The Impact of Prostate Gland Weight in Robot Assisted Laparoscopic Radical Prostatectomy

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Purpose: We determined whether prostate weight has an impact on the pathological and operative outcomes of robot assisted laparoscopic radical prostatectomy.

Materials and Methods: We reviewed the records of 1,847 consecutive patients who underwent robot assisted laparoscopic radical prostatectomy at our institution. Variables were compared across quartile distributions of prostate size as defined by weight, including group 1—less than 30 gm, group 2—30 to 49.9, group 3—50 to 69.9 and group 4—70 or greater. Factors assessed in this analysis were patient age, body mass index, prostate specific antigen, Gleason score, pathological stage, margin status, operative time, blood loss, transfusion rate, length of stay and rehospitalization rate.

Results: Patients with a larger prostate (group 4) were older (mean age 66.2 years), had higher pretreatment prostate specific antigen (median 6.5 ng/ml), lower Gleason score (mean 6.3), longer operative time (mean 3.2 hours), higher estimated blood loss (median 250 cc) and longer hospital stay ($p = 0.0002$). There was a trend toward higher risk disease based on D'Amico risk stratification and positive margin status in group 1, although evidence of extracapsular extension was more common in groups 2 and 3. There was no association between prostate size and body mass index, lymph node status, blood transfusion rate, seminal vesicle involvement and rehospitalization rate.

Conclusions: Robot assisted laparoscopic radical prostatectomy in patients with an enlarged prostate is feasible with slightly longer operative time, urinary leakage rates and hospital stay. Pathologically larger prostates are generally associated with lower Gleason score and risk group stratification. One-year continence rates and biochemical recurrence rates are similar across all groups.

Key Words: prostate, prostatic neoplasms, robotics, laparoscopy, prostatectomy

The significance of prostate weight on RP outcomes has previously been reported for ORP,[1–4] LRP[5–7] and RALP.[8,9] All types of RP have consistently demonstrated an inverse relationship between prostate weight and positive surgical margins. However, ORP has been reported to have a significantly greater EBL, allogenic transfusion rate and hospital stay in patients with large prostate weight.[1] We examined the impact of prostate weight on perioperative and pathological outcomes from 1 of the largest single institution series of RALP.

MATERIALS AND METHODS

In December 2000 a prostate cancer database was established at the department of urology at our institutional cancer center. The database collection system consists of Verity® TeleForm® scannable forms, image data capture and a Microsoft® SQL Server™ database. All patients with prostate cancer who presented to our institution on or after January 1, 1995 and who received at least part of treatment at our institution were evaluated for inclusion in this institutional review board approved database. Patient consent was obtained before enrollment into the database. Data on operative parameters and outcomes were then collected prospectively from the time of consent. A total of 1,847 consecutive patients who enrolled in the database underwent RALP, as performed by 4 surgeons at our institution between June 2003 and April 2007. Any patient otherwise considered a candidate for retropubic RP was offered RALP.

From June 2003 to November 2006, 96.8% of RPs at our institution were performed robotically. All eligible patients were included in the analysis without regard to learning curve or surgeon experience. Data were collected on all aspects of care, including patient demographics, preoperative and postoperative staging, perioperative complications, operative parameters and 1-year outcomes. Continence was defined as the use of 1 pad per day or less for security reasons only. All data were physician collected by direct patient questioning. Biochemical recurrence is defined as PSA 0.3 ng/ml or greater.

Surgical Technique and Early Postoperative Care

All prostatectomies were performed transperitoneally with our institutional modifications to the Montsouris technique.[10] A 4-arm robot with 2 assistant ports for a total of 6 ports was used for RALP. The fourth arm was placed through a port that was medial to the left anterior superior iliac spine. The procedure was initiated posterior to dissect out the seminal vesicles and vas deferens. The bladder was

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mobilized completely by bilaterally incising the peritoneum lateral to the medial umbilical ligaments. The medial umbilical ligaments and urachus were divided as cephalad as possible. The endopelvic fascia was opened to gain access to the prostatic apex and expose the deep dorsal venous complex. The dorsal vein complex was divided and controlled with a 45 mm Ethicon® endovascular stapler. For the urethrovesical anastomosis 1 to 3 posterior anastomotic sutures were interrupted depending on surgeon preference, followed by 2 running sutures from the 5 and 7 o'clock to 12 o'clock positions. Catheters were removed on postoperative day 5 to 8 according to the practice pattern of the treating surgeon unless urine leakage was clinically evident. No procedures were aborted and no patients underwent open conversion.

Histopathological Analysis

Surgical specimens were fixed intact in 10% neutral buffered formalin. The outer surface was inked to delineate surgical margins (black), and the left (green) and right (blue) orientation. Prostate and seminal vesicles were sectioned transversely at approximately 5 mm intervals depending on specimen size. The pathologist identified the location and extent of cancer. The presence and location of extracapsular extension, seminal vesicle invasion, lymph node metastasis and histological grade were recorded. A positive surgical margin was defined as tumor cells reaching the inked surface. Extracapsular extension was defined as tumor cells reaching the periprostatic adipose tissue with or without a positive surgical margin.

Statistical Analysis

Data analysis was performed using SAS® software. Data were summarized using descriptive statistics, including the mean for normally distributed continuous data, the median for nonnormally distributed continuous data and proportions for categorical data. Univariate analysis to determine group differences were performed using the Pearson chi-square test statistic for categorical data, the Student t test statistic for normally distributed continuous data and the Kruskal-Wallis test for nonnormally distributed continuous data. The log rank test was used to assess time dependent differences across groups, eg months to continence and recurrence rates. Missing data were excluded from analysis.

RESULTS

Table 1 lists patient demographic and clinical characteristics stratified by prostate weight. Patients with a larger prostate were significantly older ($p < 0.0001$) and had higher PSA ($p < 0.0001$), lower preoperative Gleason scores ($p < 0.0001$) and nonpalpable (clinical stage T1) disease ($p = 0.01$) more often than patients in the lower prostate weight groups. Body mass index was not associated with prostate weight.

Table 2 shows operative outcomes by prostate weight group. Patients with a larger prostate had longer operative time and more blood loss than those with a small or average prostate (each $p < 0.0001$). Positive surgical margin rates were higher in patients with a small prostate ($p < 0.0001$). Extracapsular extensions rates were higher in patients with a prostate of 30 to 49 gm ($p = 0.004$). Seminal vesicle involvement and node status were not associated with prostate size. Intraoperative transfusions were done in only 6 cases and intraoperative complication rates did not differ significantly across the groups. Patient outcomes were analyzed across performing surgeons with no significant differences seen.

Table 3 lists postoperative outcomes. Patients with a large prostate had an approximate 2-fold increase in perioperative complications ($p < 0.0001$) with urine leakage the most frequently cited complication. Large prostate size was also associated with a longer hospital stay ($p = 0.0002$). However, no differences were found in return to the operating room or rehospitalization rates. Catheterization time and return to continence were greater in patients with a large prostate ($p = 0.001$ and 0.004, respectively, fig. 1). However, when adjusted for anastomotic leakage rates, these differences were no longer seen. Chemical recurrence rates and followup time were similar across the groups (fig. 2).

TABLE 1. *Preoperative characteristics of patients undergoing RALP by prostate weight*

	Prostate Wt (gm)				
	Less Than 30	30–49	50–69	70 or Greater	p Value
No. pts	69	883	568	327	
Mean ± SD age at surgery	62.0 ± 8.2	61.3 ± 7.8	63.9 ± 7.0	66.2 ± 6.7	<0.0001
No. race (%):					
White	61 (88.4)	785 (88.9)	512 (90.1)	299 (91.4)	0.16
Asian	8 (11.6)	60 (6.8)	30 (5.3)	15 (4.6)	
Black	0	30 (3.4)	23 (4.0)	13 (4.0)	
Other	0	8 (0.9)	3 (0.5)	0	
Mean ± SD body mass index (kg/m^2)	27.3 ± 4.3	27.6 ± 4.2	27.8 ± 4.1	27.7 ± 4.0	0.55
PSA (ng/ml):					
No. 0–3.9 (%)	27 (39.7)	208 (23.7)	93 (16.6)	21 (6.5)	<0.0001
No. 4–10 (%)	31 (45.6)	569 (65)	402 (71.8)	243 (75.5)	
No. greater than 10 (%)	10 (14.7)	99 (11.3)	65 (11.6)	58 (18)	
Median (IQR)	4.8 (2.5–7.4)	5.1 (4.0–7.1)	5.4 (4.4–7.6)	6.5 (5.1–9.0)	<0.0001
Preop Gleason score:					
No. 2–6 (%)	37 (53.6)	511 (58.1)	372 (65.6)	248 (76.1)	<0.0001
No. 7 (%)	27 (39.1)	30.3 (34.4)	159 (28)	62 (19)	
No. 8–10 (%)	5 (7.2)	66 (7.5)	36 (6.3)	16 (4.9)	
Mean ± SD	6.6 ± 0.8	6.5 ± 0.7	6.4 ± 0.7	6.3 ± 0.7	<0.0001
No. clinical stage (%):					
T1 abc	58 (84.1)	734 (83.3)	484 (85.2)	296 (90.5)	0.02
T2/3	11 (15.9)	147 (16.7)	84 (14.8)	31 (9.5)	

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