Symposium

Handling difficult anastomosis. Tips and tricks in obese patients and narrow pelvis

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ABSTRACT

Vesico-urethral anastomosis (VUA) is a technically challenging step in robotic-assisted laparoscopic prostatectomy (RALP) in obese individuals. We describe technical modifications to facilitate VUA encountered in obese individuals and in patients with a narrow pelvis. A Pubmed literature search was performed between 2000 and 2012 to review all articles related to RALP, obesity and VUA for evaluation of technique, complications and outcomes of VUA in obese individuals. In addition to the technical modifications described in the literature, we describe our own experience to encounter the technical challenges induced by obesity and narrow pelvis. In obese patients, technical modifications like use of air seal trocar technology, steep Trendlenburg positioning, bariatric trocars, alterations in trocar placement, barbed suture and use of modified posterior reconstruction facilitate VUA in robotic-assisted radical prostatectomy. The dexterity of the robot and the technical modifications help to perform the VUA in challenging patients with lesser difficulty. The experience of the surgeon is a critical factor in outcomes in these technically challenging patients, and obese individuals are best avoided during the initial phase of the learning curve.

Key words: Robotic prostatectomy, prostate cancer, obesity, vesico-urethral anastomosis

INTRODUCTION

Prostate cancer is the most common non-cutaneous solid malignancy among men in the United States and the second leading cause of cancer death.[1] With the advent of new diagnostic advances and early screening, more than 90% of the cases identified have organ-confined disease and are potentially curable.[2] In general, radical prostatectomy (RP) is the treatment of choice for patients with clinically localized prostate cancer and life expectancy >10 years.[3] By 2008, around 80% of RPs in the United States were performed with robotic assistance.[2] The feasibility and safety of the procedure has been well documented; however, techniques continue to be refined to improve functional and oncological outcomes.[3,4] Robotic-assisted laparoscopic prostatectomy (RALP) offers several advantages including decreased blood loss, shorter hospital stay and less peri-operative morbidity compared with traditional open methods.[5-7]

Obesity represents a major healthcare problem that is significantly affecting people of all ages in developed countries. A body mass index >30 kg/m^2 is increasing in incidence and is a major health issue in the USA and elsewhere. In 2009 and 2010, the National Health and Nutrition Examination Survey (NHANES) reported the overall prevalence of obesity as 35.7% among adults in the USA.[8,9] Several previous studies have reported a correlation of obesity with increased odds of prostate cancer risk[10] higher grade prostate cancer and progression that increases death from prostate cancer.[11,12] Given the increasing incidence of obesity in men, several authors have reported the impact of body mass index (BMI) on surgical outcomes for patients with prostate cancer.[13] A Pubmed literature search was between 2000 and 2012 to review all articles related to RALP, obesity and vesico-urethral anastomosis (VUA) for evaluation of technique, complications and outcomes of VUA in obese individuals. Obesity increased the operative

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time and blood loss, elevated the transfusion rate and made radical prostatectomy challenging.[13-16]

The final step of VUA is a very challenging and critical step of RALP, particularly in obese patients. The goals that are achieved by an ideal VUA are absence of peri-operative urine leakage and earlier return of continence. Persistent efforts have been made to reduce the urinary extravasation and achieve urinary continence both in open surgery and in minimally invasive prostatectomy.[4] The dexterity of the robot had made it possible to facilitate complex reconstruction in the deep pelvis reproducing and surpassing the open techniques. Failure to achieve a watertight anastomosis is associated with post-operative urinary leak and its consequences such as paralytic ileus, prolonged catheterization, urinary peritonitis, possibly re-intervention, bladder neck contracture and delayed continence.[3,4] Thus, it is very important and critical to have a watertight anastomosis. Several techniques of urethra-vesical anastomosis have been tested in the past aiming to reduce the post-operative urine leak and its consequences. These include the use of interrupted sutures, two independent running sutures[17] and pre-tied running sutures, the van Velthoven method[18] and the use of unidirectional[19,20] and bidirectional barbed[21,22] sutures. Despite these variations, the rates of urine leak have been reported to range between 4.5% and 7.5% at high-volume centers.[23,24] Use of barbed sutures has reduced the anastomotic time in general.[22]

Numerous technical modifications have been used to improve early return and overall continence following surgery (both open and minimally invasive), including the anterior urethropexy[25] bladder neck preservation,[26] intussusception of the bladder neck,[27] puboprostatic ligament sparing and sling construction.[28] The actual benefits of these modifications are controversial. Many of the surgical reconstruction techniques for RALP have been based on the posterior reconstruction described by Rocco and his colleagues in 2001.[29] In posterior reconstruction, the posterior rhabdo-sphincter is joined to the posterior Denonvilliers' fascia and fixed to the bladder wall 1-2 cm cranial to the new bladder neck to avoid caudal retraction of the urethra-sphincteric complex, prior to completing the standard VUA. The modified posterior reconstruction, described by Rocco *et al.* is especially a very good adjunct technique for reconstruction in obese individuals.

Difficulties in obese individuals

Obese patients can present a technical challenge for RRP (13-16, 41-42) because of excess abdominal fat, which makes access to the prostate and pelvic organs difficulty. In men who elect to undergo robotic prostatectomy, the body habitus can present a challenge to even the most experienced surgeon. Other challenges usually induced by obesity include a deeper and narrowed true pelvis combined with occasional exostosis of the pubic symphysis. During the apical dissection and preservation of the intra-pelvic urethra, the surgeon encounters peri-prostatic fat that reduces the visibility and requires effort to clear. The urethral anastomosis in obese patients can be more challenging due to intra-abdominal fat obscuring the visual field. Abdominal contour resulting in acute angulation of arms, huge omental and mesenteric fat pushing the bladder and reducing the working space, large prostates with limited working space in the true pelvis, overriding pubic bone obscuring the apical dissection and VUA, inability to reach for visualization due to increased distance between the ports and depth of the pelvis, difficulty in getting the bladder caudad for anastomosis because of fat and big prostates, fragile bladder neck secondary to large prostate and tension on bladder and a difficult to visualize retractile urethra are factors responsible for difficulty in obese individuals [Table 1].

Steps to facilitate vesico-urethral anastomosis and posterior reconstruction in obese patients-

To maximize the vision in the operative field, the following maneuvers need be performed: Trendlenburg position is increased and this modification mandates caution during positioning to prevent sliding of the patient by usage of the gel pads and the bean bag. The usual angle of the table is around 25 degrees, and it may be extended to 30 degrees. If difficulty is encountered with pubic bone interposition, the scope is changed from 30 to 0 degrees for dissection of

Table 1: Problems and solutions for difficult anastomosis in obese patients

Problems	Solutions
Acute angle of the ports if not placed correctly	More proximal port placement to avoid acute angles, ports shifted laterally Perpendicular placement of ports Usage of a bariatric camera and robotic ports
Fat on the bladder	Fat excision if needed Use of suction and grasper for retraction of the bladder and bowel
Huge omental and mesenteric fat pushing the bladder and reducing the working space	Steep rendlenburg Air seal technology
Large prostates	Need bladder neck placation
Overriding pubic bone	Depressing the camera port Change of 30 degree lens to 0 degree
Inability to reach for visualization	Depressing the robotic arms and advancing the robotic trocars more intra-peritoneally
Difficulty in getting the bladder down for anastomosis	Lateral peritoneal attachments to be released adequately when the bladder is dropped Use of posterior reconstruction to reduce help the bladder down easily and use of the fourth arm to push the bladder caudad
Fragile bladder neck	Posterior reconstruction helps in reducing the tension on anastomosis
Retracting urethra	Apical stitch, perineal pressure and posterior reconstruction helps in increasing the visibility of the intra-pelvic urethra and easier anastomosis

the apex and anastomosis. If it is difficult to visualize the bladder neck and posterior sphincter complex, the scope is switched from 30 to 0 degree. Two instruments are used to retract the fat and the bladder and to prevent fat from falling into the operative field.

Based on our continuing experience, we have modified out technique to facilitate RALP in the obese patients. Port placement should be adjusted to the body habitus with trocars shifted farther away from the pelvis and more laterally, enabling a deeper reach [Figure 1]. Air-seal trocars® technology[30] has been a useful new addition to the armamentarium for laparoscopic procedures, reducing the number of episodes of pressure loss <8 mmHg helping in maintaining already compromised working space in these populations. After establishing a pneumo-peritoneum in overweight patients, the instrument's path may be obstructed by the pubic symphysis and the pelvic brim due to a more vertical angle. Depressing the robotic arms to prevent the instruments from hitting the pelvic brim can help avoid this. In the patients with protuberant abdomen, ports must be placed at a greater distance from the pubic symphysis as measured on the body surface after insufflation, typically translating a distance of 15 cm to 17-18 cm from the pubic symphysis. Additionally, robotic trocars may have to be inserted deeper into the abdominal cavity and the arms deflected laterally to flatten the working angle of the robotic arm as they reach deep into the pelvis under the pubic bone. The use of extra-long Da-vinci trocars (Intuitive surgical, Sunnyvale, CA, USA) is helpful for the purpose. Optimally, the trocars should be inserted into the peritoneal cavity perpendicular to the abdominal wall. Placing the 12 mm Air seal® bariatric assistant lateral port pointing towards the umbilicus is helpful in preventing the port being buried under pre-peritoneal fat and avoiding bowel injury. The midline camera port is a bariatric 12 mm port. A larger beanbag is necessary to accommodate larger patients and it is imperative to pad all bony points to avoid pressure trauma, and the anesthesiologist should monitor the respiratory status in a steep Trendlenburg position.

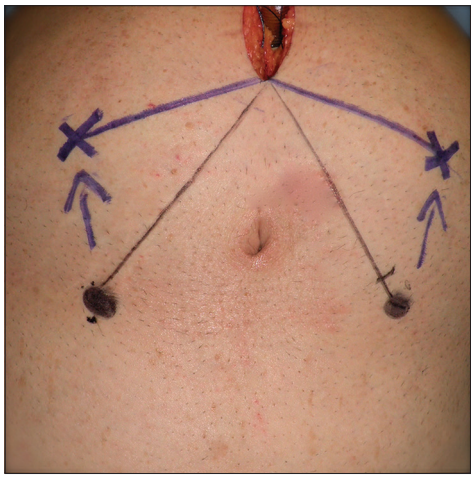

Figure 1: Picture showing cephalad placement of the camera and the 8-mm robotic ports compared with the non-obese individuals

Before performing VUA, modified reconstruction of the pelvic floor, reattaching the Denonvilliers fascia to the rhabdo-sphincter as described by Francesco Rocco *et al.*[29,31,32] is performed. For this step, a 12-cm double-armed 2/0 quill suture®[21] on a RB1 needle is used. The free edge of the Denonvilliers fascia is approximated to the posterior aspect of the rhabdo-sphincter and the posterior median raphe running one of the arms. A second layer is then run with the second arm of the suture, approximating the posterior bladder neck to the posterior lip of the urethra. A continuous modified van Velthoven VUA[18] is then performed. A 12-inch double-armed quill® 2/0 on RB1is used. The posterior urethral anastomosis is performed first with one arm of the suture starting at the 5 o clock position and reaching the 10 o clock position in the clock-wise position. This is followed by the completion of the anterior urethral anastomosis with the second arm of the suture in a counter-clock fashion and then tying the sutures on the urethral stump.

Difficulties in individuals with narrow pelvis

Several authors have reported various degrees of difficulties both in extraperitoneal and trans-peritoneal robotic prostatectomy in patients with narrow pelvis. In a study by Mason *et al.* and his colleagues,[33] the PCI (the pelvic cavity index is the pelvic inlet multiplied by the inter-spinous distance and divided by the pelvic depth) in patients undergoing prostatectomy was calculated and used to estimate the probable robotic working space. Patients with larger prostates and with narrow, deep pelvises were predicted to have a more difficult RALP. The PV (prostate volume) to PCI ratio statistically predicted lengthier and bloodier procedures but did not predict positive surgical margins[34] or transfusion risk on regression analysis. Most of the studies[34-36] did not show a positive correlation between smaller pelvic volume and negative prostatectomy outcomes. Two technical issues in patients with narrow pelvis are decreased intra-pelvic working space and clashing of robotic instruments externally. Clashing between the third and fourth arm is common in patients with smaller BMI and narrow pelvis. A minimum distance of 8 cm will negate the instrument clashing externally, with additional maneuvers of depressing the 4th arm, elevating the third arm and medially rotating the 3rd arm helping to prevent clashing. Another maneuver to prevent clashing is using a three-arm robot with additional assistant ports at the 4th arm. Intra-operative clashing can be avoided with experience; hence, smaller BMI and narrow pelvis can be avoided in the initial learning curve.

Studies and outcomes of VUA in obese individuals

Several studies have reported the functional and oncological outcomes in obese individuals [Table 2].[16,37,38] Operative

Table 2: Review of the literature

Author	BMI	OR time (mins)	Anastomotic time (min)	Complications
Castle *et al.*	32±3.9	300±65.9	40±12.3	3 Major/ 6 Minor
Bae *et al.*[39]	26.4±1.7	231.4±40.1	n/a	5 Major/ 1 Minor
Zilberman *et al.*[40]	30-34.9	178	n/a	n/a
	>35	191	n/a	n/a
Chelasani *et al.*[16]	<30	243	49.2	n/a
	>30	253	48.8	n/a
Wiltz *et al.*[41]	<30	214±65	n/a	n/a
Abdul-Mushin *et al.*[13]	<40	76.9	n/a	3 minor
	>40	84.0	n/a	5/1
Herman *et al.*[14]	25-29.9	235	n/a	n/a
	>30	304	n/a	n/a

n/a=Data not available, OR=Odds ratio, BMI=Body mass index

times ranged between 84 to 353 min, length of hospital stay ranged between 1.1 to 4.3 days and blood loss ranged between 100 to 457 ml.[13-16] Technical modifications that have shown to improve better operating time were use of Air seal technology and use of barbed suture, either unidirectional[19,20] or bidirectional.[21,22] AirSeal® trocar[30] allows reducing the number of ingress incisions and facilitates simultaneous as well as consecutive use of multiple instruments. Barbed suture has shown to decrease the anastomotic time but did not affect the urinary extravasation or long term continence rates.

CONCLUSIONS

Obesity is a significant health problem in the world. As more and more patients seek surgical management for localized cancer prostate, it is logical the surgeons will need to operate on increasing numbers of obese individuals. In obese patients, this novel technique of air seal technology, bariatric trocars, alterations in trocar placement, barbed suture and use of modified posterior reconstruction facilitate urethra-vesical anastomosis in robotic assisted radical prostatectomy. The experience of the surgeon is a critical factor in outcomes in these technically challenging patients, and obese individuals are best avoided during the initial phase of the learning curve.

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