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Management of Urethral Stent Failure for Recurrent Anterior Urethral Strictures

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Abstract

Background: Urethral stent placement for recurrent anterior urethral strictures may cause restenosis and complications.
Objective: To describe our experience with patients who had restenoses and complications following urethral stent placement for the treatment of recurrent anterior urethral strictures.
Design, setting, and participants: We evaluated retrospectively the records of 13 men with anterior urethral stricture who experienced restenosis and complications after stent insertion. We recorded stent position, prestent and poststent urethral procedures, restenosis location, stent-related complications, and management of stent failures.
Surgical procedure: The stent was removed en bloc with the whole strictured urethral segment or wire by wire after a ventral or a double-ventral plus dorsal-sagittal urethrotomy and stent section.
Measurements: Successful outcome was defined as standard voiding, without need of any postoperative procedure, and full recovery from complications.
Results and limitations: Four patients did not undergo surgery and the stent was left in situ. Of these patients, two required permanent suprapubic cystostomy. Nine patients underwent challenging surgical stent removal and salvage urethrostomy: After the first stage, three patients are waiting for further reconstructive steps, five elected the urethrostomy as a permanent diversion, and one completed the staged reconstruction using a buccal mucosa graft at the second stage. After surgery, seven of the nine patients (77.8%) were free of strictures and stent-related complications, while a restenosis occurred in two of the nine (22.2%) cases.
Conclusions: The management of urethral stent failure represents a therapeutic challenge. The stent risks converting a simple stenosis into a complex stenosis requiring a staged urethroplasty, a definitive urethrostomy, or a permanent suprapubic diversion.

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1. Introduction

In 1988, Milroy et al introduced the use of stents in the treatment of urethral strictures [1]. After initial enthusiasm and expanding indications for different kinds of urethral stenoses, long-term outcomes revealed a high failure rate [2,3]. Restenosis is the main determinant of stent failure; recurrent genitourinary infections, encrustation, pain, and sexual complaints are other common stent-related complications.

Reoperation rates of failures after stent placement in anterior urethra range between 33% and 45% [2,4], and their management usually results in a difficult therapeutic challenge. Stent failures are commonly treated by internal optical urethromy (IOU) and/or dilations, with poor outcome requiring subsequent complicated urethroplasty with moderate success [2,4–7].

We report our experience with the management of restenoses and complications after urethral stent insertion for recurrent anterior urethral strictures.

2. Methods

We retrospectively analysed the records of 13 men with anterior urethral stricture who experienced restenosis and complications after urethral stent insertion. All patients were referred to our centre between 2000 and 2008 after implantation of urethral stent in other urology departments. For each patient, we determined the aetiology of primitive stricture, stent position, urethral procedures performed before (prestent) and after (poststent) stent placement, restenosis location, stent-related complications, management of stent failures, and outcomes. Preoperative evaluation included clinical history, physical examination, urine culture, uroflowmetry, retrograde-voiding cystourethrography, and urethroscopy.

Based on the above-mentioned parameters, we chose conservative (nonsurgical) or interventional (surgical) approaches. The rationale of our surgical procedure was to provide stent removal followed by urethroplasty. Urethral repair was fashioned according to intraoperative findings.

Follow-up assessment included uroflowmetry and urine culture every 4 mo in the first year and annually thereafter. Urethrography and urethroscopy were performed in case of newly developed obstructive symptoms. Successful outcome was defined as standard voiding without need of any postoperative procedure, including dilation, and full recovery from complications.

3. Results

Mean age at time of first treatment of early stenosis was 42.4 yr (range: 20–72), at time of stent insertion was 48.7 yr (range: 24–75), and at time of our office referral was 58 yr (range: 44–78). Mean time between first treatment of primitive stenosis and stent placement was 6.1 yr (range: 1–20) and between stent placement and our approaches was 7.7 yr (range: 1–14). Mean time between first treatment and our surgical approach was 13.3 yr (range: 3–26).

The aetiologies of early urethral strictures were unknown in four (30.7%) cases, were iatrogenic in six (46.1%) cases, were lichen sclerosus in one (7.7%) case, and were traumatic in two (15.4%) cases (Table 1). Patients underwent a mean of 4.5 prestent treatments (range: 1–13) for anterior urethral stricture: Eight patients underwent IOUs, two underwent IOUs and dilations, one underwent urethroplasty, and two underwent IOUs and dilations and urethroplasty.

Stent location was bulbar in 12 cases (bulbar proximal in 4 of the 12 cases) and peno-bulbar in 1 case. In all cases, the stent was a UroLume stent (American Medical Systems, Minnetonka, MN, USA).

All patients developed restenoses after stent placement, and nine underwent a mean of 1.5 poststent treatments (range: 1–3) before referral to us; IOU, dilations, or urethroplasty failed to overcome the obstruction. At time of visit to our centre, 11 patients presented severe obstructive voiding symptoms and two presented with urinary retention treated by suprapubic cystostomy.

Restenosis was located inside the stent in four cases (cases 6, 8, 11, and 13), inside the stent plus far from stent in one case (case 10), far from the stent in two cases (cases 4 and 12), far from and close to the stent in two cases (cases 1 and 3), and close to the stent in four cases (cases 2, 5, 7, 9) (Figs. 1–4).

The restenoses were 2.5–10 cm long (mean: 5 cm). Four patients reported stent-related complications such as recurrent orchiepididymitis and urinary infections, two reported perineal pain, and two reported sexual discomfort or dysfunction (chordee, pain during erection).

Four of the 13 patients did not undergo surgery and the stent was left *in situ*; in all cases the stent was in the proximal bulbar urethra. Two patients refused open surgery due to high risk of postoperative incontinence because the stent was adjacent to the residual sphincter after transurethral resection of the prostate (TURP) (cases 11 and 13) (Fig. 5). One patient was not suitable for surgery due to severe cardiovascular comorbidities (case 10). One patient refused any further procedure (case 12). Of these four conservatively treated patients, two required permanent suprapubic cystostomy.

Overall, 9 of 13 patients underwent surgical stent removal and salvage urethroplasty. Mean follow-up for these patients was 40.3 mo (range: 12–105). An inverted Y-shaped perineoscrotal incision or a midline penile incision was made for a bulbar or a penile stent removal, respectively. A significant amount of fibrosis surrounding the corpus spongiosum was found. In two patients, the stent was strongly embedded inside a fibrotic urethra and it was removed en bloc with the whole urethral segment. In seven patients, the stent was removed wire by wire and the urethral plate was preserved. The removal of the individual wires was outlined by a ventral-sagittal urethrotomy and stent section in four cases or by double-ventral plus dorsal-sagittal urethrotomy and stent section after urethral mobilisation from the corpora cavernosa in three cases (Fig. 6).

We elected a staged approach for urethral repair, due to the adverse local tissue conditions. At stage 1, the margins of the preserved urethral plate were sutured to the adjacent genital skin edges. In case of removal en bloc (cases 6 and 7), the urethral defect was filled by a preputial skin graft positioned between the roof of the urethral ends over the corpora bodies and sutured to the adjacent perineoscrotal skin edges.

Table 1 – Results for the series

Patient (age in years)	Aetiology	Stent location	Prestent procedures	Poststent procedures	Time between first treatment and stent placement, yr	Stent duration, yr	Our management	Additional procedures
1 (46)	Lichen sclerosus	Bulbar	2 IOUs	–	5	14	Stent removal (wire by wire via ventral-dorsal urethotomy) and perineostomy; patient declined further surgery.	**None**
2 (57)	Traumatic	Bulbar	6 IOUs	–	20	5	Stent removal (wire by wire via ventral urethotomy) and perineostomy; patient declined further surgery.	**None**
3 (40)	Unknown	Bulbar	1 IOU	1 IOU	1	10	Stent removal (wire by wire via ventral urethotomy) and perineostomy; patient declined further surgery.	**None**
4 (57)	Iatrogenic	Bulbar	Dilations, 2 IOUs, 1 urethroplasty	1 IOU	18	8	Stent removal (wire by wire via ventral urethotomy) and perineostomy; patient declined further surgery.	**None**
5 (58)	Iatrogenic	Bulbar	4 IOU	3 IOUs	3	12	Stent removal (wire by wire via ventral-dorsal urethotomy) and perineostomy; patient waiting for final reconstruction.	**None**
6 (57)	Unknown	Bulbar	Dilations, 2 IOUs	Dilations	3	3	Stent removal (en bloc) and perineostomy using preputial skin graft; patient waiting for final reconstruction.	**None**
7 (75)	Iatrogenic	Bulbar	3 IOUs	1 IOUs	2	1	Stent removal (en bloc) and perineostomy using preputial skin graft; patient declined further surgery.	**Dilations**
8 (41)	Iatrogenic	Peno-bulbar	2 urethroplasties	2 IOUs	1	4	Stent removal (wire by wire via ventral-dorsal urethrotomy) and penile urethrostomy (first stage). Neourethral plate reconstruction with preputial skin graft (second stage); patient waiting for final reconstruction.	**None**
9 (46)	Unknown	Bulbar	1 IOU	–	5	5	Stent removal (wire by wire via ventral urethrotomy) and perineostomy (first stage). Closure of perineostomy using dorsal BMG (second stage).	**3 IOUs**
10 (78)	Iatrogenic	Bulbar (proximal)	Dilations, 1 IOU	Dilations	4	13	Patient not suitable for surgery due to severe cardiovascular comorbidities; permanent suprapubic cystostomy performed.	/
11 (76)	Traumatic	Bulbar (proximal)	9 IOUs	–	7	11	Patient refused urethroplasty due to high risk of postoperative incontinence; permanent suprapubic cystostomy performed.	/
12 (44)	Iatrogenic	Bulbar (proximal)	7 IOUs, dilations, 5 urethroplasties	1 urethroplasty	5	10	Patient refused urethroplasty.	/
13 (68)	Unknown	Bulbar (proximal)	7 IOUs	2 IOUs, dilations	6	4	Patient refused urethroplasty due to high risk of postoperative incontinence.	/

IOU = internal optical urethromy; BMG = buccal mucosa graft.

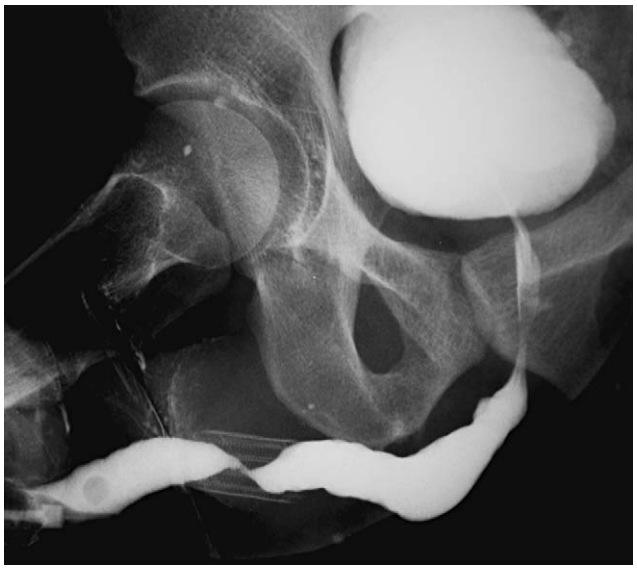

Fig. 1 – Case 8: Stent in peno-bulbar urethra, restenosis within the stent.

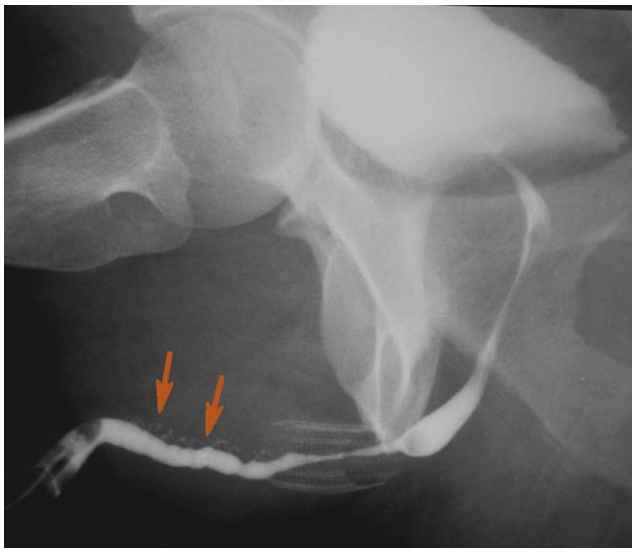

Fig. 2 – Case 6: Stent in middle bulbar urethra, restenosis within the stent, and evolving sclerosis in the distal urethra (orange arrows).

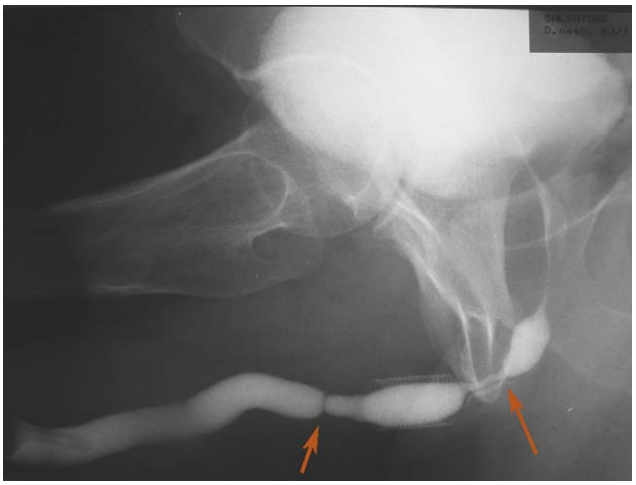

Fig. 3 – Case 3: Stent in middle bulbar urethra. Restenosis was far from and close to the stent (respectively, distally and proximally: orange arrows).

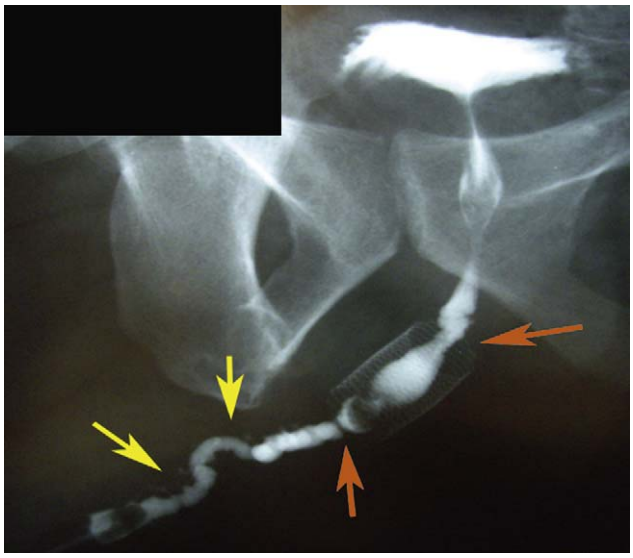

Fig. 4 – Case 1: Stent in bulbar urethra in patient with lichen sclerosus stricture. Restenoses were far from (penile tract: yellow arrows) and close to the ends of the stent (bulbar tract: orange arrows).

Following stage 1, three patients are waiting for further reconstructive steps, five elected the urethrostomy as permanent diversion and declined further surgery, and one patient completed the reconstruction in two steps by tabularisation of the urethral plate with buccal mucosa graft (BMG) at stage 2 (case 9).

After surgery, seven of the nine patients (77.8%) were stricture free without the need for any additional procedures. Two (22.2%) patients had restenosis: One underwent three IOUs (case 9) and one is now on intermittent self-dilatation (ISD) (case 7). No patients became incontinent. All patients overcame the complications, and they were satisfied with their recovered sexual life. Quality of life was improved in all cases.

4. Discussion

The first urethral stent placements showed good short-term outcomes, and the procedure was welcomed as an effective minimally invasive therapy [2,8–10]. After that first enthusiasm and following expanding indications in several urethral segments, the stents have been shown to fail in most posterior strictures [4,11]. Stents have not been promoted in penile strictures, particularly in the anterior urethra, and long-term results in the bulbar tract showed progressive deterioration with only a 13–45% success rate reported [2,3].

Some reports have been published on the supposed safety, efficacy, and reversibility of this device [2,8–10]. However, clinical practice has shown many complications following

Fig. 5 – Case 11: Obstructed stent in proximal bulbar urethra, adjacent to the only residual distal sphincter (orange arrow) after transurethral resection of the prostate.

stent insertion. The principal stent-related problem is hyperplastic overgrowth with restenosis inside or adjacent to the prosthesis. Regarding the presumed safety of stent placement, severe side-effects, such as perineal pain, sexual discomfort, erectile disorders, stent encrustations, stones, recurrent urinary tract infections (UTI), dysuria, postvoiding dribbling, and urinary incontinence, affect quality of life [2,8,12,13]. Hussain et al reported stent-related complications in 55% of patients; the majority of these were restenoses, but others were postmicturition dribble (32%), recurrent urinary tract infection (UTI) (27%), and perineal pain and dysuria. In total, 45% of their patients suffered more than one complication; operative intervention was required in 45% of their patients, and open stent removal was required in 8.3% [2].

The poststent complications are usually first managed by repeated optical IOUs and dilations but have a high failure rate [2,4]. Only a few articles in the literature on stents report the real percentage of severe failures requiring subsequent open surgery; the incidence of this complication ranges from 14% to 20% [3,8,10]. Contrary to the publicised stent reversibility, it should be highlighted that endoscopic removal of stent is almost impossible, requiring a complex open surgery. Sometimes it is possible to remove the stent piecemeal wire by wire, but frequently it requires an en bloc removal of the scarred urethra together with the entrapped stent. The subsequent choice of urethral repair in one or more stages will depend on the local conditions.

Some authors have experienced problems in managing these complex restrictures that develop after implanting the stents [2,3,7,14]. Elkassaby et al managed 13 patients by complete excision of the obstructed urethra containing the stent and subsequent urethroplasty. Stage 1 urethroplasty

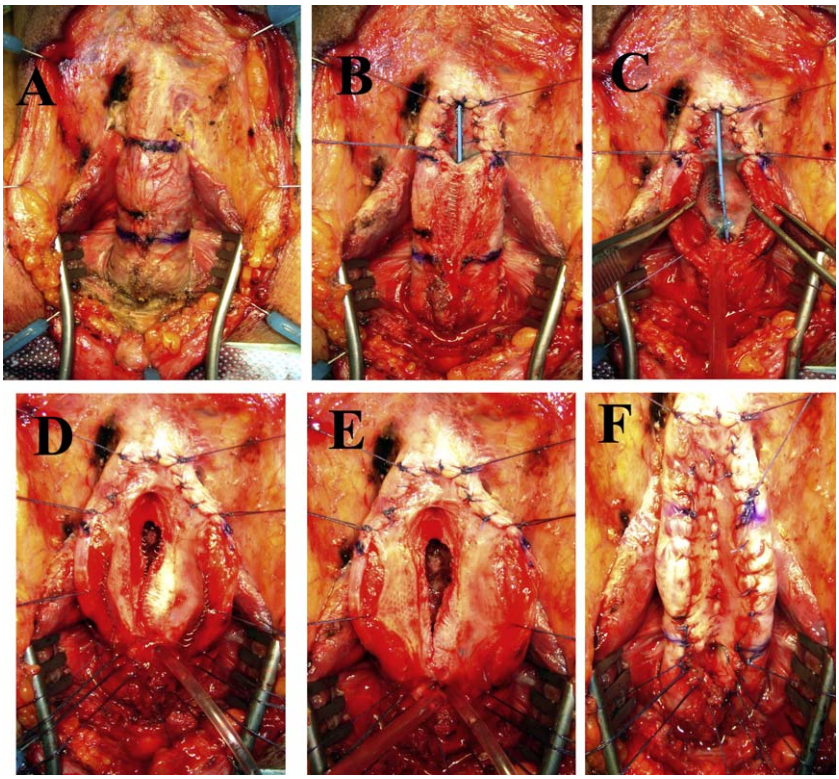

Fig. 6 – Case 1: (A, B) The stent was strongly embedded in the midst of a very fibrotic urethra. (C–E) The removal of the individual wires was by double-ventral plus dorsal-longitudinal urethrotomy and stent section after urethral mobilization from the corpora cavernosa. (F) The urethral plate was preserved for the subsequent reconstruction.

was performed in one (7.7%) patient, and he is awaiting stage 2; in 12 (92.3%) patients, a one-stage penile tabularised flap was used to bridge the urethral defect with a 91% success rate but with a short-term follow-up [5]. Eisenberg et al reported that of nine patients with stents located in the anterior urethra, eight (89%) underwent prosthesis excision and urethroplasty: stage 1 urethroplasty in was performed in four (end-to-end anastomosis in one and dorsal BMG urethroplasty in three) and stage 2 urethroplasty with dorsal BMG was performed in four patients. With a short-term follow-up of only few months in most cases, they had a 62.5% success rate [6].

In their study with longer follow-up, Chapple et al reported the difficult surgical management of 10 patients with obstructed stents located in the anterior urethra. The stent was removed (en bloc or wire by wire) in nine cases and left in situ in one. All of the urethroplasties were performed in one stage: anastomotic urethroplasty in two patients and patch graft urethroplasty in eight (using BMG in three and penile skin graft in five). Chapple's group had five (50%) successes and five failures. They elected one-stage procedures but avoided tube reconstruction. They stated, however, that if the one-stage approach had not been possible, then a two-stage procedure would be the preferred option [7]. Hussain et al confirmed that severe stent-related problems are managed most effectively by staged urethroplasty. In their series, three patients required open stent excision and perineal urethrostomy, and one opted for a suprapubic catheter [2].

In our experience, stent extraction has been shown to be a complex surgical step. After stent removal, the residual urethral plate was not retrievable and not suitable for a refined one-stage urethral reconstruction. In two cases, the resection of the whole compromised urethral segment was necessary, resulting in an extensive urethral defect. Our operative findings were targeted on a salvage staged surgery—less refined but more realistic in these complex cases. As a matter of fact, seven (77.8%) of nine patients who underwent surgery were considered successful cases because now, even if by an urethrostomy, they void well without the need for any additional procedure and they have overcome any other stent-related complications.

Nevertheless, considering that of 13 patients, 5 (38.5%) were chosen for a definitive urethrostomy, 3 (23.1%) are waiting for final reconstruction, and 4 (30.7%) refused surgery, we can state that the management of urethral stricture disease complicated by permanent stent is a therapeutic challenge. The only patient who completed the reconstruction (case 9) reported a clinical failure.

In the management of failed stents, the philosophy of many surgeons is to avoid the staged procedure if possible. In our experience, adverse local tissue conditions have forced us to a salvage staged solution. We otherwise avoid one-stage reconstructions because they carry a high failure rate that is generally unacceptable to men with a long history of stricture disease. Furthermore, the sclerotic disease frequently involves the urethra extensively and not only in the tract where the stent is located (Figs. 2–4). We have found that patients accept this safer, staged surgical strategy and often elect urethrostomy as a definitive solution, improving their quality of life overall.

Bullock et al ascertained that the urethral stent is one of the most common procedures (23.4%) used for anterior urethral strictures in the United States [15]. Despite predictable failure, 33% of urologists continue to manage recurrent strictures by using the stent, which is erroneously believed to be a minimally invasive method. Unfamiliarity with the literature and inexperience with open urethral surgery have led to the erroneous concept that there is a reconstructive surgical ladder in which urethroplasty is only performed after repeated endoscopic attempts [15]. Indeed, our series of patients had to wait a mean of 13.3 yr between the first treatment of the early stenosis and our surgical approach.

Considering the risk of irreversible urethral damage, the use of stents remains a questionable choice, especially in young patients who could overcome the urethral stricture by a successful primary urethroplasty. After his first enthusiastic reports, Milroy advised against the implant in short virgin strictures or in urethras with extensive fibrosis. His only recommendation was for recurrent bulbomembranous strictures with a moderate fibrosis and a short history [16]. Actually, this risks converting a simple stricture that is curable with a primary urethroplasty into a complex stricture with a stent trapped in a badly scarred urethral wall. Furthermore, the removal of a stent placed in the proximal bulbar urethra risks damage to the adjacent distal sphincter, and this could compromise the continence of patients after TURP. Recently, Chapple and Bhargava stated that stents should be avoided for recurrent strictures with extensive spongiofibrosis, such as those after trauma or a failed urethroplasty [7]. However, this assertion could lead some to think that other indications remain for the use of stents in urethral stricture diseases. Our opinion is that, today, there are no more indications for stents in any kind of anterior urethral strictures [17].

5. Conclusions

Stents represent the dream of resolving urethral strictures with an easy and noninvasive method. Unfortunately, stents have not only failed to show good results but also risk converting a simple stricture into a complex stricture that is difficult to manage with a one-stage surgical solution, thus often requiring a two-stage option, a definitive perineostomy, or a suprapubic diversion. Urologists who implant a "permanent" stent should consider that it could permanently damage the patient's quality of life.

Author contributions: Enzo Palminteri had full access to all the data in the study and takes responsibility for the integrity of the data and the accuracy of the data analysis.

Study concept and design: Palminteri.
Acquisition of data: Berdondini.
Analysis and interpretation of data: Palminteri, Berdondini.
Drafting of the manuscript: Palminteri, Franco, Gacci, Poluzzi.

Critical revision of the manuscript for important intellectual content: Palminteri, Gacci, Franco, Gentile.
Statistical analysis: Palminteri, Berdondini.
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Administrative, technical, or material support: Palminteri, Franco, Gacci.
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Other (specify): None.

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Appendix A. Supplementary data

The Surgery in Motion video accompanying this article can be found in the online version at doi:10.1016/j.eururo.2009.11.038 and via www.europeanurology.com. Subscribers to the printed journal will find the Surgery in Motion DVD enclosed.

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