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Original research

Does elevated body mass index (BMI) affect the clinical outcomes of robot-assisted laparoscopic prostatectomy (RALP): A prospective cohort study

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HIGHLIGHTS

- Urologists have to increasingly confront PCa patients with an elevated BMI, posing challenges for its surgical treatment.
- RALP is gaining popularity as a surgical option for the treatment of clinically localized PCa.
- The study focused on our experience with RALP using the da Vinci Si system in PCa patients with different BMI categories.
- Elevated BMI appears to increase the RALP operative time, but has little impact on clinical outcomes.
- RALP is a safe and effective procedure in patients with elevated BMI.

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ABSTRACT

Objectives: With the prevalence of obesity in the United States, a significant proportion of robot-assisted laparoscopic prostatectomy (RALP) candidates have an elevated body mass index (BMI). We determine if this impacts on the clinical outcomes of RALP. **Methods**: 218 consecutive patients underwent RALP were identified from a prospectively maintained RALP database recorded and compared for their demographics, clinical outcomes and adverse events in normal weight (BMI <25 kg/m^2), overweight (BMI ≥25 and <30 kg/m^2) and obese (BMI ≥30 kg/m^2) groups. **Results**: 36 normal weight, 115 overweight and 67 obese patients were identified. There were no significant differences in demographic data among the three groups except for mean BMI (23.1 vs. 27.5 vs. 32.8 kg/m^2, $p < 0.001$). The median operative time was longer in obese patients compared to both overweight (210 vs. 189 min, $p = 0.031$) and normal weight (210 vs. 177 min, $p = 0.008$) patients. There were no significant differences in median estimated blood loss, mean prostate volume, positive surgical margin rate and time to continence without pads. The median urethral catheter duration and hospitalization were similar in all groups. Patients with elevated BMI had a significantly higher median Gleason score ($p = 0.046$) and incidence of pathologic T3 disease ($p = 0.038$). The incidence of adverse events was low and there were no significant differences among the three groups ($p > 0.05$).**Conclusions**: Elevated BMI appears to increase the RALP operative time, but has little impact on other intraoperative parameters, clinical outcomes or patient morbidity. RALP is a safe and effective procedure in patients with elevated BMI.

1. Background

The prevalence of obesity has substantially increased in almost all countries. Currently, approximately one-third of adults in the United State are obese [1]. Obesity has been linked to several cancers and body mass index (BMI: weight in kilograms/height in square meters) as a surrogate of adiposity has been evaluated for its

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impact on the biochemical recurrence of prostate cancer (PCa) and prostate cancer-specific mortality [2]. The incidence of PCa has increased steadily and is the second most lethal malignancy in men in the United States, where a man has a 12.5% chance of suffering PCa and a greater than 70% likelihood of being overweight (BMI $\geq$25 and <30 kg/m^2) or obese (BMI $\geq$30 kg/m^2) [3]. Urologists have to increasingly confront PCa patients with an elevated BMI, posing challenges for its surgical treatment.

Robot-assisted laparoscopic prostatectomy (RALP) is gaining popularity as a surgical option for the treatment of clinically localized PCa. With experience, the selection criteria for this procedure have broadened. There have been several reports on how obesity influenced the clinical outcomes following RALP using the "standard" da Vinci robotic system (Intuitive Surgical, Inc, Sunnyvale, CA) [4–8]. The da Vinci *Si* system has been reported to allow for shorter procedure compared to the "standard" da Vinci system [9]. In this study, we evaluate our experience with RALP using the da Vinci *Si* system in overweight and obese patients, compared with a normal weight cohort.

2. Methods

2.1. Patient enrollment and preoperative evaluation

Approval for this study was granted by the Institutional Review Board at the University of Oklahoma Health Sciences Center. Prospectively collected data from the records of consecutive patients diagnosed with clinically localized PCa who underwent RALP by a single surgeon (CW) between March 2009 and March 2011 were reviewed. Based on the clinical definitions for overweight and obesity [10], patients were stratified into three groups: normal weight (BMI<25 kg/m^2), overweight (BMI $\geq$25 and <30 kg/m^2) and obese (BMI$\geq$30 kg/m^2). Surgical indications were in accordance with the PCa management guidelines of the American Urological Association, Inc [11].

All patients underwent preoperative evaluation, including complete medical history, age, weight, height, digital rectal examination, American Society of Anesthesiologists (ASA) risk score, American Urological Association Symptom Score (AUASS), Quality of Life (QoL) score, Sexual Health Inventory for Men (SHIM), serum prostate-specific antigen (PSA), transrectal ultrasonography (TRUS) measurements of prostate volume, and employment of computerized tomography and nuclear bone scan if clinically indicated. All patients were diagnosed with PCa by TRUS-guided prostate biopsies at a minimum 6 weeks prior to surgery. Patients with PCa of clinical stage $\leq$T2 without evidence of metastasis were considered candidates for RALP.

2.2. Surgical technique

RALP was performed in a six-port transperitoneal approach with a four-armed da Vinci *Si* robotic system. In brief, laparoscopic lysis of adhesions was performed initially if required. Using an anterior approach, a bladder neck sparing procedure was preferentially performed for all patients. Based on the volume of disease on the TRUS biopsy specimen, bilateral or unilateral neurovascular bundles were spared when appropriate using an interfascial sharp dissection technique without the use of mono or bipolar electrocautery. Bladder neck reconstruction was performed when required. Pelvic lymph node dissection (PLND) was performed in patients who had a serum PSA >10 ng/mL or a primary Gleason score >7. A modified one layer van-Velthoven vesicourethral anastomosis technique [12] was performed using a running double-armed 3-0 Monocryl suture containing two RB1 needles. The integrity of the anastomosis was routinely checked by bladder irrigation with normal saline. A Jackson–Pratt (JP) drain was placed in the pelvis.

2.3. Postoperative care and evaluation

Routine postoperative care was administered including oral analgesia and antibiotics. The JP drain was removed on postoperative day 1 unless high drain output with an elevated fluid creatinine was confirmed. Patients were routinely discharged home on postoperative day 1 with a urethral catheter in place and returned to our clinic on postoperative day 5 or 6 (clinic logistics) for a cystogram prior to discontinuation of the catheter. Penile rehabilitation [phosphodiesterase-5 (PDE-5) inhibitor and vacuum erection device (VED)] was offered to all patients with preoperative erectile function.

Patients were followed at 6 weeks, 3 months, and subsequently every 3 months for the first 2 years and then every 6 months. AUASS, QoL, SHIM, Pad usage, potency, serum PSA value and adverse events were recorded at each visit. Continence was defined as no urine leakage and wearing no pads.

2.4. Statistical analysis

Continuous variables were presented as mean $\pm$ standard deviation (SD) or median if not in a normal distribution, while categorical variables were presented as a percentage. Statistical analysis was performed using GraphPad InStat, version 3.0 (GraphPad Software, San Diego, CA). Comparison of continuous variables with normal distribution were completed with *t*-test or Analysis of Variance (ANOVA), otherwise, Wilcoxon or Kruskal–Wallis test was used. Paired tests were completed with paired *t*-test or Wilcoxon sign rank-sum test, depending on the normality of the data. A chi-square or Fisher's exact test was used for statistical comparison of categorical variables. A two-sided $p < 0.05$ was considered statistically significant.

3. Results

Baseline demographic information for the 218 patient cohort is presented in Table 1. There were 36 (16.5%) normal weight, 115 (53.8%) overweight and 67 (30.7%) obese patients with significant differences in mean BMI ($p < 0.001$). Overall, patients in the different BMI categories had similar demographic parameters. Mean ASA and prostate TRUS volume trended toward an increment with increasing BMI without reaching statistical significance ($p = 0.083$ and $p = 0.774$). Approximately 94% of patients presented with clinical T1c disease in each group and there was no difference in the median biopsy Gleason score between the groups ($p = 0.488$). Mean age, preoperative serum PSA level, AUASS, QoL and SHIM were similar among all groups.

Operative time for RALP tended to prolong with increasing BMI ($p = 0.020$); significant differences in median operative time was noted between normal weight and obese men (177 vs. 210 min, $p = 0.008$) and between overweight and obese men (189 vs. 210 min, $p = 0.031$), while the difference between normal weight and overweight groups (177 vs. 189 min, $p = 0.339$) did not reach statistical significance. Patients in the three groups had an equivalent median estimated blood loss of 75 mL ($p = 0.315$). Patients with elevated BMI did not require more intravenous fluids intraoperatively ($p = 0.069$). No patients required conversion to open surgery or intraoperative blood transfusion (Table 2).

Overall, the mean follow-up was 24.8 $\pm$ 11.5 months (18–42 months). The pathologic features and postoperative data are summarized in Table 3. Obese patients had a significantly higher preoperative median Gleason score (7 vs. 6, $p = 0.046$). The median