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Original Article

Prerectal-transperineal approach for treatment of recurrent vesico-urethral anastomotic stenosis after radical prostatectomy

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Abstract Vesico-urethral anastomotic stenosis (VUAS) after radical prostatectomy is a narrowing of the vesicourethral anastomosis after radical prostatectomy. We aim to describe a safe re-anastomotic procedure for recurrent bladder neck contracture following radical prostatectomy (RP). This technique allows an easier access to the stenotic vesico-urethral anastomosis, a better mobilization of the bladder neck and a tension free re-anastomosis.

Twelve patients suffering from VUAS after radical prostatectomy were enrolled between May 2014 and September 2018. We describe our approach to the disease. The evaluated outcomes were intra- and post-operative complications, stricture recurrence, and postoperative stress incontinence. Average operative time was 3 h. No major intraoperative complications or bleeding occurred. Patients were discharged after 72 h. At the time of catheter removal, 3 weeks after surgery, 9 out of twelve patients developed stress urinary incontinence, requiring 4 pads/day. Two patients with history of pelvic radiotherapy developed a surgical site abscess that required toilette and external urinary diversion. One recurrence occurred and was treated with internal urethrotomy before sphincter placement. No patient reported significant postoperative pain or fecal incontinence. Our approach allows direct access to the posterior urethra, and we demonstrate the advantages for treatment of VUAS to achieve a tension free anastomosis. All patients need to be informed of subsequent urinary incontinence to be treated with artificial sphincter placement. Patients with a history of pelvic radiotherapy show very poor

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preoperative conditions of the tissues and must be informed about the possibility of an external urinary diversion.

1. Introduction

Vesico-urethral anastomotic stenosis (VUAS) after radical prostatectomy is a narrowing of the anastomosis between the neobladder neck and the membranous urethra. This pathologic condition can be a consequence of radical prostatectomy in up to 28% of the cases [1]. On the other hand, in the era of minimally invasive surgery a rate of 1.6% of VUAS is reported [2].

This condition demands a surgical management: both endoscopic treatment and open surgery can be successful. The most common endoscopic treatments are urethral dilatation, endoscopic incision (both laser incision and direct vision internal urethrotomy) or urethral stent placement. In the literature, the described success rates range from 27% to 92% [3–6] for internal dilatation, and 62%–58% [7,8] for direct vision internal urethrotomy with some studies reporting long-term follow-up success rates for both techniques.

Recurrent and severe VUAS require an open treatment, which warrants a success rate that ranges between 70% [9] and 100% [10]. A possible access is transperineal, which is performed through a vertical median incision about 10 cm long, below the scrotum of the patient. The perineal approach does not guarantee a tension free anastomosis in every case and several maneuvers on the urethral stump need to be performed to obtain the desired length. We believe our approach represents a valid alternative to the common perineal access only for the management of post-operative vesico-urethral anastomosis stenosis, once the patient acknowledges and accepts the iatrogenic incontinence that follows this kind of surgery.

The aim of the study is to describe a single centre, single-operator experience in performing a posterior urethroplasty by means of a prerectal approach, which allows an easier access of the VUAS, a better mobilization of the bladder neck and a tension free anastomosis.

2. Methods

2.1. Accrual

Starting from May 2014 to September 2018, all patients experiencing VUAS following radical prostatectomy were enrolled in the present retrospective study. In all cases, a retrograde and voiding cystourethrogram was performed preoperatively for a better definition of the location and extension of the stricture. All patients were informed of the high rates of incontinence resulting from this kind of surgery and signed a specific informed consent prior to surgery. Further, all patients accepted the possibility of a salvage urinary diversion to manage postoperative complications. During the study period this was not the only technique used for management of posterior urethral strictures. The treated causes vary from adenomectomy, transurethral resection, idiopathic, infectious diseases, traumatic disruption of posterior urethra and urethrorectal fistula. These patients were treated by transperineal, retropubic or combined access. All patients suffering from urethro-vesical anastomotic stenosis were treated by prerectal approach, since it is the favored approach by the surgeon. The population in study was chosen due to homogeneity of cause and anatomy. All the patients who received an artificial sphincter were implanted an AMS800. This model is the one preferred by the surgeon and the standard in our institution. Sexual function was explored in all the patients in study and it was found to be very poor in all the patients in study. Nonetheless all patients were warned about the loss of residual sexual function deriving from the intervention and they accepted it.

2.2. Surgical technique

The patient is positioned in simple lithotomy position. The ischial tuberosities are palpated and used as landmarks, so that a half ellipse-shaped incision (inferior convexity) is performed about 1–2 cm above the anus, medially to the ischial tuberosities, without incising the skin above them. Keeping the skin incision away from ischial tuberosities is crucial to allow the patient to sit down with applying pressure on the wound after surgery (Fig. 1). A marker pen is used to draw the incision on the skin before performing it. This peculiar incision makes the technique an adaptation of the transperineal prerectal approach used for radical perineal prostatectomy to VUAS treatment, rather than a modification of the classic transperineal approach for posterior stenosis. After skin incision, blunt dissection of the

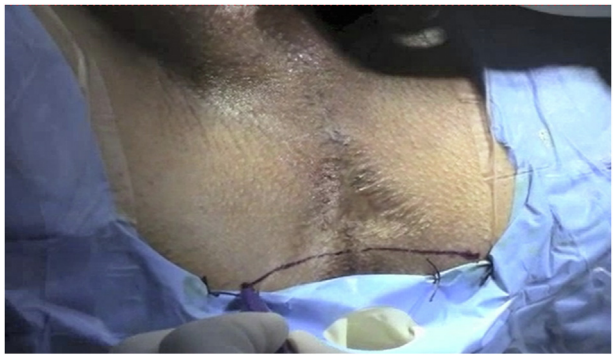

Figure 1 The skin marking is a half ellipse which runs between the ischial tuberosities 1 cm–2cm above the anus.

subcutaneous tissue is performed until the central tendon of the perineum is palpated. Thus, the central tendon of perineum is divided by electrocautery and access to the ischioanal fossae is gained by sheer palpation, rather than under direct vision. Gaining the ischioanal fossae first by prerectal incision is the main difference between the classic transperineal access and the prerectal transperineal. The fossae are a pair of prism-shaped spaces, lateral to the anal canal and directed anteromedially to the pubic symphysis. The floor of the ischioanal fossae is the levator ani muscle and the medial wall is made by the anal canal and the levator ani muscle. Gaining the fossae as the first step of the surgical procedure allows to exploit a lower dissection plane. Other authors such as Schuettfort et al. [11] have described a transperineal approach for VUAS, but the dissection in the common transperineal approach is higher: the ischioanal fossae are not found and the dissection plane is strictly above the rectum, while in the prerectal approach is directly on the rectum and around it in an half-moon shape, following the first skin incision. The operator inserts the index finger of the nondominant hand in the rectum (the "finger sleeve" of the TUR-pack is used to guarantee sterility of the field) to have a clear tactile feedback of the rectal wall while performing mechanical separation of the fatty tissue with the dominant finger to access the fossae. The lateral limits are the ischial tuberosity and the obturator muscle with his fascia. In our department we choose to mobilize and isolate the rectum as previously described by Young [12]. By this approach, access is anterior to the superficial and deep portions of the anal sphincter. The incision of the central tendon of the perineum and rectourethralis muscle in the healthy patient exposes the Denonvillier's fascia and the prostate apex. In the patient who underwent radical prostatectomy, the vesico-urethral anastomosis and the surrounding scar tissue are exposed. Then the rectum is bluntly mobilized on both sides of the anastomosis. The urethra is isolated and cut at the level of the bladder neck. The fibrotic tissue is surgically removed by scissors and the bladder neck is identified with the aid of a suprapubic Benique dilator and then everted. The suprapubic Benique is useful to incise the stricture upon it and to elevate the bladder neck to avoid rectal injuries during scar tissue excision. Further mobilization of the urethral stump can be obtained performing an upward perineal incision on the median line (Fig. 2A). The new anastomosis is ensured with three stitches anteriorly and three stitches posteriorly (Fig. 2B).

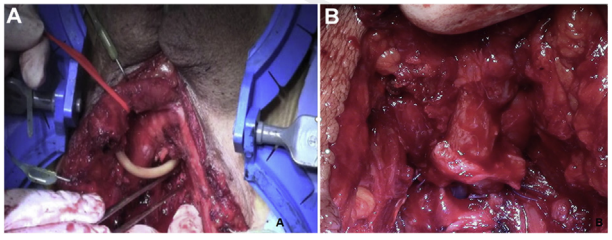

Figure 2 The surgical technique. (A) An additional perineal incision makes it easier to mobilize a longer portion of the urethra to achieve the desired length for a tension free anastomosis. (B) Afterwards, when the desired length of the urethral stump is achieved the anastomosis is performed by three interrupted stitches anteriorly and three posteriorly.

3. Results

From May 2014 to September 2018, 12 patients affected by VUAS following a radical prostatectomy procedure were enrolled in the present retrospective study. In the group of patients treated with prostatectomy alone, two reported a combined condition of stricture and incontinence. The mean age of this cohort was 65.6 (52–72) years. Ten patients developed VUAS after radical retropubic prostatectomy. In two cases, the stricture was a consequence of radical prostatectomy followed by radiotherapy. One of these two patients developed a recto-urethral fistula after endoscopic treatment (urethral stent placement plus transurethral bladder neck incision) and underwent fistula excision and gracilis muscle interposition. There were no patients with significant history of vasculopathy or diabetes (type I and II both). All patients who did not require any further surgical maneuvers kept the transurethral catheter in place for 3 weeks after surgery and a voiding urethrogram was performed before removal. Retrograde urethroscopy was performed 3 months after surgery. General features of the patients are described in the Table below.

All patients underwent radical retropubic prostatectomy, mean time from catheter removal after radical prostatectomy and reporting of stricture (defined as first time the patient reported voiding disfunction, elevate post void residue or needed suprapubic catheterization which brought to endoscopic diagnosis of VUAS) was 162 days, with the longer time to presentation being 16 months (one case) and the shorter being 2 months (three cases). The oncological characteristics of the population in study are stated in the table below: The stage of disease at biopsy and after surgery is heterogeneous (Table 2). As shown in Table 3 all patients reported stricture, but only two patients in the radical prostatectomy without radiotherapy reported incontinence. None of the radical prostatectomies were performed in our unit, but patients were referred to us for VUAS treatment. Nine out of twelve patients presented with suprapubic catheter when first came to our attention and 3 out of twelve patients with an open tip pediatric (10–12 Fr) transurethral catheter which required to be changed using a guidewire. All patients underwent at least three prior (failed) endoscopic treatments before the redo anastomosis was suggested.

A predictable consequence of posterior re-anastomosis is stress incontinence and all patients were informed before surgery. Ten patients removed the catheter 3 weeks after surgery and all but one of them developed stress incontinence, which required more than 4 pads/day. Two patients (those who underwent post-operative radiotherapy) developed postoperative surgical site infections, with perineal abscess and sepsis, that required surgical toilette and a salvage urinary diversion. Specifically, one patient underwent bilateral ureterocutaneostomy and the other a Bricker ileal conduit. The patient who did not declare urinary stress incontinence currently uses about two safety pad per day. Endoscopic follow-up revealed that a 16 Fr cystoscope could be passed into the bladder without any difficulty. The partial residual continence in this patient is still unexplained.

Table 1 General characteristics of the patients and surgical outcome after sphincter placement. A 2-year follow-up was completed for all patients. Urinary sphincter was placed 4–6 months after surgery.

Age at surgery (year)	Weight (kg)	ASA score	Radiotherapy	Comorbidity	Sphincter placement
66	75	II	No	Gilbert syndrome	Yes
66	78	II	No	Hypertension	Yes
52	70	II	No	Hypertension	Yes
68	74	II	No	Atrial fibrillation	Refused
65	74	II	No	Hypertension, Dupuytren's contracture	Refused (mild incontinence)
67	85	II	No	Mild obesity	Sphincter placed after internal urethrotomy
71	82	III	No	Hypertension	Yes
65	77	II	No	Smoker >10 cigarettes/day	Yes
73	69	III	No	Hypertension, COPD	Yes
62	70	II	No	Asthma	Yes
58	82	II	Yes	No prior comorbidities listed	Ureterocutaneostomy
72	88	III	Yes	COPD	Ureteroileal conduit

ASA score, American Society of Anesthesiology score. COPD, chronic obstructive pulmonary disease (see Table 1).

Table 2 Patients presented with various clinical and pathological TNM stages and Gleason grade at biopsy and definitive histological examination. One Gleason score 6 (3 + 3) patient upgraded to 7 (3 + 4), Three Gleason 7 (3 + 4) upgraded to Gleason 8 (4 + 4), one GS 8 patient upgraded to Gleason 9 (4 + 5). Only two patients had non focal surgical margins and underwent radiotherapy. TNM, tumor-node-metastasis; cTNM, clinical stage TNM; pTNM, pathologic stage TNM.

Oncological feature	Results
Gleason score at biopsy, *n* (%)	
6 (3 + 3)	3 (25%)
7 (3 + 4)	5 (41.6%)
8 (4 + 4)	4 (33.3%)
Gleason score at histology, *n* (%)	
6 (3 + 3)	2 (16.6%)
7 (3 + 4)	3 (25%)
8 (4 + 4)	6 (50%)
9 (4 + 5)	1 (8.3%)
cTNM, *n* (%)	
cT1c	9 (75%)
cT2a	3 (25%)
pTNM, *n* (%)	
pT2b	2 (16.6%)
pT2c	6 (50%)
pT3a	4 (33.3%)
Surgical margin, *n* (%)	
Negative	8 (66.6%)
Focal	2 (16.6%)
Positive	2 (16.6%)

The nine patients affected by stress incontinence were proposed an artificial sphincter placement for incontinence after surgery. One of these patients required internal urethrotomy before artificial sphincter placement. One patient later decided to refuse the artificial sphincter.

If we look at the population in study, 9/10 patients who underwent redo anastomosis after radical prostatectomy alone showed complete urinary incontinence after our intervention (described as the need to use 4+ pad/die). The remaining two patients underwent redo anastomosis after radical prostatectomy and radiotherapy, and they were treated with urinary diversion after surgical failure (ureterocutaneostomy or ureteroileal conduit). The patient who underwent re-anastomosis with gracilis muscle interposition for bladder neck contracture and urethrorectal stricture had fistula recurrence and an ureteroileal conduit was performed in March 2019. The other patient developed a surgical site abscess which could be managed only by surgical toilette and ureterocutaneostomy. We completed 2-years follow-up for all patients and none of them underwent additional maneuvers to treat recurrence except for the one who needed internal urethrotomy on the surgical site before artificial sphincter placement. All patients who accepted artificial sphincter placement, underwent transcorporal bulbar artificial sphincter placement. We prefer this kind of cuff placement in patients who underwent posterior re-anastomosis, because distal urethra has not been mobilized during previous surgery and blood supply is intact. One of the patients reported urethral sphincter erosion on June 2019 (about 8 months after surgery). The sphincter had to be removed and an end-to-end reanastomosis was performed to excise the site of erosion. No further maneuvers were performed on the patient. Zero patients reported significant postoperative pain and besides the two patients who had surgical site infection, there were no significant problems with the wound. No patients reported fecal incontinence after surgery or modifications of gait after surgery.

4. Discussion

When dealing with vesicourethral anastomotic stricture, the first step in treatment should be dilation or endoscopic resection. An extensive review by Rocco and Zuckerman

Table 3 The table shows patients who were reported incontinence before reanastomosis. Twelve patients were treated, two of them underwent RP + RT, 10 underwent only open retropubic prostatectomy and two patients in this group reported incontinence before our intervention by prerectal approach. One of the patients in the RP + RT group had history of urethrorectal fistula too.

Characteristics	Radical prostatectomy group	Radical prostatectomy + Radiotherapy group
Stricture, *n* (%)	8 (80%)	2 (100%)
Stricture + preoperative incontinence, *n* (%)	2 (20%)	0 (0%)

RP, radical prostatectomy; RT, radiotherapy.

[13] identified several articles which reported long-term favorable outcomes:

- Park et al. [3] reported 92.3% of success for office based progressive dilatation after multiple treatments.
- Geary et al. [6] and Zhang et al. [14] reported an astounding 100% success rate after multiple dilatation treatments with a long-term follow-up.
- Endoscopic incision showed a success rate ranging from 44.2% to 83% at the first treatment and after multiple treatments.

All these studies gathered by Rocco and Zuckerman [13] show that a large percentage of patients perform very well after outpatient or endoscopic treatment for VUAS, but those who suffer from recurrent or unnegotiable strictures suffer a great loss in quality of life and need to be referred to a specialized center and informed of the great deal of complications and consequences for open surgery, such as stress incontinence and decrease of erectile function.

The most common open access for the treatment of VUAS following radical prostatectomy is the perineal technique. This technique is carried out by performing a perineal incision and isolating the posterior urethra. To reach the bladder neck with the urethral stump and to obtain a tension free termino-terminal anastomosis, some additional maneuvers are described to be necessary, especially in post-traumatic defects. Specifically, section of the crura of the corpora cavernosa is required in 17% of the patients, inferior pubectomy (Fig. 3A) in 10%–60% of the patients [15,16]. In 3% of the patients these maneuvers are unsatisfactory, and the urethral stump remains too short. Cutting the crura deeper, over the penobulbar junction, highly increases the risk of damaging the spongy tissue, therefore in these patients it is necessary to perform a supracrural urethral rerouting: after a pubectomy is performed (Fig. 3A), the stump is brought around the crura to completely straighten it [16] (Fig. 3B). Similar maneuvers are common in treating traumatic disruption of the urethra but very rare in treating VUAS. In our experience extensive removal of scar tissue may result in a very short urethral stump when a transperineal approach is performed. To avoid excessive penile shortening or tension on the anastomosis, rerouting maneuvers are an option. Moreover, in the classic perineal approach, a flexible suprapubic cystoscopy is often needed to identify the bladder neck, which is not an absolute disadvantage, but it requires two more surgeons to perform the retropubic anterograde cystoscopy. On the contrary, a single surgical team can introduce the Benique dilator and proceed with the prerectal time of the interventions. Moreover, the Benique is useful to lift the bladder neck up and away from the rectum during dissection (a feature which cannot be accomplished with the anterograde cystoscopy).

The transperineal approach has been described extensively to treat VUAS [11] and it is an efficient and well established technique, but we sought to add some advantages to the technique describing the prerectal approach also in terms of quality of view of the surgical field for the operator and comorbidities for the patient: Since the dissection is achieved on a lower plane, it can be carried out with the patient in simple lithotomy with a frontal view of the bladder neck and the intervention can last longer without worries for the problems deriving from exaggerated lithotomy position, as described by Choi et al. [17].

Furthermore, there are specific situations in which severe stenosis develops within highly abundant fibrotic tissue. In these cases, the vesico-urethral complex may be twisted anteriorly, making urethra inaccessible from a classic perineal approach. These are the so-called "complex cases". In these cases, a transpubic-transperineal approach may be offered [17], in which the bladder neck is reached through an anterior, suprapubic access, often by means of the excision of a short tract of the pubic symphysis, in order to expose the stenotic anastomosis. Therefore, the fibrotic tract is incised and removed, and the urethra splayed open to prepare it for a vesico-bulbar anastomosis.

In this scenario, the prerectal approach may represent a valid alternative, as it warrants direct visualization of the area of the stenotic anastomosis, even in complex cases, by using the rectum as a guide, a complete removal of fibrosis around the bladder. Moreover, using a lower plane of dissection, as in the prerectal approach, a better and more extensive mobilization of the bladder neck is performed. These are all means to achieve a tension free anastomosis.

Regarding the use of external ani sphincter as anatomical landmark, we performed all our cases with the Young approach [12] because we believe that, by leaving the fibers of the anal sphincter intact and below the dissection plane, it is less likely to damage the rectum wall.

Regarding the onset of stress incontinence after surgery, it is expected: since the VUAS is a pathologic condition involving the bladder neck and the striated sphincter itself, and both of them must be transected to remove all the scar tissue, it is very unlikely to obtain a good lumen and preserve continence on the same time. In our opinion the best strategy is to inform the patient about possible postoperative incontinence and make him understand that the intervention is the first step in the stricture management, which must be followed by artificial sphincter placement.

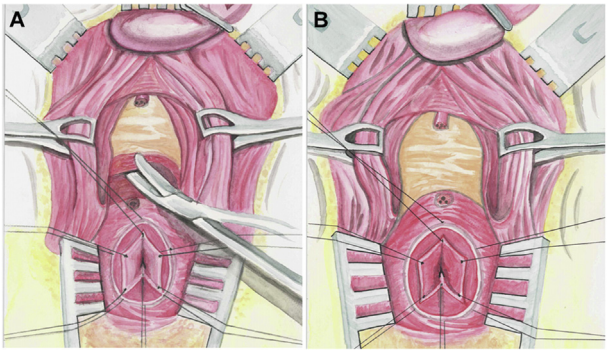

Figure 3 Additional maneuvers to obtain a tension free anastomosis. (A) Inferior pubectomy; (B) Rerouting of the urethra around one of the corpora cavernosa.

Another crucial point about this approach and the treatment of VUAS is the management of patients who underwent pelvic radiotherapy (EBRT). In both our patients who underwent EBRT, the surgical treatment was a complete failure and required toilette of the surgical wound and urinary diversion. Mundy and Andrich [19] reported higher incidence of postop complications and a difficult management for patients treated with radiotherapy when facing VUAS and this is a further confirmation of the need of careful consideration of the case in the surgical management of irradiated patients. In our unit after this experience we suggest urinary diversion (ureterocutaneostomy or ureteroileal conduit) in irradiated patients showing bladder neck contracture, urethrorectal fistulae or recalcitrant urethral stricture.

In the end, an upcoming alternative in treating VUAS is the robotic extraperitoneal retropubic approach as described by Lavollé et al. [20], which presented a series of six patients treated. In the presented patients, three patients had stricture recurrence within a year from the reconstruction, despite the superior quality of vision and precision in robotic surgery. In our opinion, a frontal view of the bladder neck, guaranteed by a transperineal or prerectal-transperineal approach makes for a better scar tissue excision and complete bladder neck mobilization when compared to a retropubic approach, whether it be robot assisted or open. Anyhow, the rate of postop continence is way higher than the one obtained with the prerectal transperineal approach (50% of the patients were declared continent against a rate close to 100% as declared in our study).

All our patients reported poor sexual function before the redo anastomosis and when we had to suggest them the artificial sphincter placement for incontinence management, we could adopt the transcorporal technique: a valid alternative to preserve the residual sexual potency when needed is a distal double cuff placement. Since all our patients were affected by erectile dysfunction, we decided to adopt a technique we know better, but everyone of our patients were informed of the possibility of a three-piece penile implant.

5. Conclusions

Although limited by few cases, our experience with the prerectal technique to solve complex cases of urethral and bladder neck strictures was feasible and successful. One of the major advantages was the direct access to posterior urethra, without the need to mobilize a greater portion of urethra from the bulbar section down to the vesicourethral anastomosis as in the classic perineal access. Importantly, this technique makes it possible to have a tension free anastomosis. All patients must be informed of the risk of post-operative complications, which may require in some cases a urinary diversion. Finally, this technique should be avoided in patients with a history of local radiotherapy for the poor preoperative quality of the tissue, making it very difficult to heal, especially in an area like the perineum which could be very easily exposed to fecal material and urine. Main limitations of our study are: the retrospective nature of the study, the small number of patients and the lack of confrontation with patients treated by simple perineal approach, which are all challenges we want to face in further studies and analyses.

Author contributions

Study design: Antonio Vitarelli, Marco Vulpi, Vincenzo Pagliarulo.
Data acquisition: Marco Vulpi, Giuseppe Papapicco.
Data analysis: Marco Vulpi.
Drafting of manuscript: Marco Vulpi, Antonio Vitarelli, Vincenzo Pagliarulo.
Drawings: Giuseppe Papapicco.
Critical revision of the manuscript: Pasquale Ditonno.

Uncited references

Q4

[18].

Conflicts of interest

The authors declare no conflict of interest. Q3

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