The effect of prostate weight on the outcomes of robot-assisted radical prostatectomy

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ABSTRACT

Objective: The effect of prostate volume on the surgical, functional, and oncological outcomes of robot assisted radical prostatectomy (RARP) was evaluated.

Material and methods: A total of 180 patients who underwent RARP and had at least a 1-year follow-up were included. The patients were divided into 3 groups based on prostate weight (Group 1: <45 g, Group 2: 45-75 g, and Group 3: >76 g). Erectile function and continence were evaluated at 3, 6, 9, and 12 months postoperatively. The International Index of Erectile Dysfunction (IIEF) score and daily pad usage were evaluated as indicators of erectile function and continence, respectively. The measurement of two prostate-specific antigen (PSA) values over 0.2 ng/mL was considered biochemical disease recurrence.

Results: Patients with larger prostates were older and had a longer operative time and higher PSA level compared with patients with smaller prostates ($p<0.05$). The positive surgical margin rate was higher in patients with smaller prostates ($p=0.06$). However, patients with a prostate weight <45 g had higher IIEF scores at 3 and 6 months. IIEF scores were similar at the end of the 1-year follow-up period. Pad usage and time to continence were higher in patients with larger prostates ($p>0.05$).

Conclusion: Although prostate weight affected the surgical outcomes of RARP, the functional and oncological outcomes were similar among all patients. Long-term follow-up is needed to determine their impact on oncological outcomes.

Key words: Prostate weight; Gleason score; robot.

Introduction

Prostate cancer is the second most frequent cause of mortality in men after deaths from lung cancer. In the United States of America in the year 2013, 238.590 new cases will be diagnosed as prostate cancer, and 2970 patients will die from prostate cancer.^[1] Robot-assisted radical prostatectomy (RARP) has become a treatment alternative with improved oncological, and functional outcomes similar to those of open surgery.^[2]

Indications of robot-assisted radical prostatectomy has been reported as the presence of big prostate, and median lobe, and special conditions requiring surgical experience.^[3] In various publications, effects of prostate volume on surgical outcomes have been reported, however the impact of prostate volume on oncological, and functional outcomes is not

clear-cut.^[4] In this study the effect of prostate size on post-RARP functional, and oncological outcomes was investigated.

Material and methods

A total of 180 patients who had undergone RARP between the years 2008, and 2011 in our clinic, and followed up for at least one year, were included in the study. From all patients enlightened consent forms for RARP were obtained. The same surgeon performed RARP using Montsouris technique. As indicated by Hong et al.^[5] since as an indication of RARP, criteria of prostate size can be misleading, in our study, we used prostate weight instead. The patients were divided into 3 groups as for weight of the prostate specimens as follows: Group 1, 0-45 g; n=66; Group 2, 46-74 g; n=74 patients, and Group 3, ≥ 75 g; n=39 patients.

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Submitted:
24.03.2013

Accepted:
17.07.2013

Available Online Date:
16.05.2014

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Erectile functions, and continence status were evaluated at 3., 6., 9. and 12. months For the evaluation of erectile function International Index of Erectile Function (IIEF-5) was used. In case of detection of postoperative erectile dysfunction in pre-operatively potent patients, the patients were randomized into two groups as those receiving 5-phosphodiesterase inhibitor or using vacuum device, and included in the penile rehabilitation protocol. For the evaluation of continence, number of daily pad use was recorded. Patients who didn't use pads or those using safety pads were considered as continent. Biochemical recurrence was considered as the detection of two successive PSA values over 0.2 ng/mL after the lowest prostate- specific antigen (PSA) value. The patients who received adjuvant therapy were not included in the study.

Statistical analysis

For the comparison of the parameters demonstrating normal distribution, One-way ANOVA test was used. For the comparison of parameters demonstrating non-normality distribution Kruskal- Wallis test, and for the determination of the group which was responsible for intergroup difference Mann-Whitney U test were used. For the comparison of qualitative data *chi*-square test was applied. Statistical significance was evaluated at $p < 0.01$, and $p < 0.05$, respectively.

Results

Median age of the patients was 62.9 (49-77 yrs) years. Median prostate weight of all the patients was 56.7 (10-260 g) g. Ages, operative times, preoperative PSA levels of the patients in Group 3 were found to be higher when compared with those found in Group 1 ($p < 0.05$). However, higher number of patients in Group 1 had positive surgical margins with any statistically significant intergroup difference ($p = 0.06$). Surgical characteristics of the patients according to their prostate volumes were summarized in Table 1.

Biochemical recurrence rates for the first year were 13.6, 9.3, and 5.1% for Groups 1, 2, and 3, respectively. Any statistically significant intergroup difference was not detected ($p = 0.36$) (Table 1). Groups were included in a multivariate analysis where factors effective on biochemical factors including clinical stage, PSA level, surgical margin positivity, Gleason score, and prostate volume were evaluated. Surgical margin positivity (odds ratio: 6.16 [1.84-20.56], $p = 0.003$), preoperative PSA value (odds ratio: 1.07 [1.00-1.15], $p = 0.045$) were determined as independent risk factors. Prostate volume had no effect on biochemical recurrence.

IIEF scores of the patients during follow up period are given in Table 2. Preoperative potencies of the patients were similar ($p = 0.18$), while in Group 1, IIEF scores were 5.95 ($p = 0.005$)

and 8.74 ($p = 0.016$) at 1., 3., and 6. month controls, respectively. These IIEF scores were found to be higher than those of the other two groups. However at the end of the first year, comparable IIEF-5 scores were 12.88, 11.16, and 9.38 for groups 1, 2, and 3, respectively ($p = 0.20$). At 12. months of the follow-up period, multivariate analysis performed evaluated factors that might effect potency including age, nerve-sparing surgery, and prostate volume. As demonstrated in multivariate analysis prostate volume did not effect IIEF-5 scores. Relatively smaller age of the patients ($p = 0.0001$), and bilateral nerve-sparing surgery ($p = 0.042$) had a favorable impact on potency.

Table 1. Surgical, and oncological outcomes

	<45 g (n=66) Group 1	46-75 g (n=75) Group 2	(n=39) >76 g Group 3	p
Age (year)	61.2	63.1	65.3	0.003
BMI (kg/m ²)	27.4	26.4	27.3	0.111
PSA (ng/mL)	6.57	8.40	10.41	0.007
Biopsy Gleason Score	6.17	6.29	6.08	0.099
Tumor volumes (%)	2.55	2.85	3.97	0.521
Clinical Stage (n, %)				
1	39 (59.1%)	46 (61.3%)	20 (51.3%)	
2	26 (39.4%)	26 (34.7%)	18 (46.2%)	0.714
3	1 (1.5%)	3 (4.0%)	1 (2.6%)	
Operative time (mins)	148.9	145.8	167.7	0.005
Amount of blood loss (mL)	150	161	183	0.290
Hospital stay (days)	3.80	3.85	3.90	0.085
Drain dwelling time (days)	2.53	2.45	2.54	0.893
Nerve sparing (n, %)				
Not spared	7 (10.6%)	15 (20.0%)	8 (20.5%)	0.209
Unilateral	3 (4.5%)	7 (9.3%)	5 (12.8%)	
Bilateral	56 (84.8%)	53 (70.7%)	26 (66.7%)	
Positive surgical margin (n, %)	13 (19.7%)	6 (8.0%)	3 (7.7%)	0.066
Pathological Gleason Score	6.29	6.64	6.26	0.292
Pathological Stage n (%)				
pT0	1 (1.5%)	1 (1.3%)	0 (0%)	
pT2a	6 (9.1%)	7 (9.3%)	13 (33.3%)	
pT2b	0 (0%)	1 (1.3%)	0 (0%)	
pT2c	44 (66.7%)	39 (52%)	18 (46.2%)	
pT3a	12 (18.2%)	24 (32%)	7 (17.9%)	
pT3b	3 (4.5%)	3 (4.0%)	1 (2.6%)	
Biochemical recurrence (n, %)	9 (13.6%)	7 (9.3%)	2 (5.1%)	0.361

BMI: body mass index; PSA: prostate- specific antigen; pT: pathological T stage

Average number of pads used by the patients based on their prostate volumes, and their continence status are shown in Tables 3, and 4. Mean number of pads used daily by the patients were comparable (in Groups 1, 2, and 3, 0.21, 0.17, and 0.46 pads, respectively ($p=0.547$). Still at the end of 12. months, comparable rates of continence in Groups 1, 2, and 3 were 90.9, 89.3, and 84.6%, respectively ($p=0.60$). Although number of pads used in Group 3, and time to achieve continence were comparatively increased, it wasn't at a significant level ($p>0.05$).

Discussion

Nowadays, together with oncological success, improvement in functional complications including urinary incontinence, and erectile dysfunction constitute corner stones of the treatment. Therefore the factors except for PSA, Gleason score, clinical stage, and nerve sparing surgery which might effect these outcomes have been investigated in the literature. In various studies the impact of prostate volume on prostate surgery has been investigated, and larger prostate volume has been held responsible for prolonged operative times, and increased amount of bleeding.^[6-8]

Min et al.^[9] reported that higher rates of surgical margin positivity were seen in patients with lower prostate volume who had undergone retropubic radical prostatectomies (RRP). However, they published their outcomes indicating that prostate volume

less than 40 g is an independent risk factor for biochemical recurrence at 5. month of the follow-up period Chang et al.^[10] allocated 400 patients on whom they had performed laparoscopic radical prostatectomy (LRP) into two groups based on their prostate volumes. Despite prolonged operative times in patients with prostate volumes greater than 75 g, they found lower rates of surgical margin positivity. Similarly, Marchetti et al.^[11] reported the outcomes of their 690 patients who had undergone RRP, and indicated that lower prostate volume was associated with increased rates of surgical margin positivity. In our study, higher rates of surgical margin positivity in patients with lower prostate volumes relative to the other groups were not statistically significant ($p=0.066$). Our scarce number of patients compared to other literature studies might be the reason for the detection of these higher rates of positivity. Besides, any difference was not observed between biochemical recurrence rates estimated at 1. postoperative years. In our multivariate analysis, PSA, and positive surgical margins were independent factors for biochemical recurrence, while prostate volumes were not. Gershman et al.^[12] reported that in patients with prostate volumes less than 40 cc, risk of upgrading Gleason score increased. This risk of erroneous grading might be one of the reasons for falsely increased rates of surgical margin positivity. Another reason for higher surgical margin positivity might be related to negligence to take prostate volume in D'Amico risk classification. Despite their inclusion in a lower risk group, patients with lower prostate volumes should be evaluated more precautiously.

Link et al.^[13] published outcomes of their patients who had undergone RPRP based on their prostate volumes, and couldn't find any difference between groups as for continence, and biochemical recurrence rates. In this study where erectile function was not included in the evaluations, the authors emphasized that in patients with larger prostates, robotic surgery can be applicable. Pettus et al.^[14] reported that prostate volumes of the patients who had undergone open or laparoscopic prostatectomies have no effect on the functional results at first years. Similarly Zorn et al.^[15] did not report any difference between rates of continence in patients who had under-

Table 2. IIEF-5 scores of the patients according to postoperative prostate volumes

	<45 g (n=66) Group 1	46-75 g (n=75) Group 2	>76 g (n=39) Group 3	p value
Pre-op IIEF-5 score	18.76	16.31	14.15	0.188
3. IIEF-5 score	5.95	4.37	3.13	0.005
6. IIEF-5 score	8.74	6.67	5.36	0.016
9. IIEF-5 score	10.61	9.04	7.77	0.242
12. IIEF-5 score	12.88	11.16	9.38	0.200
IIEF: International Index of Erectile Dysfunction				

Table 3. Postoperative pad use

	<45 g (n=66) Group 1	46-75 g (n=75) Group 2	>76 g (n=39) Group 3	p value
3. postop. month	1.17	1.09	1.47	0.361
6. postop. month	0.58	0.42	0.72	0.603
9. postop. month	0.33	0.24	0.64	0.245
12. postop. month	0.21	0.17	0.46	0.547

Table 4. Continence rates at 3., 6., 9., and 12. postoperative months

	<45 (n=66) Group 1	46-74 (n=75) Group 2	>75 (n=39) Group 3	p value
3. postop. month	33 (50.0%)	33 (44.0%)	13 (33.3%)	0.251
6. postop. month	48 (72.7%)	58 (77.3%)	28 (71.8%)	0.750
9. postop. month	66 (84.8%)	66 (88.0%)	30 (76.9%)	0.300
12. postop. month	60 (90.9%)	67 (89.3%)	33 (84.6%)	0.604

gone RARP. However, Meeks et al.^[16] emphasized that median lobe prolongs operative time without any effect on continence rates. Only Konety et al.^[17] reported that patients with larger prostates had gained their continence much later than other BPH patients. Since in their study, instead of prostate volume, only results of the transrectal measurements were used which might not give a true estimate of the prostate gland. Montorsi et al.^[3] published the results of Pasadena consensus panel, and reported that the presence of median lobe complicates surgical intervention which requires experienced surgeons. It was indicated that to gain sufficient experience, 40 operations should be performed annually. They pointed to the presence of advanced age, obesity, and a larger prostate gland as risk factors for the development of incontinence. Similarly, in our study, we couldn't observe any difference between groups as for prostate volume, and time to achieve continence.

Labanaris et al.^[4] performed RARP on their patients, and published functional comparative outcomes of these patients based on their prostate weights (> 100 g or <50 g) In this study erectile scores of the patients were evaluated using IIEF scores. The patients with preoperative erectile dysfunction, and those who hadn't undergone interfascial nerve sparing surgery were not included in the study. At the end of 12. months, rate of potency was 61.9 in patients with larger prostates, while in the group with smaller prostates it was reported as 72.9% which was statistically significant ($p < 0.05$). In our study, any difference was not observed between erectile functions at first years, while IIEF-5 scores at 3., and 6. months were higher in patients with lower prostate volumes. When IIEF -5 scores at 12. months were evaluated in a multivariate analysis, advanced age, failure to perform nerve-sparing surgery decreased IIEF-5 scores, while prostate volume did not effect potency. Zorn et al.^[15] could not find any difference as for time to achieve baseline erectile function. In this study, authors reported that the impact of prostate volume on erectile function was not clear-cut. Still in Pasadena consensus panel, importance of the impact of preoperative condition of the patient, and postoperative rehabilitation on erectile function was underlined. Besides, avoidance of using thermal energy near neurovascular bundle during operation, and minimal use of traction were also recommended.

In conclusion, though size of the prostate effected surgical outcomes of the patients who had undergone RARP, it didn't exert any impact on the first year functional, and oncological outcomes. For the determination of oncological impact, further studies with longer follow-up periods are required.

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

Peer-review: Externally peer-reviewed.

Author Contributions: Concept - U.B., T.T., C.B., F.F.Ö., E.G.; Design - U.B., T.T., C.B., F.F.Ö., E.G.; Supervision - U.B., E.G.; Funding - U.B., E.G.; Materials - U.B., E.G.; Data Collection and/or Processing - U.B., T.T., C.B., F.F.Ö., E.G.; Analysis and/or Interpretation - U.B., E.G.; Literature Review - U.B., E.G.; Writer - U.B., T.T.; Critical Review - U.B., E.G.

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

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

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