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Original Research / Özgün Araştırma

Safety and effectivity of open simple prostatectomy in octogenarians: A single center experience

Açık basit prostatektominin seksenliklerde güvenilirlik ve etkinliği: Tek merkez deneyimi

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Özet

Amaç: Bu çalışma ile 80 yaşından büyük hastalarda açık simple prostatektominin (ASP) güvenilirliğinin ve etkinliğinin araştırılması amaçlandı.

Gereç ve Yöntemler: Ocak 2012-Ocak 2018 tarihleri arasında merkezimizde ASP uygulanan hastalar bu çalışmanın hedef kitlesini oluşturmuştur. Hastalar, tüm kohort üç yaş grubuna bölünerek değerlendirilmiştir: 50-64, 65-79 ve ≥80. Çalışma grupları demografik özellikler, ameliyat öncesi klinik veriler, operasyonel parametreler, ameliyat sonrası birinci ay ve üçüncü ay üroflowmetrik veriler ve kısa dönem komplikasyon oranları açısından karşılaştırıldı.

Bulgular: Ameliyat öncesi dirençli akut üriner retansiyon ve üretral kateterizasyon oranları, ≥80 yaş grubunda olanlarda diğer hasta gruplarına göre anlamlı derecede yüksekti. Gruplar intraoperatif tahmini kan kaybı, kan transfüzyonu, Clavien-Dindo Class≥3 komplikasyon oranları ve genel komplikasyon oranı açısından istatistiksel olarak benzerdi. Karşılaştırmalı analiz, kateterizasyon süresinin Grup 2 ve 3'te Grup 1'e göre anlamlı olarak daha uzun olduğunu gösterdi (p=<0,001). Hastanede kalış süresi de Grup 3'teki hastalarda Grup 1'deki hastalara göre anlamlı olarak daha yüksekti (p=0,003). Postoperatif 3. ay IPSS değeri Grup 3'de diğer gruplara göre daha yüksek izlenmiştir (p=0.042).

Sonuç: ASP, ≥80 yaş grubunda olanlarda etkili ve güvenli bir cerrahi tedavi yöntemi olmasına rağmen, kateterizasyon süresi, hastanede kalış süresi ve IPSS skorları açısından etkinliği diğer gruplara göre sınırlıdır. ASP öncesinde işleme

Abstract

Objective: This study aimed to investigate the safety and effectiveness of open simple prostatectomy (OSP) in patients older than 80 (i.e., octogenarians).

Material and Methods: Patients who underwent OSP in our center between January 2012 and January 2018 constituted this study's target population. The patients were evaluated by dividing the entire cohort into three age groups: 50-64, 65-79, and ≥80. The study groups were compared regarding demographic features, preoperative clinical data, operative parameters, postoperative first-month and third-month uroflowmetric data, and short-term complication rates.

Results: Preoperative persistent acute urinary retention and urethral catheterization rates were significantly higher in octogenarians than in the other patients. The groups were similar concerning intraoperative estimated blood loss, blood transfusion rates, Clavien-Dindo Class≥3 complication rates and the general complication rate statistically. The comparative analysis revealed that the duration of catheterization was significantly longer in Group 2 and 3 than Group 1 (p=<0.001). The length of hospital stay was also significantly higher in octogenarians than the patients in Group 1 (p=0.003). Postoperative third-month IPSS valuee were significantly higher in octogenarians compared to the other groups (p=0.042).

Conclusion: Although OSP is an effective and safe surgical treatment method in octogenarians, its effectiveness is limited compared to other

The study was approved by University of Health Sciences Ethics Committee (Approval number: 2020-22-23, Date: 2020/11/02). All research was performed in accordance with relevant guidelines/regulations, and informed consent was obtained from all participants.

bağlı morbidite ve mortalite oranlarını azaltmak için her hasta bireyselleştirilmiş bir yaklaşımla yönetilmelidir.

Anahtar Kelimeler: Benign prostat hiperplazisi, Açık simple prostatektomi, Seksenlikler

groups in terms of urethral catheter duration, length of hospital stay and IPSS scores. Before OSP, each patient should be managed by an individualized approach for lowering the procedure-related morbidity and mortality rates.

Keywords: Benign prostatic hyperplasia, Open simple prostatectomy, Octogenarians

INTRODUCTION

Benign prostatic hyperplasia (BPH) is the most common cause of lower urinary tract symptoms (LUTS) in male patients older than 50(1). Among the patients with BPH, approximately 30% necessitate surgical interventions due either to BPH-related complications or its impact on the patient's quality of life (2). The European Association of Urology (EAU) guidelines recommend open simple prostatectomy (OSP) as a surgical treatment option in patients suffering from LUTS who has a prostate volume of higher than 80 ml (3).

Open simple prostatectomy has gained popularity since it gives the surgeon the chance to remove a considerable amount of adenomatous tissue with favorable post-surgical outcomes in both short and long terms (4-7). It was also reported that the reoperation rates were relatively lower. However, it is widely accepted that OSP can cause significant blood loss, require a blood transfusion and relatively long duration of hospital stay and recovery period (8,9). Since elderly patients are vulnerable to postoperative adverse events, they should be given special attention during and after the OSP procedure (10).

Although it is known that the incidence of BPH increases with aging, the potential impact of aging on the efficacy and safety of OSP has not been widely investigated (11,12). Since average life expectancy is increasing worldwide, the possibility of encountering an octogenarian patient afflicted by medical treatment-resistant LUTS with a high prostate volume is also increasing. Thus, this study aimed to compare the success and safety of OSP between patients who are older than 80 (i.e., octogenarians) and those who are relatively younger.

MATERIAL AND METHODS

This study was approved by the Ethical Review Committee of our institution (2020/467). Data of the patients who underwent OSP in our center between January 2012 and January 2018 were retrospectively reviewed. Patient using anticoagulants and antiaggregants, patients who had a history of prostate or urethra surgeries, those who had an urodynamically-approved diagnosis of neurogenic voiding dysfunction, and those with prostate cancer were excluded. Patients with incomplete follow-up data were also omitted.

All patients underwent a general medical and standard urological evaluation preoperatively. The latter included a digital rectal examination (DRE), urinalysis, transrectal ultrasonography (TRUS) and prostate volume (PV) measurement, analysis of prostate-specific antigen (PSA), maximum flow rate (Qmax), post-voiding residual urine volume (PVR) and IPSS (International Prostate Symptom Score) assessments. The prostate volumes were measured by TRUS, and Qmax values were analyzed by uroflowmetry. Since we believed that the measurements performed immediately after voiding in the toilet would give more accurate results than the measurements performed after uroflowmetry, we preferred the former approach for PVR assessments. A portable bladder scanner was used in order to calculate the residual urine volume.

Recurrent acute urinary retention (AUR) or urinary tract infections, prostate-related macroscopic hematuria, medical treatment-resistant LUTS, renal functional deterioration due to BPH were considered indications of OSP in the presence of a PV higher than 80 ml.

All OSP procedures were performed using the transvesical (i.e., Freyer's) technique by postgraduate year 4 and 5 urology residents under urology specialists' supervision (13). Continuous bladder irrigation was initiated immediately after insertion

of a 22F 3-way Foley catheter following enucleation of the prostate and bleeding control. A non-suction drain was inserted before closure. The drain was removed once the daily discharge was less than 100 cc per day. Duration of surgery and estimated blood loss (EBL) were obtained from recorded in patient folders. Hemoglobin (Hgb) and hematocrit (Hct) drops were calculated as taking the difference between the pre-operative levels and postoperative lowest levels. The decision regarding blood transfusion was given based on EBL and Hgb or Hct drops. Patients who developed anemia symptoms or hemodynamic instability were given blood transfusions regardless of the laboratory parameters. EBL, Hgb and Hct levels. The Foley catheters were removed at post-operative fifth day once the urine output was clear, and patients were discharged after ensuring that the patient could void spontaneously. The complications were categorized based on Clavien-Dindo classification. Histopathological assessment reports of all patients were obtained from recorded in patient folders. The Qmax and PVR were measured during the first month, and the IPSS questionnaire was performed during the third-month outpatient clinic encounter.

Patients were grouped based on their age: Group 1 included patients older than 50 and younger than 65, Group 2 consisted of patients between the ages of 65 and 80, while Group 3 included those aged ≥80 (i.e., octogenarians). Study groups were compared regarding demographic and clinical preoperative features, duration of the procedure, EBL, the weight of the specimen, Hgb drop, Hct drop, blood transfusion rate, overall complication rate, Clavien-Dindo Class 3 or higher complication rate, duration of drain output, catheterization and hospital stay, postoperative Qmax, PVR and IPSS.

Statistical Analysis

Categorical variables were presented as numbers and percentages, while continuous variables were given as means and standard deviations. The normal distribution of the continuous variables was tested by the Kolmogorov-Smirnov Shapiro-Wilk test. Means of the multiple groups with normal and non-normal distributions were compared using Analysis of Variance (ANOVA) and Kruskal-Wallis tests. The Tukey HSD test was performed for post-hoc analysis when the ANOVA revealed a significant difference. The Tamhane's T2 test was used when the Kruskal-Wallis test gave significant results. The rates of categorical variables were compared using Pearson chi-square and Fisher's exact tests. The statistical analyses were performed by Statistical Package for Social Sciences (SPSS v21, IBM SPSS Statistics; IBM Corp., Armonk, NY).

RESULTS

Our retrospective review revealed that 255 patients underwent OSP during the study period. After the application of inclusion and exclusion criteria, 178 patients were included. Among these patients, 42 were in Group 1 (i.e., aged between 50 and 65), 96 in Group 2 (i.e., aged between 65 and 80), and 40 in Group 3 (i.e., age≥80). Demographic and clinical data of the study patients are displayed in Table 1.

The rate of patients with ASA score of 3 was 7,1%, 18,8% and 27,5% in Group 1, 2 and 3, respectively (p=0.054). The rate of hypertension was significantly higher in Group 2 and Group 3 (i.e., octogenarians) than compared to Group 1 (p=0.014; Table 2). Although there was no difference between the groups regarding preoperative serum PSA levels, the rate of prostate biopsy rate was significantly higher in Group 1 and Group 2 than in compared to octogenarians. On the other hand, preoperative persistent AUR frequencies were significantly higher in octogenarians compared to others. Mean preoperative Qmax values were 5.57 ± 1.51, 6.84 ± 3.93 and 5.95 ± 2.04 ml/s in Group 1, Group 2 and Group 3, respectively. The mean PVR values were calculated as 136 ± 34, 137 ± 34, and 156 ± 29 in Group 1, Group 2, and Group 3, while the mean IPSS scores were 21.8 ± 4.37 in Group 1, 21.0 ± 6.41 in Group 2, and 22.5 ± 4.43 in Group 3 (Table 2).

There was no significant difference between the groups concerning the duration of the procedure, EBL and specimen weight. The overall blood transfusion, complication and Clavien-Dindo Class≥3 complication rates were calculated as 13.5% (24/178), 24.1%, and

Table 1. Demographic data and clinical characteristics of the whole study population

Number of patients	178
Mean age ± SD, (yrs)	65.8 ± 7.53
Mean BMI ± SD, (kg/m^2)	27.1 ± 3.73
ASA score, n(%)	
ASA 1	58 (32.6)
ASA 2	88 (49.4)
ASA 3	32 (18.0)
HT, n(%)	37 (20.8)
DM, n(%)	20 (11.2)
Mean PSA ± SD, (ng/ml)	8.33 ± 5.84 7.9 ± 3.1
Mean TRUS PV ± SD, (cm^3)	140 ± 45
Median lob, n(%)	69 (38.8)
Preop prostate biopsy, n(%)	105 (59.3)
Bladder diverticulum, n(%)	9 (5.1)
Bladder stone, n(%)	59 (33.1)
Preop urethral catheter dependency, n(%)	75 (42.1)
History of AUR, n(%)	106 (59.6)
Mean preop Qmax ± SD, (ml/s)	6.41 ± 3.30
Mean preop PMRV ± SD, (ml)	146 ± 135 141 ± 33
Mean preop IPSS ± SD	21.9 ± 5.74
Mean OT ± SD, (min)	120 ± 44
Mean EBL ± SD, (ml)	553 ± 334
Mean specimen weight ± SD, (g)	106 ± 58
Transfusion, n(%)	24 (13.5)
Overall complication, n(%)	43 (23.9)
Clavien ≥ 3 complication, n(%)	12 (6.7)
Mean catheterization time ± SD, (days)	5.67 ± 1.10
Mean LOS ± SD, (days)	5.67 ± 1.48
Mean postop Qmax ± SD, (ml/s)	22.3 ± 7.95
Mean postop PVR ± SD, (ml)	6.75 ± 2.38
Mean postop IPSS ± SD	18.8 ± 13.8

SD, standart deviation; ***BMI,*** body massindex; ***ASA***, American Society of Anaesthesiology score; ***HT,*** hypertension; ***DM***, diabetes mellitus; ***PSA,*** prostate specific antigen; ***TRUS***, transrectal ultrasonography; ***PV***, prostate volume; ***AUR***, acute urinary retention; ***PVR***, post-voiding residual urine; ***IPSS,*** International prostate symptom score; ***OT,*** operative time; ***EBL***, estimated blood loss; ***LOS***, lenght of hospital stay

Table 2. Comparison of preoperative patient characteristics between the age groups

Variables	Groups			P value
	Group 1 (50-65)	Group 2 (65-79)	Group 3 (≥80 yrs)	
Number of patients	42	96	40	
Mean BMI, (kg/m²)	26.2 ± 3.45	27.2 ± 3.64	27.6 ± 4.17	0.211*
Mean ASA score ± SD	1.59 ± 0.62	1.87 ± 0.69	2.07 ± 0.69	0.007* 1 vs 3 0.005
ASA 3 score, n(%)	3 (7.1)	18 (18.8)	11 (27.5)	0.054 ¥
HT, n(%)	2 (4.8)	25 (26.0)	10 (25.0)	0.014 ¥ 1 vs 2 0.004 1 vs 3 0.01
DM, n(%)	4 (9.5)	13 (13.5)	10 (25.0)	0.120 ¥
Mean PSA ± SD, (ng/ml)	8.81 ± 6.29 8.2 ± 2.7	8.13 ± 6.22 8.0 ± 3.4	8.33 ± 4.29 7.47 ± 2.84	0.822* 0.532*
Mean TRUS PV ± SD, (cm³)	125 ± 30	141 ± 43	152 ± 57	0.141**
Median lob, n(%)	18 (42.9)	40 (41.7)	30 (44.8)	0.925 ¥
Preop prostate biopsy, n(%)	30 (71.4)	60 (63.2)	15 (37.5)	0.004 ¥ 1 vs 3 0.002 2 vs 3 0.006
Bladder diverticulum, n(%)	2 (4.8)	5 (5.2)	2 (5.0)	0.994 ¥
Bladder stone, n(%)	10 (23.8)	32 (33.3)	17 (42.5)	0.199 ¥
Preop urethral catheter dependency, n(%)	16 (38.1)	32 (33.3)	27 (65.5)	0.001 ¥ 1 vs 3 0.008 2 vs 3 <0.001
History of AUR, n(%)	22 (52.4)	51 (53.1)	33 (82.5)	0.004¥ 1 vs 3 0.008 2 vs 3 <0.001
Mean preop Qmax ± SD, (ml/s)	5.57 ± 1.51	6.84 ± 3.93	5.95 ± 2.04	0.698**
Mean preop PVR ± SD, (ml)	136 ± 34	137 ± 34	156 ± 29	0.558*
Mean IPSS ± SD	21.8 ± 4.37	21.0 ± 6.41	22.5 ± 4.43	0.609*
Mean hemoglobin ± SD, (g/dl)	14.2 ± 1.05	14.3 ± 1.34	14.1 ± 1.48	0.339**
Mean hematocrit ± SD, (%)	43.2 ± 2.82	43.1 ± 3.62	43.0 ± 3.88	0.959*

SD, standart deviation; **BMI**, body massindex; **ASA**, American Society of Anaesthesiology score; **HT**, hypertension; **DM**, diabetes mellitus; **PSA**, prostate specific antigen; **TRUS**, transrectal ultrasonography; **PV**, prostate volume; **AUR**, acute urinary retention; **PVR**, post-voiding residual urine; **IPSS**, international prostate symptom score
*One way **ANOVA**; ¥ Pearson Chi-Square; **Kruskal Wallis Test; &Fisher's Exact Test

6.7%, respectively. The groups were similar regarding blood transfusion rates, overall complication rates, the Clavien-Dindo Class≥3 complication rate, statistically (Table 3). The comparative analysis revealed that the duration of catheterization was significantly longer in Group 3 compared to groups 1 and 2 and 3 (p=<0.001). The length of hospital stay was also significantly higher in octogenarians compared to the patients in Group 1 (p=0.003). The mean postoperative first-month Qmax values were 21.3 ± 8.95 in Group 1, 23 ± 7.62 in Group 2, and 21.9 ± 7.66 in Group 3. The mean postoperative PVR values were 17.1 ± 13.3 in Group 1, 18.1 ± 8.78 in Group 2, and 22.3 ± 21.7 in Group 3. On the other hand, the mean postoperative third-month IPSS scores

Table 3. Intraoperative and postoperative outcomes of the patients stratified by age category

Variables	Groups			P value
	Group 1 (50-65)	Group 2 (65-79)	Group 3 (≥80 yrs)	
Number of patients	42	96	40	
Perioperative data				
Mean OT ± SD, (min)	123 ± 47	120 ± 45	116 ± 40	0.771*
Mean EBL ± SD, (ml)	496 ± 367	560 ± 345	596 ± 261	0.385*
Mean specimen weight ± SD, (g)	97.9 ± 29.6	109 ± 67.5	110 ± 59.7	0.834**
Postoperative data				
Mean hemoglobin drop ± SD	2.69 ± 1.63	2.57 ± 1.47	2.35 ± 1.24	0.570*
Mean hematocrit drop ± SD	8.49 ± 5.12	7.77 ± 4.49	7.33 ± 3.98	0.502*
Transfusion rate, n(%)	7 (16.7)	11 (11.5)	6 (15.0)	0.677¥
Overall complication, n(%)	9 (21.4)	23 (24.0)	11 (27.5)	0.812¥
Clavien ≥ 3 complication, n(%)	2 (4.8)	5 (5.2)	5 (12.5)	0.287¥
Mean drainage time ± SD, (days)	3.23 ± 1.58	3.64 ± 1.56	3.55 ± 1.43	0.360*
Mean catheterization time ± SD, (days)	5.21 ± 0.68	5.47 ± 1.08	6.25 ± 1.13	<0.001* 1 vs 2 0.235 1 vs 3 <0.001 2 vs 3 <0.001
Mean LOS ± SD, (days)	5.09 ± 1.20	5.70 ± 1.47	6.20 ± 1.60	0.003* 1 vs 3 0.002
Mean Qmax ± SD, (ml/s)	21.3 ± 8.95	23.0 ± 7.62	21.9 ± 7.66	0.459*
Mean PVR ± SD, (ml)	17.1 ± 13.3	18.1 ± 8.78	22.3 ± 21.7	0.177*
Mean IPSS ± SD	6.38 ± 2.44	6.57 ± 2.28	7.57 ± 2.42	0.042* 1 vs 3 0.069 2 vs 3 0.075

Figure 1. Preoperative and postoperative third-month Qmax, PVR and IPSS of the patients stratified by age category

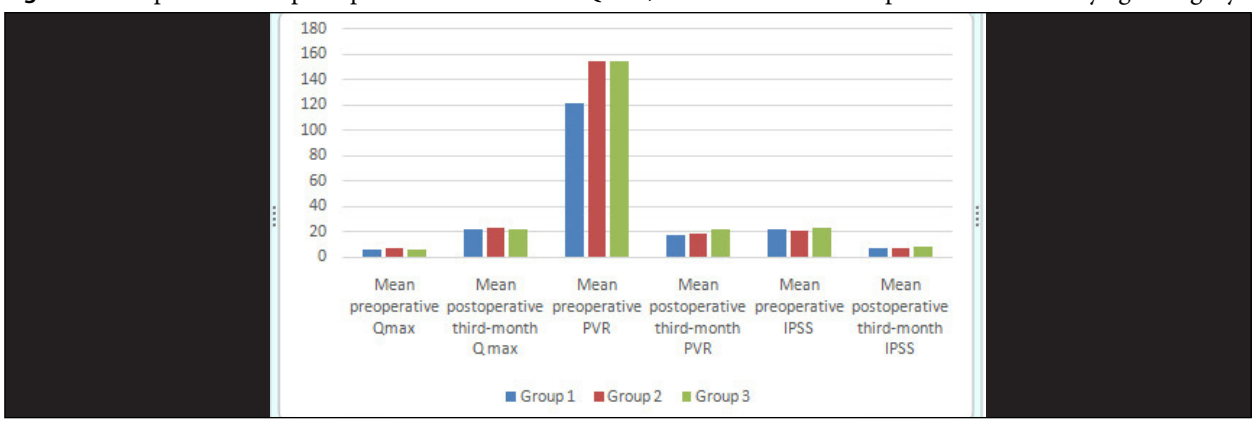

Table 4. Comparison of transfusion rates and complication rates between age groups, summary of complications and complication management

Variables	Group 1 (50-65)	Group 2 (65-79)	Group 3 (≥80 yrs)	P value
Transfusion rate, n(%)	7 (16.7)	11 (11.5)	6 (15.0)	0.677¥
Overall complication, n(%)	9 (21.4)	23 (24.0)	11 (27.5)	0.812¥
Clavien ≥ 3 complication, n(%)	2 (4.8)	5 (5.2)	5 (12.5)	0.287¥
Complication	**n(%)**	**Classification according to CDCS**	**Management**	
Fever	2 (1.1)	I	Antipyretics	
Transient elevation of serum creatinine	1 (0.5)	I	Hydration	
Urge incontinence	2 (1.1)	I	Antimuscarinic	
UTI	2 (1.1)	II	Antibiotics	
Hemorrhage requiring blood transfusion	24 (13.4)	II	Blood transfusion	
Organised haematoma in bladder	2 (1.1)	IIIb	Endoscopic intervention	
Bladder neck stenosis	3 (1.6)	IIIb	Bladder neck resection	
Urethral stenosis	6 (3.3)	IIIb	Internal urethrotomy, Urethroplasty	
Pulmonary embolism	1 (0.5)	IVa	ICU admission	

CDCS, Clavien Dindo classification system; ***UTI,*** urinary tract infection; ***ICU,*** intensive care unit

SD, standart deviation; ***OT***, operative time; ***EBL***, estimated blood loss; ***LOS***, lenght of hospital stay; ***PVR***, post-voiding residual urine; ***IPSS***, international prostate symptom score

*One way ANOVA; ¥ Pearson Chi-Square; ** Kruskal Wallis Test; &Fisher's Exact Test

were calculated as 6.38 ± 2.44 in Group 1, 6.57 ± 2.28 in Group 2, and 7.57 ± 2.42 in Group 3 (Table 3). The values of Qmax, PVR, and IPSS values in all groups before and after OSP are shown in Figure 1.

The complications, classification of complications according to the Clavien Dindo system and management of complications are presented in Table 4.

DISCUSSION

The OSP procedure became popular due to its favorable short and long-term outcomes by excising a considerable amount of adenomatous prostate tissue (4-6). On the other hand, the popularity of the minimally invasive methods such as laser prostatectomy techniques and robotic surgery has also increased during the last two decades because of similar success rates and low morbidity rates related with these techniques and relatively high blood transfusion rates and long recovery times associated with OSP (14). Some of these minimally invasive procedures including Holmium laser enucleation and thulium laser enucleation are considered current methods that can be performed in patients with high prostate volumes. In a review study comparing transurethral laser prostatectomy procedures compared to OSP, those who underwent laser prostatectomy showed less hemoglobin reduction, shorter catheterization time, shorter hospital stay and less blood transfusion rate (15). Some studies reported that blood transfusion rates were observed more frequently in octogenarians, probably because the frequency of use of anticoagulants is higher than in other age groups (16). One of the advantages of laser technologies over other prostatectomy techniques is that surgery can be performed without the necessity of interruption of blood thinning agents (17). However most health centers do not have the equipment or trained and experienced staff to perform these procedures.

In studies comparing laparoscopic simple prostatectomy and OSP, the overall complication rates and blood transfusion rates were found to be similar, the operation time was found to be longer in the laparoscopic technique.(18,19) When comparing robotic simple prostatectomy with laparoscopic simple

prostatectomy and OSP, blood transfusion rate was observed less in robotic simple prostatectomy compared to both surgical techniques. There was no difference was observed between the three methods in terms of improvement in long-term functional results (20,21). Considering all these, OSP is still commonly performed worldwide. In cases with PV>80 ml with large bladder stones or urethral stenosis, OSP may offer excellent postoperative results in suitable patient groups (18).

Average life expectancy is increasing worldwide. Since, it is not uncommon to encounter patients older than 80 with relatively high prostate volumes and LUTS, we investigated the efficacy and safety of OSP in this patient population. It is known that the elderly male patient population with urological diseases also has relatively high risk of systemic comorbidities (14). These comorbidities, including cardiovascular diseases, pulmonary disorders, and aging-related metabolic changes, can pave the way for post-surgical complications and unfavorable outcomes (15-17). Since OSP leads to a challenging postoperative recovery period even for relatively young patients, it is evident that octogenarians undergoing this procedure necessitate special attention. It is widely accepted that a thorough pre-operative assessment is crucial in these cases. Our analysis revealed that the rate of hypertension was significantly lower in patients younger than 65 than the others, while there was no difference between these patient groups concerning the rate of diabetes mellitus. Since it is accepted as a marker of high risk in elderly patients (18), an ASA score higher than two was used as the comparison parameter. In our cohort, the rate of patients with an ASA score of 3 increased with increasing patient age. However there was no statistically significant difference between the groups in this regard.

On the other hand, a comparison of the mean ASA scores elucidated significant differences between the octogenarians and the patients younger than 65. The pre-OSP prostate biopsy rate was significantly higher in Group 1 and Group 2 compared to than in octogenarians. The relatively lower prostate biopsy rate in octogenarians can be because these patients had a shorter life expectancy, and this fact was considered while making biopsy decisions (19). In our cohort, the rate of preoperative persistent urethral catheterization and acute urinary retention was significantly higher in octogenarians than the other patients, as reported in the literature (20).

As such, the overall blood transfusion rate of 13,5% was also consistent with the previously published literature (21,22). The three groups were similar regarding blood transfusion rate, Clavien-Dindo Class 3 or higher complication rate and the overall complication rate. This latter finding is not consistent with the literature (20). This finding can be attributed to the exclusion of patients using anticoagulant and antiaggregant therapy in our study, and to the fact that more patients in the octogenarian group in the related study. The general complication rate of 27,5% in our octogenarian patients is lower than the rates reported in previous studies (20,23). This difference can be explained by the evolvement of preoperative assessment tools, anesthesia methods, and postoperative care protocols. Our comparative analysis revealed that the mean duration of catheterization was significantly higher in older patients than younger patients. Since we usually remove the urethral catheters on the day of discharge, this approach might have led to a relatively longer length of hospital stay in these patients. Also, a relatively longer postoperative recovery period and a higher general complication rate in octogenarians might have contributed to more extended hospital stays. It should also be considered that studies investigating the length of hospital stay in patients undergoing transurethral resection of the prostate (TURP) or radical prostatectomy revealed that advanced patient age was significantly associated with prolonged hospital stay (24).

One of our significant findings was that the postoperative third-month IPSS score was significantly higher in octogenarians than the other patients. Gormley et al. reported that LUTS persisted after TURP in most patients with advanced age due to aging-related detrusor instability that was present preoperatively (25). Jeong Kim et al. hypothesized that this finding was due to the changes in the urinary bladder wall's ultrastructure due to chronic obstruction (26). They also noted that these changes included collagen deposition and increased receptor

sensitivity. The fact that the rates of persistent AUR and preoperative urethral catheterization were higher in our octogenarian patients than the younger patients supports the hypothesis of Jeong Kim et al.(26). Although the length of hospital stay, general complication rate, and postoperative IPSS scores of our octogenarian patients was higher than the other patients, the value of OSP in patients with medical treatment-resistant LUTS and high prostate volumes should not be underestimated. In our study, none of our patients -including octogenarians- died, and there was no difference between the patient groups regarding Clavien-Dindo Class 3 or higher complication rates which can potentially contribute to procedure-related morbidity and mortality. We postulate that improvements in preoperative patient assessment, regional anesthesia techniques, and intensive care unit patient management protocols led to this result.

Our study has some limitations that need to be considered while evaluating its findings. First, it is a retrospective study. Second, it is a single-center study, and it does not include long-term outcomes. Third, OSP procedures were performed by different urologists and senior urology residents. Therefore, there may be an operator-dependent bias.

CONCLUSIONS

Despite the limitations mentioned above, we conclude that OSP is a safe procedure, and its effectiveness is limited compared to the other groups in terms of urethral catheter duration, length of hospital stay and IPSS scores. Before OSP However, perioperative management should be individualized for each patient.

Conflict of Interest

The authors declare to have no conflicts of interest.

Financial Disclosure

The authors declared that this study has received no financial support.

Informed Consent

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

Ethical Approval

The study was approved by University of Health and Sciences Ethics Committee (Approval number: 2020-22-23). The study protocol conformed to the ethical guidelines of the Helsinki Declaration.

Author Contributions

Conception and design: Şam E, Data acquisition: Şeker KG, Data analysis and interpretation: Kalfazade N, Drafting the manuscript: Kalfazade N, Critical revision of the manuscript for scientific and factual content: Güner E, Şahin S, Tuğcu T, Statistical analysis: Kalfazade N, Supervision: Güner E, Şahin S, Tuğcu T.

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