterioration of the FU, the tip of the laser probe should be out of the scope as far as one-quarter of the screen diameter. For preventing excessive prolonged deflections, the stones in the lower pole should be repositioned in order to allow a more straight working channel.

Pulverization of the stone is preferred over fragmentation since it decreases the operative time and risk of injury during removal of the fragments. A power setting of low frequency (10-15 Hz) and high energy (1-2 J) is recommended for kidney stones. It is advised to keep the laser tip 1-2 mm to the stone and start from the outer part of the stone rather than causing holes and tunnels in the center, which leads to larger fragments. The use of small fiber diameters (200-275 nm) is recommended. However, since they are more prone to fiber degradation, it should be cleaved at each 10 minutes of firing with a simple metallic scissor by protruding from the tip of the FU without removing and replacing the laser probe.

When extraction of fragments is necessary, zero tip nitinol baskets are recommended.

The most important exit strategy is endoscopic inspection of the ureter wall during the removal of UAS by keeping the tip of the scope a few centimeters out of the UAS. Routine stenting whenever a UAS has been used is recommended. When the surgery is uneventful, and the endoscopic examination of the ureter seems normal, short-term stenting is offered.

Emre Selçuk Keskin, MD

Endourology

doi: 10.4274/jus.2016.03.035

Re: Renal and Adrenal Minilaparoscopy: A Prospective Multicentric Study

Breda A[1], Castellan P[1], Freitas RA[1], Schwartzmann I[1], Álvarez Osorio JL[2], Amón-Sesmero JH[3], Bellido JA[4], Ramos E[5], Rengifo D[6], Peña JA[1], Villavicencio H[1]

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Urology 2016;92:44-50.

EDITORIAL COMMENT

The authors evaluated the role of minilaparoscopy (ML) in renal and adrenal surgery in 6 laparoscopic surgical centers by collecting data with a common database in a prospective manner. One-hundred ten patients (73 males and 37 females) were included during the study period consisting of 59 nephrectomy (40 radical nephrectomy, 12 simple nephrectomy, 7 living donor nephrectomy), 20 partial nephrectomy, 9 nephroureterectomy, 13 pyeloplasty, 3 pyelolithotomy, and 6 adrenalectomy. Standard approach was defined as 3 to 4 3-mm trocars with a 3-mm laparoscope and 3-mm instruments. Overall mean operative time was 180±64 minutes, with estimated blood loss of 120±50 mL. Eleven cases required an additional 5-10 mm port, one case of conversion to 5-mm trocars and a single case conversion to open surgery. Intraoperative complication rate was 5.4% (n=6) and postoperative complication rate was 28% (n=31) which are similar to standard laparoscopy series. With regard to the Clavien-Dindo classification, 71% was grade 1, 6% - grade 2, 20% - grade 3 and a single case was grade 4. No mortality was reported. Average hospitalization time was 5±2.2 days and transfusion rate was 5.4%. Considering the role of ML in most urological surgical procedures, the present study provides valuable data for the feasibility and reproducibility of this evolving technique. Further prospective randomized studies will better help for standardization of this technique for everyday clinical practice.

Ozan Bozkurt, MD

Basic Science

doi: 10.4274/jus.2016.03.036

Re: The Role of MicroRNA in Castration-Resistant Prostate Cancer

Thieu W, Tilki D, deVere White RW, Evans CP

University of California Davis Medical Center, Clinic of Urology, and UC Davis Comprehensive Cancer Center, California, USA

Urol Oncol 2014;32:517-523.

EDITORIAL COMMENT

Castration-resistant prostate cancer (CRPC) arises when hormone refractory prostate cancer growth occurs in a castrate androgen level environment. Although the mechanism is not fully understood, the androgen receptor (AR) has emerged as an important target for therapy for metastatic prostate cancer. MicroRNA (miRNAs) are small non-coding 21 to 23 nucleotide base pair RNA molecules that serve as transcriptional and post-transcriptional regulators of gene expression. Recently, miRNAs have been at the forefront of urological oncology attention with more than 40 miRNAs implicated in urologic cancers that target common carcinogenic pathways providing novel opportunities to develop strategies for prognosis and therapy. Recently, in the literature, there are many studies about miRNAs-cancer connection, potential diagnostic, prognostic or therapeutic roles of miRNAs as possible biomarkers in CRPC, miRNA role in the relationship of AR with CRPC. Especially, miR-30 has been a focus of interest in CRPC due to its involvement with the Src tyrosine kinase pathway and potential to direct Src inhibitor therapy. In some studies, it has been shown that overexpression of the miR-30 inhibits growth, invasion and migration of CRPC cells. The excitement behind the discoveries of the repressive effects of miRNAs on CRPC tumors opens a potential avenue for future therapeutics from the current search for a novel biomarker.

Fehmi Narter, MD

doi: 10.4274/jus.2016.03.037

Re: Epigenetics of Cellular Reprogramming

Krishnakumar R, Blelloch RH

Eli and Edythe Broad Center of Regeneration Medicine and Stem Cell Research, Center for Reproductive Sciences and Clinic of Urology, University of California San Francisco, California, USA

Curr Opin Genet Dev 2013;23:548-555.

EDITORIAL COMMENT

Cells have some specific molecular and physiological properties that act their functional process. However, many cells have an ability of efficient transition from one type to another. This ability is named plasticity. This process occurs due to epigenetic reprogramming that involves changes in transcription and chromatin structure. Some changes during reprogramming that have been identified in recent years as genomic demethylation (both histone and DNA), histone acetylation and loss of heterochromatin during the development of many diseases such as infertility and cancer progression. In this review, the authors focused on the latest work addressing the mechanisms surrounding the epigenetic regulation of various types of reprogramming, including somatic cell nuclear transfer, cell fusion and transcription factor- and microRNA-induced pluripotency. There are many responsible factors such as genes, cytokines, proteins, co-factors (i.e. vitamin C) in this local area network. The exact mechanisms by which these changes are achieved and the detailed interplay between the players responsible, however, remain relatively unclear. In the treatment of diseases, such as infertility, urooncology, reconstructive urology, etc., epigenetic changes and cellular reprogramming will be crucial in the near future. Central to achieving that goal is a more thorough understanding of the epigenetic state of fully reprogrammed cells. By the progress of researches on this topic, new treatment modalities will be identified for these diseases.

Fehmi Narter, MD

doi: 10.4274/jus.2016.03.038

Re: Prospective Pilot Study of Mirabegron in Pediatric Patients with Overactive Bladder

Blais AS, Nadeau G, Moore K, Genois L, Bolduc S

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Eur Urol 2016;70:9-13. doi: 10.1016/j.eururo.2016.02.007. Epub 2016 Feb 11.

EDITORIAL COMMENT

Overactive bladder (OAB) is a highly prevalent disorder in the pediatric population. This event negatively affects and impairs children's development. Antimuscarinics are the mainstay pharmacological management of OAB, but their side effects profile limits their use. Mirabegron, a new molecule with a distinct mechanism of action (b3-adrenoreceptor agonist), was recently approved as monotherapy for idiopathic OAB in adults but has not been studied in the pediatric population. Blais et al. have evaluated the efficacy and safety of mirabegron in the treatment of urinary incontinence in children with idiopathic OAB who were refractory to and/or intolerant of antimuscarinics. This prospective off-label study, using an adjusted-dose regimen of mirabegron (25-50 mg), included pediatric patients with refractory urinary incontinence due to OAB. Patients without symptom improvement or with partial response under intensive behavioral protocol and medical therapy (at least two different antimuscarinic agents) were included in the study. Their primary outcome was better reported efficacy than with the use of prior anticholinergic medication. Secondary end points were tolerability and safety. Families were questioned for continence, side effects, compliance, and Patient Perception of Bladder Condition (PPBC) questionnaire. A total of 58 patients (14 girls, 44 boys) were enrolled in a mirabegron open-label trial. The median age at initiation of mirabegron was 10.1 years [interquartile range (IQR): 8.8-13.5]. The median duration of treatment was 11.5 months (IQR: 6.0-15.0). The median bladder capacity improved from 150 ml to 200 ml ($p<0.001$). Continence improved in 52 of 58, with 13 being completely dry. The median PPBC score improved from 4.0 to 2.0 ($p<0.001$). The authors also assessed the safety of mirabegron. All electrocardiogram and blood tests remained normal. No significant change in blood pressure (<5 mmHg) and heart rate (fewer than five beats per minute) was reported. Fifty patients (86%) did not report any side effects. A subgroup of 5 (9%) described mild side effects i.e. transient abdominal colic (2), constipation (2), and blurred vision (1). Three patients, however, (5%) discontinued the treatment because of side effects; one patient had significant nasopharyngitis, one patient had nausea, and one had a change in behavior (as if his attention deficit hyperactivity disorder treatment was no longer effective). As a result, mirabegron, a novel first-in-class therapy, appears to be a safe alternative for children with idiopathic OAB and allows improvement of symptoms in patients refractory to antimuscarinics. Absence of a placebo group was a limitation of the study. However, patients had already failed two trials of medication, decreasing the likelihood of a placebo effect.

Sinharib Çitgez, MD

PATHOLOGY PAGE

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Journal of Urological Surgery 2016; 3: 153-154

Intraductal Carcinoma of the Prostate

Prostatın İntraduktal Karsinomu

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Introduction

Intraductal carcinoma of the prostate (IDC-P) is a term that refers to prostatic adenocarcinoma extending into and proliferating within preexisting prostatic ducts or acini (1). It is often associated with high-grade invasive prostatic adenocarcinoma and is also an adverse prognostic marker (1,2,3).

The histologic differential diagnosis of IDC-P on prostate needle biopsy includes high-grade prostatic intraepithelial neoplasia (HGPIN), invasive cribriform prostatic adenocarcinoma, prostatic ductal adenocarcinoma, and urothelial carcinoma extending into prostatic ducts. Diagnostic reproducibility is low in the category of intraductal lesions of the prostate (4) whereas, accurate diagnosis is crucial for patient management. When IDC-P is accompanied by invasive carcinoma, it is associated with higher grade and higher stage cancer. Isolated IDC-P (IDC-P unaccompanied by invasive cancer) on needle biopsy is generally associated with high-grade invasive prostatic adenocarcinoma on subsequent radical prostatectomy (2,4). IDC-P requires either definitive therapy or prompt rebiopsy. In contrast, HGPIN is considered a preneoplastic lesion; its presence does not require definitive therapy and in limited quantities, does not require rebiopsy. If urothelial carcinoma extending into prostatic ducts is identified on needle biopsy, radical cystoprostatectomy is recommended. Usual (acinar) prostatic adenocarcinoma and prostatic ductal adenocarcinoma are treated in the same manner and require definitive treatment.

Histologically, IDC-P is characterized by malignant epithelial cells filling and expanding nonneoplastic prostatic ducts and acini with at least partial preservation of an identifiable basal cell layer. Five patterns have been described: solid, dense cribriform, loose cribriform, micropapillary, and flat (rare). There is often marked nuclear atypia and frequent mitotic activity or comedonecrosis.

IDC-P and HGPIN share many cytological features, such as nuclear enlargement and hyperchromasia, and prominent nucleoli (4). Furthermore, both lesions can show loose cribriform and micropapillary patterns. In contrast to IDC-P, HGPIN lacks solid or dense cribriform patterns, rarely have comedonecrosis, and lacks marked pleomorphism. In HGPIN, very focal comedonecrosis may be seen, but nonfocal comedonecrosis is not observed (1). The outlines of prostatic ducts with HGPIN are usually smooth with rounded contours, in contrast to irregular outlines in IDC-P (5).

The morphologic distinction between IDC-P and cribriform prostatic acinar adenocarcinoma can be difficult. Cribriform prostatic acinar adenocarcinoma lacks the branching glands often seen in IDC-P and the identification of basal cells on immunostaining for basal cell markers serves to distinguish IDC-P from invasive prostatic carcinoma.

Intraductal spread of urothelial carcinoma is an important mimicker of solid IDC-P. Solid IDC-P is often associated with cribriform patterns elsewhere, which is not seen with intraductal spread of urothelial carcinoma (4). Greater nuclear pleomorphism, increased mitotic activity, and stromal inflammation favor intraductal spread of urothelial carcinoma (1). Furthermore, in intraductal spread of urothelial carcinoma, tumor cells are negative for prostate-specific antigen and prostate-specific acid phosphatase, and usually positive for p63 and high-molecular-weight cytokeratin.

The cribriform pattern of prostatic ductal adenocarcinoma is most likely to be confused with IDC-P. Prostatic ductal adenocarcinoma has cribriform glands with large, slit-like lumina, tall columnar tumor cells, papillary fronds with true vascular cores and usually lacks basal cells.

In conclusion, the differential diagnosis of intraductal lesions of the prostate on core needle biopsy is not always straightforward, but because of both therapeutic and prognostic implications, accurate diagnosis is crucial.

Keywords

Intraductal carcinoma, prostate, differential diagnosis

Anahtar Kelimeler

İntraduktal karsinom, prostat, ayırıcı tanı

Ethics

Peer-review: Internal peer-reviewed.

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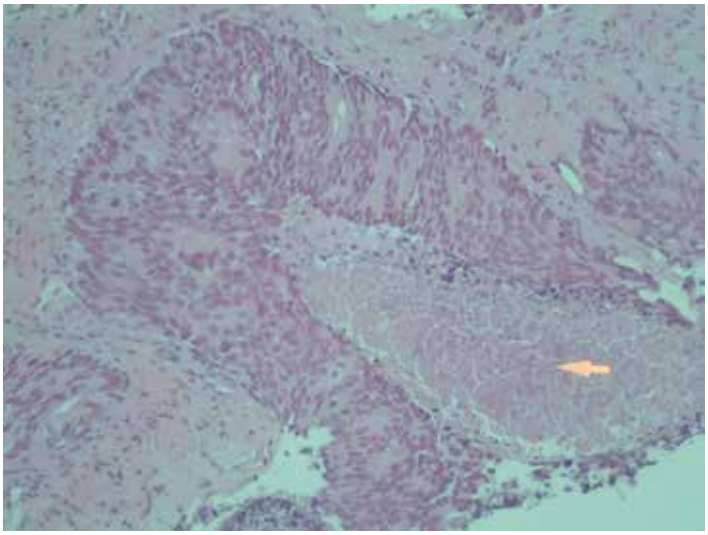

Figure 1. Intraductal carcinoma of the prostate showing comedonecrosis in a large duct (H&E x200)

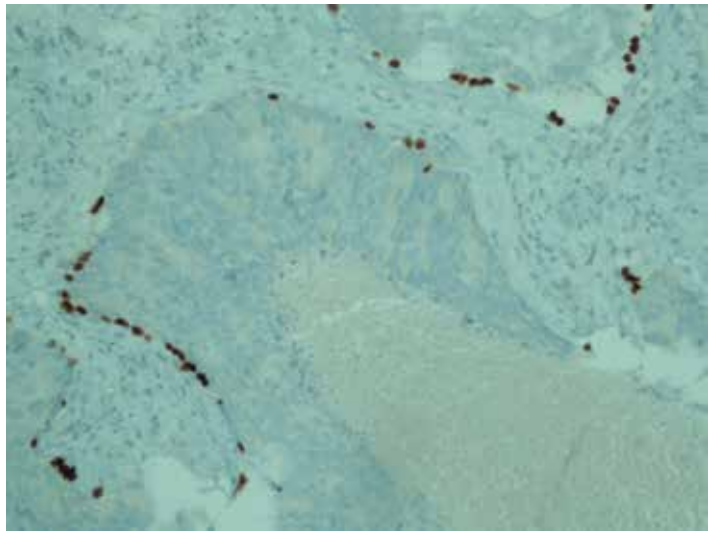

Figure 2. The large duct shows the presence of basal cells on immunostaining for p63 (x200)

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