ORIGINAL PAPER

FUNCTIONAL UROLOGY

Impact of obesity on peri-operative and functional outcomes after robotic-assisted simple prostatectomy

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Citation: Bove AM, Pallares-Mendez R, Ochoa M, et al. Impact of obesity on peri-operative and functional outcomes after robotic-assisted simple prostatectomy. Cent European J Urol. 2024; doi: 10.5173/ceju.2024.77 [Epub ahead of print]

Article history
Submitted: March 22, 2024
Accepted: Jun. 16, 2024
Published online: Sept. 30, 2023

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Introduction Obesity represents a worldwide epidemic disorder, increasing the overall morbidity and mortality rate. In this study we assessed the impact of obesity on perioperative and long-term functional outcomes of robotic-assisted simple prostatectomy (RASP).

Material and methods Baseline measurements of uroflowmetry and validated questionnaire responses were prospectively recorded, which were repeated at follow-up. Composite outcomes (trifecta) were defined as combination of post-operative Q-max >15 ml/s, IPSS score <8, and absence of complications. Pentafecta included 2 additional criteria, namely post-operative ejaculation persistence (MSHQ score >0) and erectile function maintenance (ΔIEEF <6). Data analysis was stratified by BMI (<30 or ≥30).

Results Eighty-one patients underwent RASP in our institution. Baseline demographic and clinical features, questionnaire scores, and baseline uroflowmetry results showed no significant differences between obese and non-obese cohorts. However, during follow-up, obese patients reported less improvement in IPSS (p = 0.02) and OABQ scores (p <0.001), along with a higher incidence of stress incontinence requiring duloxetine (p <0.001). Uroflowmetry outcomes were also lower in the obesity group (p = 0.02 and p = 0.03 for Qmax [ml/s] and post-void residual [ml], respectively). However, when considering assessment of comprehensive outcomes, obese patients demonstrated similar rates of achieving trifecta (67% vs 54%, p = 0.39) and pentafecta (p = 0.76) compared to non-obese patients.

Conclusions Our results show that obesity is associated with poorer functional outcomes. Specifically concerning storage LUTS and incontinence rates following RASP. However, no impact of obesity on the achievement rates of trifecta and pentafecta outcomes was observed.

Key Words: prostatectomy ‹› obesity ‹› body mass index ‹› lower urinary tract symptoms ‹› robotic surgical procedures

INTRODUCTION

Benign prostatic hyperplasia is the most common cause of bladder outlet obstruction (BOO) and lower urinary tract symptoms (LUTS) in elderly men [1–3]. Surgical intervention is considered the cornerstone treatment in complicated LUTS when medical treatment is ineffective [4]. The EAU Non-neurogenic Male LUTS Guidelines recommend open simple prostatectomy (OSP) or laser adenoma enucleation in males with large prostatic gland (>80 g) [4]. Recently, robotic-assisted simple prostatectomy (RASP) has obtained widespread acceptance in the scientific community as a feasible alternative to OSP for complicated BOO caused by large prostates [5]. Moreover, RASP offers lower peri-operative complication incidence, shorter length of hospitalisation, and lower estimated blood loss and transfusion rate compared to OSP [5, 6].

Obesity represents a major health problem worldwide, with increasing prevalence over the years [7]. Several studies correlated obesity with an increased

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risk of intra- and postoperative complications as well as functional outcomes impairment for a variety of urological procedures, while other studies denied any correlation between obesity and treatment outcomes [8–10]. However, there are few studies in literature investigating the potential correlation between the patient's body mass index (BMI) and functional outcomes after RASP. Therefore, we analysed the impact of obesity on perioperative and long-term functional outcomes of patients undergoing RASP in our centre.

MATERIAL AND METHODS

This is a retrospective analysis of a prospectively maintained Institutional Review Board-approved database of RASP performed between June 2012 and May 2020 in our institution (Registration ID: 1722/22). Demographic data included age, American Society of Anesthesiology classification status (ASA), BMI, and history of prior pelvic and/or abdominal procedures. Patients were divided into 2 groups depending on their BMI: non obese (<30 kg/m^2) and obese (≥30 kg/m^2).

Baseline functional parameters included validated questionnaires scores: International Prostate Symptom Score (IPSS) and its quality of life index (QoL), International Index of Erectile Function (IIEF) score, Male Sexual Health Questionnaire (MSHQ), International Consultation on Incontinence Questionnaire (ICIQ), and Overactive Bladder Questionnaire (OABQ). Baseline uroflowmetry parameters, such as post-void residual volume (PVR) and maximum flow rate (Qmax), and prostate-specific antigen (PSA) were also recorded. These variables were also assessed every 6 months during follow-up.

Exclusion criteria included a history of bladder or prostate cancer, urethral stricture, neurological disease, and prostate volume (PV) <80 g. Prostate volume was assessed by transrectal ultrasound, using the ellipsoid formula: height × width × length of the prostate × 0.523.

We evaluated composite outcomes (Trifecta), defined as a combination of post-operative Q-max >15 ml/s, IPSS score < 8, and absence of complications [11]. Additionally, composite pentafecta outcomes included the trifecta variables plus the persistence of antegrade ejaculation (MSHQ >0), and erectile function maintenance (ΔIEEF <6) [12].

Perioperative outcomes included operative time (OT), catheterisation time, blood loss, and length of hospital stay. Post-operative complications within the first 90 days were graded according to the Clavien-Dindo classification (CDC) [13]. All surgeries were performed with the Da Vinci Si Surgical System (Intuitive Surgical, Sunnyvale, CA, USA). Patients were scheduled for urethral- or non-urethral-sparing RASP according to specific pre-operative parameters discussed in previous series [14].

Statistical analysis

Continuous and categorical variables were compared using Mood's median test and the χ^2 test, respectively. A p-value <0.05 was considered statistically significant. Statistical analyses were performed with the Statistical Package for the Social Sciences (SPSS version 23, IBM, Chicago, IL, USA).

Bioethical standards

The study was retrospective and does not require consent of the bioethics committee.

RESULTS

The characteristics of the 81 individuals who underwent RASP in our institution are presented in Table 1. Demographics and baseline features were comparable between cohorts. As expected, median BMI was significantly different between the 2 cohorts, with 66 patients having a BMI <30 kg/m^2 compared to a BMI ≥30 kg/m^2 in 15 patients (p <0.01).

All surgeries were performed by a transperitoneal approach. Freyer, Millin, and Madigan techniques were performed in 26 (32%), 37 (46%), and 18 (22%) cases, respectively. Perioperative and long-term functional outcomes were detailed in Table 2. The median follow-up was 36 months. The median OT, defined as time from incision to skin closure, was comparable between groups (p = 0.39). No differences were observed in terms of catheterisation time (p = 0.42), hospital stay (p = 0.73), blood loss, which was negligible (<50 ml), and peri-operative complications (p = 0.64).

At follow-up, median IPSS decreased by 21 points in the non-obese population compared to a 14-point decrease in obese patients (p <0.02). A significant improvement in QoL index was also recorded, but without significant differences between groups (p <0.47). Median Qmax was higher in the non-obese patient cohort (22 ml/s vs 20 ml/s, p <0.02). Additionally, the median PVR was lower also in non-obese individuals (0 ml vs 10 ml p <0.03). PSA levels were found to be significantly decreased in both cohorts.

Regarding sexual function, no significative differences were observed in postoperative IEEF score (p <0.41), MSHQ score (p <0.65), and ICIQ score (p <0.08) between cohorts. However, a statistically significant ad-

Table 1. *Baseline and perioperative outcomes*

Variable	Overall (n = 81)	BMI <30 (n = 66 [64%])	BMI ≥30 (n = 15 [36%])	p-value
Age (years)	69 (63–74)	69 (64–74)	67 (62–72)	0.56
ASA ≥3 [%]	12 (15%)	10 (15%)	2 (13%)	0.86
BMI	25 (23–29)	24 (22–27)	31 (30–32)	<0.01
Prostate volume [g]	90 (80–116)	90 (79–116)	90 (80–117)	0.84
Indwelling catheter [%]	31 (38)	28 (42)	3 (20)	0.10
PSA pre [ng/dl]	5 (3.6–8.8)	5 (3.3–8.6)	6 (4–10)	0.40
IPSS pre	25 (20–28)	25 (21–28)	20 (17–26)	0.08
QoL index PRE	5 (4–5)	4.5 (4–5)	5 (4–5)	0.65
IIEF-5 pre	19 (11.5–23)	20 (12–23)	18 (9–21)	0.40
MSHQ pre	11 (8–15)	10 (8–15)	11 (8–15)	0.69
ICIQ pre	1 (1–4)	1 (1–5)	1 (0–2)	0.10
OABQ-SF pre	44 (37–55)	42 (34–52)	45 (38–58)	0.21
Q-MAX [ml/s] pre	8 (5–10)	8 (5–10)	6 (4–8)	0.08
Operative time [min]	116 (92–135)	120 (95–136)	110 (90–126)	0.39
Surgical technique [%] FREYER MILLIN MADIGAN	 26 (32) 37 (46) 18 (22)	 20 (30) 31 (47) 15 (23)	 6 (40) 6 (40) 3 (20)	0.77
Length of stay (days)	3 (3–4)	3 (3–4)	3 (3–5)	0.73
Peri-op complication (%)	8 (9)	7 (11)	1 (7)	0.64

ASA – America Society of Anesthesiologist score; BMI – body mass index; ; ICIQ – International Consultation on Incontinence Questionnaire; IEEF – Index of Erectile Function; IPSS – international prostate symptoms score; MSHQ – Male Sexual Health Questionnaire; OABQ – Overactive Bladder Questionnaire; Q-MAX – peak flow; QoL – Quality of life

Table 2. *Perioperative and long-term functional outcomes*

Variable	Overall (n = 81)	BMI <30 (n = 66 [64%])	BMI ≥30 (n = 15 [36%])	p-value
Time to catheter removal (days)	7 (6–8)	7 (7–9)	7 (5–8)	0.42
Follow-up (months)	37 (22–66)	38 (24–66)	33 (14–69)	0.30
PSA post	0.7 (0.4–1.2)	0.7 (0.4–1.2)	0.4 (0.2–0.8)	0.04
IPSS post	5 (3–9)	4 (2–9)	6 (5–9)	0.02
QoL post	1 (0–1)	1 (0–1)	0 (0–1)	0.47
IIEF-5 post	18 (9–22)	18 (11–23)	18 (6–20)	0.41
MSHQ post	4 (1–5)	3 (1–5)	5 (1–11)	0.65
ICIQ post	1 (1–1)	1 (0–1)	1 (1–5)	0.08
OABQ-SF post	20 (19–26)	19 (19–21)	36 (24–58)	<0.01
QoR – VAS [%]	90 (70–100)	90 (70–100)	90 (60–100)	0.78
Q-MAX post [ml/s]	21 (18–26)	22 (18–28)	20 (16–21)	0.02
PVR [ml]	0 (0–14)	0 (0–10)	10 (0–20)	0.03
Tamsulosin post [%]	12 (15)	9 (14)	3 (20)	0.53
Duloxetine post [%]	7 (9)	2 (3)	5 (33)	<0.01
Trifecta [%]	46 (57)	36 (54)	10 (67)	0.39
Pentafecta [%]	14 (17)	11 (17)	3 (20)	0.76
Delayed complications [%]	2 (2.5)	0 (0)	2 (13)	<0.01
Antegrade ejaculation [%]	24 (30)	20 (30%)	4 (27%)	0.78

IEEF – Index of Erectile Function; ICIQ – International Consultation on Incontinence Questionnaire; IPSS – International Prostate Symptoms Score; MSHQ – Male Sexual Health Questionnaire; OABQ – Overactive Bladder Questionnaire; PVR – post-void residue; Q-MAX – peak flow; QoL – quality of life; QoR – quality of recovery

vantage of the non-obese cohort was observed in the median post-operative OABQ score (19 vs 36, respectively [p <0.01]). Furthermore, a statistically higher incidence of post-operative stress incontinence requiring duloxetine prescription was found in the obese cohort (2 vs 5 patients, p <0.01).

Trifecta was achieved in 36 (54%) patients of the non-obese cohort, compared to 10 (67%) patients of the obese cohort (p <0.39). Overall, 11 (17%) patients achieved pentafecta in the non-obese cohort compared to 3 (20%) patients in the other group (p = 0.76).

DISCUSSION

Obesity represents a major clinical issue in many countries, with a 3- to 6-fold increase over the last decade [15]. Besides adversely affecting general health, obesity has been demonstrated to increase the risk of postsurgical complications [8]. Several studies in men have linked abdominal adiposity to a higher prevalence of LUTS [16, 17]. Fowke et al. identified a strong correlation between prostate volume and BMI [18, 19]. Giovannucci et al. reported that patients with a waist circumference larger than 109 cm were 38% more likely to undergo surgery for LUTS secondary to benign prostatic obstruction compared to those with a waist circumference <89 cm [16]. Given these findings, an increasing prevalence of LUTS due to BOO is expected in the coming years alongside the global increase in obesity rates. Hence, we believe this is a highly relevant topic requiring further investigation.

Although multiple studies have demonstrated the feasibility, reproducibility, and efficacy of RASP in the general population, the present study is the first in the literature to report perioperative and long-term functional outcomes after RASP stratifying them by patient BMI.

Although the patient population was homogeneous for demographics, ASA score, and baseline uroflowmetry parameters and validated questionnaire scores, obese patients reported significantly lower subjective improvements in International Prostate Symptom Score (IPSS) and Overactive Bladder Questionnaire (OABQ) scores, as well as a higher incidence of stress incontinence (p <0.01) after a median follow-up of 36 months. Postoperative flowmetry parameters, such as Q-max and PVR, were also significantly worse in this cohort.

Despite previous studies suggesting a correlation between obesity and prolonged operative time, perioperative mortality, and morbidity [9, 10, 20–22], Singh et al. observed no statistically significant difference in mean OT and perioperative complications among obese and non-obese patients undergoing radical prostatectomy [23]. Similarly, we did not find a significant difference in OT between cohorts in our study (120 min vs 110 min, p = 0.39). The median OT is notably shorter than those reported in other series [11, 24]. Pavan et al. reported a Clavien-Dindo classification rate of 17.7% in their series of RASP. In our study the overall complication rate was 9.0%, with most being low-grade (Clavien I–II), which usually has no impact on post-operative recovery and length of hospital stay. Only one patient (1.2%) patient experienced a Grade III complication, while no Grade IV or Grade V complications were recorded. These results are in line with those reported by Autorino et al. in their series [11]. PSA levels decreased significantly in both groups, representing indirect evidence of prostatic volume enucleation success of the surgical procedure.

The median length of hospital stay (LOS) was similar for both groups (3 days), which is shorter compared to the OSP series [25], but considerably longer when compared to that of patients undergoing laser or bipolar enucleation [21]. Holmium laser enucleation of the prostate (HoLEP) is less invasive than RASP and suitable for prostates of any size, unlike transurethral resection of the prostate. To date, HoLEP is the only laser treatment endorsed by both the American Urological Association (AUA) and European Association of Urology (EAU) guidelines, as there is level 1 evidence that it provides functional outcomes comparable to those of OSP in men with large prostates. However, a recent retrospective study comparing functional outcomes of RASP vs HoLEP, showed that trifecta achievement was significantly higher in the RASP group compared to HoLEP [26]. Gacci et al. described an association between obesity, metabolic syndrome, and poor LUTS relief after OP and TURP [27]. In this study limited improvements in IPSS score were observed in patients with a waist circumference greater than 102 cm [27]. Our study's results are in line with those of Gacci et al. [27], particularly with respect to the obese patient cohort showing worse postoperative subjective (median IPSS and OABQ scores) and objective (Q-Max and PVR) functional outcomes compared to the control group. Nonetheless, no statistically significant improvement was observed in terms of quality of life (QoL) index between groups.

In a prospective trial, Sener et al. correlated abdominal obesity with a detrimental effect on QoL mainly due to the persistence of storage symptoms after surgical treatment [28]. McVary et al., in a recent pooled data analysis, reported that improvement in storage symptoms has more positive impact on QoL and urinary discomfort compared to voiding symptoms [29, 30]. In a systematic review

Simonin et al. found that age and BMI were the most relevant risk factors for incontinence after prostatectomy regardless of the surgical approach [30]. This correlates with our results, where the number of patients with incontinence requiring duloxetine after surgery was considerably higher in the obese patient group (5 vs 2, respectively) ($p < 0.01$).

Recently, trifecta and pentafecta composite outcomes have been introduced as markers of surgical quality for simple prostatectomy procedures [11, 12]. In multivariable analysis, BMI was not an independent predictor of trifecta outcome in Autorino's series [11]. However, in the series published by Pavan et al., RASP functional outcomes were negatively affected by age and BMI [24]. In our study, in comprehensive outcomes assessment, obese patients had comparable trifecta (67% vs 54%, $p = 0.39$) and pentafecta achievement rates (20% vs 17%, $p = 0.76$) between BMI cohorts.

The present study is not free from limitations. Firstly, the retrospective study carries some inherited bias due to the nature of its design. The analysis was confined to parameters that were available and of appropriate quality for a reliable assessment. Secondly, obesity was defined solely based on BMI. However, in patients with significant muscle mass, BMI may not effectively distinguish pure adipose tissue from lean body mass. Thus, other obesity parameters, such as waist circumference or waist-to-hip ratio, were not assessed.

Furthermore, the comparison of RASP with other established endoscopic procedures for BPE remains to be fully elucidated. Currently, limited evidence exists in this regard. In a large-retrospective cohort, holmium enucleation of the prostate had comparable short-term functional outcomes and complication rates among obese and non-obese individuals [21]. This topic certainly warrants further investigation.

CONCLUSIONS

The present observations show that RASP offers comparable long-term functional outcomes and perioperative complications among obese and non-obese patients. Ultimately, obese patients should be counselled regarding the risk of post-prostatectomy storage LUTS and urinary incontinence.

CONFLICTS OF INTEREST

The authors declare no conflict of interest.

FUNDING

This research received no external funding.

ETHICS APPROVAL STATEMENT

The ethical approval was not required.

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