Use of the Allium Round Posterior Stent for the Treatment of Recurrent Vesicourethral Anastomosis Stricture

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OBJECTIVE To compare outcomes of monopolar incision and Allium Round Posterior Stent (RPS) insertion for the treatment of recurrent vesicourethral anastomosis stricture.

METHODS Having a suprapubic catheter and an obstructed pattern with a peak flow rate (PFR) ≤12 mL/s on uroflowmetry were the indications for the surgery.

Once the fibrotic vesicourethral anastomosis was incised, RPS was inserted at the level of vesicourethral anastomosis under fluoroscopic guidance. All the stents were removed at postoperative first year.

Patients were evaluated 3 months after stent removal. Objective cure was defined as no need to further treatments and PFR ≥12 mL/s while subjective cure was defined as having points < 4 on Patient Global Impression of Improvements scale.

RESULTS Of the 30 patients with a median age 66 (52-74) enrolled in the study, 18 had a suprapubic catheter, remaining 12 had median PFR 5.2 (2-10) mL/s.

Stent migration was noted in two patients, these stents were replaced by new ones. Stone formation was diagnosed in one patient, a pneumatic-lithotripsy was performed.

The median follow-up time was 28 (4-60) months following stent removal. Six cases needed further treatment after removal. The median PFR of remaining 24 patients was 20 (16-30) mL/s (P = .001). The objective cure rate was 24/30(80%), the Patient Global Impression of Improvements scores varied from 1 to 2, meaning subjective cure rate was 24/30(80%). For the six failed cases, according to patient preferences a lifetime RPS insertion was planned.

CONCLUSION With its minimally invasive nature, reversibility, and acceptable success and complication rates, incision of anastomosis and insertion of the RPS for a 1-year duration is a promising option for the treatment of recurrent vesicourethral anastomosis stricture. UROLOGY 179: 118–125, 2023.

The term vesicourethral anastomosis stricture (VUAS) refers to the anastomotic stricture that can occur following radical prostatectomy (RP) surgery.[1] Despite the improvements in the surgical technology and the general increase in experience with prostate cancer surgery, VUAS is still reported with a rate of 8%-33%.[2] The exact mechanism of VUAS is still unknown; some risk factors were described such as diabetes mellitus, coronary arterial disease, prostate surgery history, urine leakage from the anastomosis, increased blood loss during surgery, hematoma formation at the pelvis, and urethral or bladder neck ischemia.[3,4]

Traditionally, the first step in VUAS treatment is endoscopic incision/excision of the bladder neck, however the recurrence rate is 20%-30%.[5] In case of recurrent VUAS (r-VUAS), a surgical repair—abdominal or transperineal, via an open, laparoscopic, or robotic approach—is necessary. Those options are challenging both for the surgeon and the patient, and they have their own common complications.[6,7] Suprapubic diversion is a palliative option in case of total bladder neck obstruction and failed endoscopic or reconstructive treatments.

High recurrence rates of endoscopic treatments and high complication rates of reconstructive surgeries for r-VUAS led to the search for new options. Some studies have evaluated steroid injection and mitomycin injection to increase the efficacy of endoscopic treatments.[5-7] Stent usage has also been studied as a second-line

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treatment for r-VUAS.[2,6-8] The idea behind stent insertion is to provide resistance against fibrosis at the bladder neck following endoscopic incision or resection. The initial results were promising, and the authors primarily suggested the use of stents following failed endoscopic treatments.

The Round Posterior Stent (RPS) (Allium Medical Solutions Ltd, Caesarea, Israel)—a totally covered metallic, self-expandable temporary stent—has long been in our armamentarium for the treatment of r-VUAS, and we have gained satisfactory clinical results using a standardized treatment protocol that we created. Accordingly, the aim of this study was to evaluate outcomes when using the RPS for the treatment of r-VUAS following RP while adhering to a standardized protocol. To the best of our knowledge, this is the first report on this subject includes only the patients with a history of RP and uses long-term prospective follow-up data.

MATERIALS AND METHODS

Study Population

Patients who underwent RPS insertion due to r-VUAS between 2016 and 2021 were enrolled in this prospective nonrandomized study. The study protocol was approved by the local ethics committee. Written informed consent was obtained from each patient.

Diagnosis of r-VUAS

Patients complaining of voiding difficulty or urinary retention following the endoscopic treatment of VUAS were evaluated using case history, pelvic-floor examination including urethral meatus, free uroflowmetry (UF), postvoided residual urine volume (PVRV) measurement and retrograde cysto-urethrogram. Patients diagnosed with an anterior urethral stricture by retrograde cysto-urethrogram were excluded from the study and were referred to urethroplasty surgery. Flexible urethracystoscopy was performed in the office when the diagnosis was unclear.

The indications for the surgery included having a suprapubic catheter, failure to pass the bladder neck with a flexible cystoscope, and presence of an obstructed pattern with a peak flow rate (PFR) of less than 12 mL/s on UF. Patients were offered a repeat endoscopic treatment (incision, resection, or vaporization of the bladder neck), bladder neck reconstruction (via an abdominal or perineal approach), and temporary RPS placement. The preference of the patient determined the type of treatment administered.

Surgical Technique

All the procedures were performed under general anesthesia in lithotomy position, using fluoroscopy guidance, by the same surgeon (JN) with the assistance of different fellows. Perioperative antibiotic prophylaxis was administered. A 24 French (Fr) resectoscope was passed through the urethra, and the fibrotic tissues on the vesicourethral anastomosis were incised with a monopolar Collins knife until the fatty tissue was reached, in a circular fashion with a diameter of approximately 30-45Fr (Fig. 1A). The diameter was estimated in relation to the size of the tip of the resectoscope (24Fr). The localizations of the vesicourethral anastomosis and the external urinary sphincter were marked on a fluoroscopic image (Fig. 1B). In case of total obliterative strictures, suprapubic antegrade flexible cystoscopy, and retrograde rigid cystoscopy were combined to restore the patency of the bladder neck.

The RPS is a self-expandable stent developed for the treatment of bladder neck contracture VUAS and BNC.[9] It has a flexible Nitinol body entirely covered by a copolymer coating. Tissue ingrowth, stone formation, and encrustation are prevented by this copolymer, and radial force power is provided by

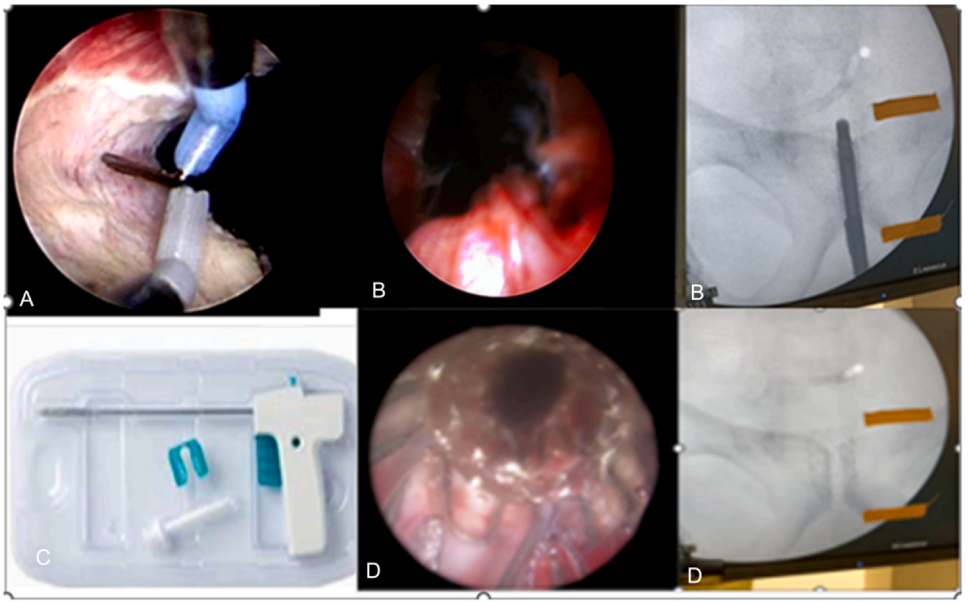

Figure 1. **(A)** Incision of fibrotic vesicourethral anastomosis till the fatty tissue. **(B)** Marking the level of vesicourethral anastomosis and urinary sphincter under x-ray. **(C)** The ready-to-use package of Allium Round Posterior Stent. **(D)** Endoscopic and fluoroscopic view of Allium Round Posterior Stent after insertion. (Color version available online.)

the Nitinol body. The RPS can widen up to 45Fr diameter after insertion and is 3 or 4 cm in length. There is a wire passing through the external urinary sphincter and an anchor at the tip of the wire that prevents proximal migration. The RPS is loaded to the tip of a ready-to-use delivery system (Fig. 1C). A zeo or 30-degree optic with a 12Fr diameter and saline irrigation are also fixed to the delivery system during insertion.

The system was inserted to urethra via the meatus shield, which is also provided as a part of the ready-to-use package. Once the delivery system reached the desired position in the bladder neck, the lock was released, and the trigger of the delivery system was squeezed several times until the stent was fully released. The position of the stent was also checked using fluoroscopy (Fig. 1D). The delivery system was then fully removed by semicircular movements. After an eventless period, patients were discharged the same day. The suprapubic cystostomy catheter that had been inserted during RPS insertion was removed at the postoperative second day.

For the removal of the RPS, a small, semirigid ureteroscope or cystoscope with a conventional grasper is used. Once the anchor of the RPS is grasped and pulled under local anesthesia, the stent unravels spontaneously and turns into a thread-like strip formation. This formation allows an easy and total removal of the RPS.

Follow Up

Preoperative data including patient demographics, type of RP, history of radiotherapy, prior treatments of VUAS, preoperative UF, and PVRV parameters were noted.

In addition, the length of the procedure, fluoroscopy duration, length of stricture, and complications according to the Clavien–Dindo system were noted.[10] At the postoperative first week, a visit was scheduled to assess early postoperative complications. Stent removal was planned at the first postoperative year. During the follow-up period, a clinical visit was planned once every 3 months to assess the patency and localization of the stent using pelvic ultrasonography, anteroposterior pelvic graphy in supine position. If migration was detected, the stent was removed, and a secondary insertion was performed. The data were also noted.

Outcome measurement was performed 3 months after stent removal. An objective cure was defined as a PFR > 12 mL/s, with no need for urethral or suprapubic catheterization. A subjective cure was assessed using the Patient Global Impression of Improvements (PGI-I) scale. A score of less than four was defined as an achieved subjective cure.

The primary and secondary outcomes of the study were the objective and subjective cure rates at 3 months after stent removal and the perioperative complication rates of RPS insertion, respectively.

Data were analyzed using Statistical Package for Social Sciences (SPSS) for Windows version 20.0 (Armonk, NY: IBM Corp.). Categorical variables were presented as frequencies (n) and percentages (%). Continuous variables were presented as median (minimum-maximum) and were compared using a Wilcoxon test. A two-tailed P value of $< .05$ was considered significant.

RESULTS

In total, 30 patients with a median age of 66 (52-74) years were enrolled in the study. Of them, 11 underwent robot-assisted, 5 laparoscopic, and 14 open RP. Four patients had a history of adjuvant radiotherapy due to a positive surgical margin. All patients had a history of at least one endoscopic procedure due to VUAS (Table 1).

Of the patients, 18 had a suprapubic catheter due to urinary retention. The median PFR was 5.2 (2-10)mL/s of remaining 12 patients. These 12 patients had also PVRV values between 100 and 200 mL. The median total length of the procedure was 23 (15-30) minutes,

Table 1. Preoperative characteristics and perioperative data.

Age, median, (minimum-maximum) (y)	66 (52-74)
Route of radical prostatectomy (number)	
1. Open abdominal	14
2. Robotic	11
3. Laparoscopic	5
Number of previous endoscopic treatments for vesicourethral anastomosis stricture (number)	
1. One	3
2. Two-three	15
3. More than three	12
Presence of suprapubic catheter (number)	18
Peak flow rate on uroflowmetry median, (minimum-maximum) (mL/s)	5.2 (2-10)
Length of stricture median, (minimum-maximum) (cm)	1.6 (1-2.5)
Length of procedure median, (minimum-maximum) (min)	23 (15-30)
Fluoroscopy time median, (minimum-maximum) (s)	5 (3-15)
Size of Round Posterior Stents (numbers)	
1. 3 cm	8
2. 4 cm	22
Complications according to Clavien-Dindo grading system (numbers), (type of complication)	
1. Grade 1	5
2. Grade 2	6
3. Grade 3	3
Follow-up time median, (minimum-maximum) (mo)	28 (4-60)
Peak flow rate on uroflowmetry median, (minimum-maximum) (mL/s)	20 (16-30)
Objective cure rate (number, percentage)	24, 80%
Subjective cure rate (number, percentage)	24, 80%

and the median fluoroscopy time was 5 (3-15) seconds. There were no recorded perioperative complications during the procedures. The median length of the strictures was 1.6 (1-2.5) cm.

Six patients complained of de novo stress urinary incontinence (SUI) following stent insertion. The number of daily pads needed for these patients was less than two. Stent-related discomfort was reported in five cases just after stent insertion, which was addressed with short-term oral nonsteroidal anti-inflammatory drug treatments. Two patients were diagnosed with a urinary tract infection following stent insertion which was treated with oral fluoroquinolone for 5 days. Dysuria without fewer was the main complaint and the urine culture reported 10.000 colony-forming units/milliliters *E coli*. Those two cases were the patients with a suprapubic catheter before the insertion. Four patients complained of urgency following stent insertion and managed with short-term oral tolterodine treatments (Table 2).

During the study period, there were two cases in which the RPS migrated into the bladder at the postoperative first and second months. Sudden onset of voiding difficulty and urgency were the alarming symptoms for the stent migration. Of these two cases, one had a trans-sphincteric wire disconnection (Fig. 2A), while the other had a totally intact stent at the time of migration (Fig. 2B). The migrated stents were removed, and new RPSs were inserted in those cases. In one other patient complaining of progressive difficulty in voiding, stone formation was diagnosed in the RPS lumen, and treated with endoscopic stone surgery using a pneumatic lithotripter.

All stents were removed without any complications at the postoperative first year. The median follow-up time was 28 (4-60) months following stent removal. In the period of 1-3 months following stent removal, 6 patients reported difficulty in voiding and needed urinary catheterization. They also needed further treatment for rVUAS; a subjective and objective cure were not achieved in those 6 cases, and they were recorded as failed cases.

For the remaining 24 cases, the median PFR was 20 (16-30) mL/s and the PVRV was less than 100 mL. Significant improvements on UF were achieved ($P = .001$). Any further treatment was not needed for those 24 cases. Thus, the objective cure rate was calculated as 24/30(80%). The PGI-I scores varied from 1 to 2, meaning a subjective cure was also achieved in 24/30 patients (80%).

For the six failed cases, available options for a second treatment for VUAS were offered, and all were opted for lifetime RPS insertion. RPS insertion was performed, and they were scheduled for a RPS change in every 3 years.

DISCUSSION

The management of VUAS is challenging for both urologists and patients. The current guidelines recommend endoscopic treatment as the first step,[1] while in the case of relapse—unlike for urethral strictures—consecutive endoscopic treatments are recommended. As the next step, current European Association of Urology (EAU) and American Association of Urology+ (AUA) guidelines recommend either urinary diversion or the reconstruction of the vesicourethral anastomosis.[11,12] Nikolavski et al emphasized that reconstructive surgeries for VUAS are more invasive, have a negative impact on patients' quality of life, and can result in new complications such as urinary incontinence and rectal injuries.[13] Nowadays, while new techniques for vesicourethral anastomosis reconstruction surgeries are being described, attempts to improve endoscopic treatments, such as steroid injections and stent insertions, are also ongoing. Our protocol is one of these new attempts and has promising results, as evidenced by its high success rate, acceptable morbidity, and reversible nature, as discussed in this study.

For complete VUAS, the current guidelines do not recommend endoscopic treatments[7]; however, Shaw et al published a paper including patients diagnosed with complete stenosis at the vesicourethral anastomosis and treated with endoscopic interventions.[5] In our series, we had 18 patients with suprapubic cystostomy, and a combined approach was performed. Our idea was in line with Shaw et al, that in experienced hands, this procedure is also an option.

The success rate of endoscopic treatments was previously reported by Rosenbaum et al to be 37%-69% for the treatment of BNC.[14] However, our study has a higher success rate of 80%, which is one of the most remarkable results of our cohort. It is surely impossible to precisely compare our success rate with those of studies evaluating endoscopic treatments due to the heterogeneity of the studies. However, our protocol has some advantages over the others which explain the higher success rate of our protocol. Firstly, instead of performing simple incision, we incise routinely all fibrotic tissue up to the healthy tissue in our method. Secondly, the RPS acting as a mold maintains the patency of the bladder neck during the wound healing. The role of urethral stents in wound healing following the urethral insertion of stents was also supported by Ustuner et al.[15] Moreover, the RPS can guard against fibrosis following the incision or resection of the bladder neck. This can be explained by three characteristics of the RPS: its ability to be used for a long indwelling time, the radial force of the Nitinol body, and its ability to prevent tissue ingrowth because of the copolymer coating. Sedigh et al described the idea behind the use of UVENTA stents (Taewoong Medical, South Korea) which are also available for the treatment of VUAS as guiding the healing process.[16] Similarly, Wong et al stated that preventing scar formation is the key benefit of implementing a permanent Memokath 045, (Engineers & Doctors A/S, Hornbaek, Denmark) stent for the treatment of VUAS.[17]

When it comes to procedure-related complications, it is reasonable to expect our complication rates to be higher than those of procedures involving endoscopic incisions or resections alone but lower than those of reconstructive surgeries. Our urinary tract infection rate (6%) was comparable to other endoscopic procedures; however, the presence of stent-specific complications was a disadvantage of our technique. The stent migration

Table 2. Preoperative, perioperative and postoperative data of the patients included in the study.

Pt	Age (y)	Type of RP	History of RT	Number of Previous Treatments for VUAS	SC	PFR (mL/s)	Length of Stricture (cm)	Length of RPS (cm)	Complication	Management of Complications	Needed Further Treatment	PFR (mL/s)	PGI-I Score	Follow Up Time (mo)	Type of Further Treatment
1	55	LRP	ADJ	1	+		1	3	SUI	Conservative		18	1	60	
2	66	RRP		2	+		1.2	3				16	2	36	
3	61	ORP		2		3	1.6	4	Urgency	Tolterodine		21	1	13	
4	74	ORP		2	+		2	4	Migration	Removal and repeat insertion		20	2	7	
5	58	RRP		3	+		1.5	4	SUI	Conservative	+			48	RPS insertion
6	63	RRP		3		2	2.5	4			+			44	RPS insertion
7	70	ORP		2		5	1.1	3	Stent dyscomfort	Short term NSAID		20	1	12	
8	60	RRP		2	+		2.5	4	UTI	Antibiotic	+			28	RPS insertion
9	68	LRP		2		5	1.2	3	Stent dyscomfort	Short term NSAID		19	1	31	
10	69	RRP		3	+		2.3	4				26	2	21	
11	60	ORP		3	+		1.3	4	Migration	Removal and repeat insertion		25	1	36	
12	72	ORP	ADJ	3	+		1.2	3	UTI	Antibiotic		24	1	6	
13	63	RRP		1		6	2	4				20	1	40	
14	66	LRP		3	+		1.4	3			+			29	RPS insertion
15	52	RRP		2	+		1.8	4	Urgency	Tolterodine		19	1	25	
16	67	ORP		3		4	1.5	4				26	1	30	
17	68	ORP		2	+		2	4	SUI	Conservative		18	2	18	
18	65	RRP		3		8	1.5	4	Stent dyscomfort	Short term NSAID		23	1	34	
19	70	ORP		3	+		1.6	4	Urgency			18	1	16	
20	65	ORP		2	+		2.3	4			+			23	RPS insertion
21	70	RRP	ADJ	2		5	1.4	3	Stent dyscomfort	Short term NSAID		22	1	10	
22	53	LRP		2	+		2.4	4				20	2	55	
23	71	RRP		3		6	2.3	4	Stone formation	Endoscopic Stone fragmentation		18	1	12	
24	59	ORP		1	+		1.8	4			+			33	RPS insertion
25	67	ORP		2		3	1.5	4	SUI	Conservative		21	1	36	
26	69	ORP		3	+		2	4	Stent dyscomfort	Short term NSAID		20	2	30	

Table 2 (*Continued*)

Pt	Age (y)	Type of RP	History of RT	Number of Previous Treatments for VUAS	SC	PFR (mL/s)	Length of Stricture (cm)	Length of RPS (cm)	Complication	Management of Complications	Needed Further Treatment	PFR (mL/s)	PGI-I Score	Follow Up Time (mo)	Type of Further Treatment
27	61	ORP		2		6	2	4	SUI	Conservative		26	1	40	
28	64	LRP		3	+		1.9	4				17	1	4	
29	70	ORP		2		6	1.5	4	SUI	Conservative		24	1	16	
30	66	RRP	ADJ	2	+	10	1.2	3	Urgency	Tolterodine		30	1	22	

ADJ, adjuvant; LRP, laparoscopic radical prostatectomy; NSAID, nonsteroid anti-inflammatory drugs; ORP, open radical prostatectomy; PFR, peak flow rate; PGI-I, patient global impression of improvements; Pt, patients; RP, radical prostatectomy; RPS, Round Posterior Stent; RRP, robotic radical prostatectomy; RT, radiotherapy; SC, suprapubic catheter; SUI, stress urinary incontinence; UTI, urinary tract infection; VUAS, vesico-urethral anastomosis stricture.

Figure 2. (A) Normal position of the Round Posterior Stent and migration secondary to trans-sphincteric wire rupture. Blue arrows indicate body of the stent in the bladder and anchor below the urinary sphincter. **(B)** Normal position of the Round Posterior Stent and migration into bladder of the stent with an intact body. Red arrows indicate body of the Round Posterior Stent and the anchor at the tip of the stents. (Color version available online.)

and stone formation rates were 2/30 and 1/30, respectively. Even though these rates were acceptable, surgical interventions for removal or stone fragmentation were required. Rectal injury, de novo permanent SUI, and urine leakage are the most reported complications of reconstructive surgeries for VUAS.[7] To prevent rectal injury, we avoid making the incisions of the bladder neck at the level of the 6 o'clock position. In our series, the rate of de novo SUI was 20%, which was higher than expected. If the patient was continent before the procedure, the RPS lumen would not cause SUI because it does not pass through the external sphincter. As such, the rate of de novo SUI during the RPS indwelling period may be explained by detrusor hyperreflexia occurring due to the RPS, the passage of the trans-sphincteric wire (despite being just 0.035 Fr in diameter), and the distal migration of the stent during physical effort. After the removal of the RPS, we did not observe any kind of urinary incontinence in our cohort. Following reconstructive surgeries, however, SUI becomes permanent due to the external urinary sphincter injury. In such cases, up to 80% of the patients needed artificial urinary sphincter implantation.[14]

Until now, a limited number of studies have evaluated the outcomes of r-VUAS treatments using stent insertion.[2,8,9,15-17] In addition, the definitions of success and the tools used to assess outcomes have differed among the studies. The main parameter used to define an objective cure has been not requiring further treatment for r-VUAS. In our cohort, this rate was 80%. However, the success rates reported by others have varied widely,

which is 25% by Sedigh et al, 54% by Culha et al, 89% by Erickson et al and 93% by Nathan et al.[2,6,8,16] This wide range can be explained by differences in study designs and used stent types. Certainly, all the studies, including ours, reported significant improvements in the UF parameters. Interestingly, no studies prior to ours used a validated tool to assess subjective cure. In our study, PGI-I score was used for this purpose. In our study, the 80% subjective cure rate aligned with the objective cure rate, meaning that patients had been cured were also satisfied with protocol.

Interesting data regarding patient satisfaction came from the six failed cases in our cohort. Despite the failure of the protocol, they preferred lifetime RPS insertion as a further treatment for r-VUAS. Although subjective cure was not evaluated during the RPS indwelling time, this preference suggested higher patient satisfaction with RPS insertion.

Culha et al published the first experiences regarding RPS insertion for BNC.[2] Although they did not separate patients who experienced BNC following transurethral prostate resection from those with r-VUAS, some of their results were informative. Their migration rate was 43% and 53% at the 1st month and 14th month after insertion, respectively. Their rates were higher than ours (6%), which may be explained by the fact that for the patients diagnosed with BNC; a 3 cm RPS would not fully cover bladder neck and prostatic cavity, so distal edge of the stent would be pressed during physical effort causing migration toward the bladder. Their success rate for r-VUAS was 54%, which is a bit lower than ours. This difference may be explained by their cohort containing patients from 2009, when the idea of stenting with the RPS was just emerging. In addition, our indwelling time of 12 months was longer than that used in their cohort; median 7 (3-14) months. We observed the benefits of longer indwelling time for the wound-healing process. Sedigh et al supported this idea, as they scheduled UVENTA stent removal at 6 months after insertion. They further stated that a longer indwelling time enabled by improvements in stent technology could result in a higher success rate.[16]

Although no histological study has examined the ideal duration by evaluating the wound-healing process around the bladder neck, we selected 12 months as the stent indwelling duration. Rosenbaum et al suggested the use of magnetic resonance imaging to evaluate the amount of fibrosis as a future direction.[14] We think that such data would help in setting the duration of the stent indwelling period.

Currently RPS, UVENTA, Memokath 045 and Urolume (American Medical Systems) stents are available on the market for the treatment of r-VUAS and there is also no available data comparing these stents. The choice usually depends on availability of the stents and surgeon experience. Urolume is a permanent metallic stent which has been criticized due to higher rates of complications including tissue ingrowth, re-stenosis, urinary tract infection and stone formation by Frankiewics et al.[18] Memokath 045 is a temporary metallic stent with a thermo-expandable body. Tissue ingrowth, migration and stone formation are the reported complications.[17] UVENTA and RPS have a coat over the metallic body with preventive advantages of coating against tissue ingrowth, which was emphasized by Abbasi et al, who also suggested using coated stents for the treatment of r-VUAS.[7] To minimize the risk of migration an anchor was attached to the body of the RPS with a wire, while four anchors were fixed to both edges of the stent for UVENTA. Sedigh et al observed 75% migration rate after UVENTA insertion for the treatment of r-VUAS, while no migration was noted in bulbar urethral stricture cases.[16] It may be argued that for VUAS the anchors of UVENTA were not sufficient to prevent migration. Considering the previous studies in literature, we preferred RPS for our protocol.

Limitations

This study has certain limitations. First, the cohort was relatively small, and there was no control group including nonstented patients following the incision of bladder neck. Second, a validated stent-related symptom questionnaire was not used, as none are yet available to the best of our knowledge. The lack of a cost analysis is another limitation. Lastly, a detailed clarification for the six failed cases was missing.

CONCLUSION

With its minimally invasive nature, reversibility, and acceptable success and complication rates, our protocol which includes the incision of the vesicourethral anastomosis and insertion of the RPS for a 1-year duration is a promising option for the treatment of r-VUAS after failed endoscopic treatments and before reconstructive surgeries.

Declaration of Competing Interest

The authors have no conflict of interest to declare.

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