Penile Prosthesis Surgery for the Fibrotic Penis

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Penile fibrosis renders implantation of a penile prosthesis a formidable procedure. Fibrosed corporate cavernosa resist dilation by blunt dilators, mandating the use of force and resulting in a high percentage of complications. This is a report on advances in the field of penile prosthesis surgery for the fibrotic penis through the years 2006 to 2008. In that time, bovine pericardium was added to the choices of graft materials used to expand the corpora to accommodate the implant alongside the fibrous tissue. Also, the technique for open excavation of fibrous tissue through extended corporotomies was further evaluated in a series of nine cases. Downsized prostheses that were previously implanted in cases of penile fibrosis were replaced by regular-sized ones after having served as tissue expanders. Finally, minimally invasive, visually guided, sharp excavation of fibrous tissue has evolved through three stages, combining endoscopy and ultrasonography to safely excavate corporeal fibrous tissue.

Introduction

Penile fibrosis may indicate implantation of a penile prosthesis, rendering implantation a formidable procedure that discourages many surgeons and challenges others. Corporeal fibrosis may result from neglected priapism, habitual intracorporeal injection therapy, removal of an infected prosthesis, irradiation for prostatic carcinoma, as well as from other conditions.

The use of blunt dilators to expand the corpora cavernosa via standard corporotomy incisions is met with resistance, mandating the use of force to get through and override the obstructing fibrous tissue bulk. The surgeon performs this forceful dilatation primarily with lack of vision, considering that the tip of the dilator travels unseen, especially in the crura. Blind force combined with resistance has resulted in a high percentage of complications including distal perforation, proximal perforation with posterior migration of the cylinders, urethral injuries, high infection rates necessitating cylinder removal, up to total failure of dilatation and abandonment of the procedure [1,2].

Most surgeons dilate the corpora flush with the tunica albuginea alongside fibrosis rather than excavate or excise fibrous tissue, thereby stretching the tunica albuginea to accommodate the cylinders adjacent to the fibrous mass. Some recommend stepwise dilatation of segment after segment through multiple corporotomy incisions [3], thereby shortening the distance that the dilator travels unseen and possibly decreasing the complication rate. Still, dilatation is difficult [3].

Difficult, discouraging dilatation and the tight space available for implantation thereafter may influence the size of cylinders chosen, and may favor implantation of semirigid rods rather than an inflatable device [3]. Blunt dilatation has resulted in a 1-year prosthesis survival rate in the range of 50% in the hands of experienced implanters. [4].

Using grafting to expand the corporeal chambers has also been tried, with several graft materials now in use, including Gore-Tex (W.L. Gore & Associates, Newark, DE) [4], synthetic vascular graft materials [5], rectus fascia [6], and pericardium allograft [7], among others. While grafting of the tunica and expansion of the corpora may allow more space for an unhindered inflatable implant, it poses a higher risk of infection, especially when synthetic material is used [4]. Grafting also adds to the cost of the procedure in case an allograft is used, and to the difficulty if an autologous graft is to be harvested.

Cavernotomes are specialized dilators capable of scrapping fibrous tissue [8]. Cavernotomes that have a blunt tip face considerable resistance upon introduction, and the surgeon still lacks vision while manipulating the instrument. Cavernotomes with sharp blades have demonstrated a considerable rate of perforation [9]. Since cavernotomes help develop the space between the tunica albuginea and fibrous tissue rather than actually excise the fibrous tissue bulk, patient dissatisfaction and disappointment persist since penile length is not restored on account of the contracting fibrous tissue [9].

Even with cavernotomes, dilatation is arduous [10], and it is very difficult to dilate the corpora to the minimum caliber required to implant a standard-sized inflatable prosthesis of 11 mm [10]. Undersized penile implants are available for implantation in such cases [10].

In one case report in which a patient had post-irradiation fibrosis, extended corporotomies spanning most of the length of both corpora from the glans to the tips of the crura were used to excise fibrous tissue under vision. While 2 cm of penile length were restored, operative time was 3.5 hours, and the patient suffered remarkable postoperative pain [11]. Another trial in the same domain involved open resection of fibrous tissue through extensive cavernostomies by the diathermy loop used for prostatic resection [12]. Larger case series are required to confirm whether the extensive exposure and extended operative time have impact on morbidity and infection rates.

To summarize, the former techniques involved either blindfolded aggressive dilatation by a blunt instrument alongside the fibrous tissue, blind-folded incision by a sharp instrument, or open dissection and excavation of fibrous tissue through extensive incisions.

This report investigates the medical literature for advances in the field of penile prosthesis surgery for the fibrotic penis through the years 2006 to 2008. We conducted an Internet search with the terms "penile prosthesis," "penile implant," and "fibrosis," limited to the aforementioned time span, to find significant improvements and innovations. We found that the armamentarium of graft materials has been expanded to include bovine pericardium [13]. The technique for open excavation of fibrous tissue through extended corporotomies [11,12] was further evaluated in a series of nine cases [14••]. Also, downsized prostheses implanted in cases of penile fibrosis were replaced by regular-sized ones after having served as tissue expanders [15••]. And, minimally invasive, visually guided, sharp excavation of fibrous tissue developed through three stages, the first being penoscopy-guided resection [16••,17•] the second being ultrasonography-guided excavation [18••], and the third being a combination of the latter two with refinement and troubleshooting, involving into "Modified Shaeer's Excavation" [19••].

Bovine Pericardium for Expanding the Corpora Cavernosa

In a single case report, bovine pericardium was used to graft the tunica albuginea and expand the corpus cavernosum, to accommodate one prosthesis rod alongside fibrous tissue in a diabetic patient with penile fibrosis. The results are encouraging [13]. The authors suggest virtues for this graft over other synthetic grafts and allografts including lower cost, inertia, elasticity, absence of transmission of diseases, low probability of retraction, and good resistance to tension that allow the graft to cover large defects without forming protuberances [13].

Open Corporeal Excavation

Open excision of fibrous tissue throughout the corpora has been reported upon as single case reports [11,12]. The work described herein is an investigation of this technique in a series of nine cases [14••]. The operative approach is through an inverted T penoscrotal incision that affords exposure of nearly the entire corpus cavernosum on each side. Extended corporotomies are made on the ventral aspect of each corpus cavernosum. A plane of dissection between the fibrotic corporeal tissue and the inner surface of the tunica albuginea is established and followed, resulting in core removal of nearly all fibrotic intracorporeal tissue. Cylinders are laid into the empty corporeal bed, and the tunica albuginea is closed primarily [14••].

Prostheses were successfully implanted and they survived adequately in all nine patients. Most patients (7/9) needed small-diameter shorter cylinders rather than standard ones. The authors recommended that preoperatively, patients should be counseled that the decrease in penile size they have already noted will not be reversed by this procedure and that their flaccid stretched penile length will be their approximate length with device inflation [14••].

Tissue Expansion and Upsizing of Inflatable Cylinders

A two-stage procedure was performed for 37 patients with corporeal fibrosis. In the first stage, the corpora were dilated using cavernotomes. Dilatation was very difficult and could not reach a caliber of 11 mm. Special undersized inflatable devices (in length and girth) were implanted. Patients were advised to inflate the device for 3 hours daily for the next 8 to 12 months. This resulted in dilatation and elongation of the corporeal spaces. The second stage involved replacement of the undersized devices with standard ones [15••].

The authors reported a 54% onsite proximal perforation rate, and a 30% delayed pending distal erosion rate [15••]. Proximal perforation was necessary due to the need for forceful introduction of the cavernotome into the crura against fibrous tissue, and was corrected with a nonabsorbable suture rear tip extender sling. In all cases the proximal perforation scarred over and healed and did not require further intervention upon replacing the undersized implant with the regular one [15••]. Pending distal erosion was corrected with a distal corporoplasty [20] coincident with the substitution of standard-sized cylinders for the downsized ones. Virtually all patients were satisfied with penile appearance, although some still wanted the length prior to the original implant [15••].

Penoscopic Corporotomy and Fibrous Tissue Resection

This is the first report describing endoscopic excavation of corporeal fibrous tissue. It is a minimally invasive

technique that allows visually guided incision and resection of fibrous tissue by a sharp blade or by cutting diathermy current [16••,17•].

The "penoscopic corporotomy unit" is the unit used for optical urethrotomy: a zero or 30-degree lens and a blade, mounted on a working element, within a 21F sheath (6 mm). Through a penoscrotal incision and standard corporotomies, the penoscope is inserted into the corpora. The blade sharply incises fibrous tissue under vision, along three lines assuming a stellate configuration, away from the urethra, each being around 1 cm deep. The stellate incision is dilated with blunt metal dilators. The penoscope advances through the whole length of the corpora by alternating incision and dilatation. Advancement of the penoscope is easy considering that it has a caliber of merely 6 mm. Incision is maintained amid the corpus cavernosum to avoid perforation as much as possible. Although no cases of perforation were faced, the report confirms that accidental puncture of the tunica albuginea is possible but is of trivial consequence. Being sharply incised, small in caliber (considering the small size of the blade), and away from the urethra, the accidental puncture should heal spontaneously and promptly; there is no need to repair it [16••,17•]. Tip of the crus is identified by palpation of the thick fibrous tissue and the ischial tuberosity, and incision stops short of this tip. Irrigation by antibiotic-supplemented solution is maintained throughout the process [16••,17•].

Fibrous tissue masses and protrusions that may hinder the function of an inflatable prosthesis can be resected as in prostatic resection by the "penoscopic resection unit," which is a prostatic resection diathermy loop, a working element and a cystoscopy lens within an insulated 26F (8.6 mm) sheath. Minimal cutting current shaves off fibrous tissue to smooth out the inner surface of the corpora [16••,17•]. This should be kept to a minimum to avoid vascular complications. Preferably, the pendulous penis should be coapted to the pubic skin to allow for current dissipation.

Average operative time was 90 minutes. In no case was the procedure difficult or was forceful dilatation needed [16••,17•].

All six patients in this series had uneventful recovery except for postoperative pain that was more than the usual for penile implantation, but within the expected range for cases of fibrosis operated upon by other techniques. This degree of pain persisted for 48 hours. There were no cases of perforation, infection, or urethral injury. There was evident increase in length and girth, as well as correction of deformity attributed to release of fibrous tissue adhesions [16••,17•].

Ultrasound-Guided Cavernotomy

The use of blunt dilators or even cavernotomes to dilate the corpora will meet with resistance and difficulty, along with the ensuing complications. And, while sharp instruments would meet much less resistance, they are still out of sight, and thus could cause the same complications.

In 2007, we published the first report of the use of ultrasound guidance to shepherd sharp instruments through cavernotomy, maintaining them in the mid-corpus cavernosum position to avoid perforation [18••]. Just about any sharp instrument can be used—an Otis urethrotome, scissors, even trochars—as long as they are ultrasound guided.

Five patients with extensive penile fibrosis were operated upon. Initial blunt dilatation by Hegar dilators were met with considerable resistance. An ultrasound probe was applied to the ventral aspect of the penis. A sharp laparoscopy trochar within its sheath was introduced under ultrasound guidance into the corpora. The trochar's tip was oriented in the mid-corpus cavernosum by alternating longitudinal and transverse sonography sections, as it gently drilled into the fibrous tissue. Laparoscopy scissors were used in the same fashion to cut fibrous tissue lumps. The proximal tip of the crus was clearly identified by ultrasonography, thereby avoiding proximal perforation. Following excavation of fibrous tissue and development of the corporeal spaces, prosthesis was implanted [18••].

In all five cases, the corpora were dilated to a caliber of 13 Hegar. Excavation and implantation were straightforward and relatively easy, compared to our experience with alternative methods including cavernotome dilatation. Patients were generally satisfied with their result as indicated by International Index of Erectile Function questionnaire, Erectile Dysfunction Inventory of Treatment Satisfaction questionnaire, a global satisfaction question, and a specific question about satisfaction with penile girth. Unfortunately, length could not be restored in two of five patients. In all five cases, no complications issued, namely infection, perforation, urethral injury, or mechanical failure [18••].

Modified Shaeer's Penoscopy

This technique is the evolution of the latter two techniques [16••,18••], addressing their shortcomings and improving their results.

Optical corporotomy and resection [16••,17•] lacked the presence of a guidewire. A guidewire is customary for stricture incision. Its presence would make incision of corporeal fibrous tissue much more safe, accurate, and familiar to the urologist. Modified Shaeer's Penoscopy [19••] uses ultrasonography to insert a guidewire along and amid the whole length of the penis to guide the penoscope. Moreover, in the original penoscopy technique [16••], tip of the crus could not be visualized and was roughly indentified. In Modified Shaeer's Penoscopy [19••], ultrasonography is used to identify the tip of the pendulous corpus and crus, thereby making anterior and posterior perforation even more remote.

Although ultrasound-guided cavernotomy enables accurate visualization of the tip of the crus [18••], it lacks

the potential of penoscopic resection of fibrous tissue protrusions that may hinder an inflatable prosthesis or limit restoration of penile length, girth, and straightness. Length could not be restored in two of five cases [18••]. Modified Shaeer's Penoscopy [19••] combines the virtues of ultrasonography at visualizing the tip of the corpus cavernosum, and those of penoscopy at smoothing out the interior of the corpus cavernosum.

Twelve patients with penile fibrosis were operated upon. Through a penoscrotal incision and standard corporotomies, a central venous pressure catheter was inserted into the distal corpus cavernosum under ultrasound guidance, maintaining it amid the corpus and stopping short of the tip. A guidewire was inserted through the catheter, and the latter was withdrawn. Penoscopic corporotomy proceeded along the guidewire, incising the fibrous tissue. Upon approaching the tip, ultrasonography was re-introduced to avoid perforation. The process was repeated in the crus [19••].

The procedure was relatively easy. Average operative time was 80 minutes. Ten cases were dilated up to size 13.5 Hegar, and two up to size 14 Hegar. A size 13 prosthesis was implanted in all cases. Length and straightness were also restored. There was no restriction as to the type of prosthesis used. No complications resulted in terms of infection, extrusion, urethral injury, or mechanical failure of the device [19••].

Conclusions

Formerly, implantation of penile prosthesis in a fibrosed penis was a very difficult and risky procedure, and patient dissatisfaction with the results of a so-called "successful" procedure was high. The techniques reported herein provide alternatives that improve safety while enhancing results and patient satisfaction.

With the former techniques, there had to be compromises to the extent of dilatation to reduce the complication rate. These included implantation of a modest, undersized inflatable device. Based on the reported paper [15••], it is recommended to replace these cylinders with a regular-sized device after they are used to expand the corporeal spaces. This reflected positively on patient satisfaction.

Sharp, visually guided excision of fibrous tissue has the virtues of creating ample space for an adequately sized prosthesis with unhindered inflation, and is capable of restoring size that is diminished by fibrosis, while avoiding perforation and other complications that result from blindfolded force. This can now be achieved by endoscopic minimally invasive surgery, an easier, one-stage procedure with satisfactory results.

Disclosures

No potential conflicts of interest relevant to this article were reported.

References and Recommended Reading

Papers of particular interest, published recently, have been highlighted as:

- • Of importance
- •• Of major importance

1. Douglas L, Fletcher H, Serjeant GR: **Penile prostheses in the management of impotence in sickle cell disease.** *Br J Urol* 1990, **65:**533–535.
2. Fallon B, Ghanem H: **Infected penile prosthesis: incidence and outcomes.** *Int J Impot Res* 1989, **1:**175–180.
3. Ghanem H, Ghazy S, El-Meliegy A: **Corporeal counter incisions: a simplified approach to penile prosthesis implantation in fibrotic cases.** *Int J Impot Res* 2000, **12:**153–156.
4. Boyd S, Martins FE: **Simultaneous Ultrex penile prosthesis reimplantation and Gore-Tex grafting corporoplasty: functional outcomes of a surgical challenge.** *J Urol* 1995, **153:**361A.
5. Herschorn S, Ordorica RC: **Penile prosthesis insertion with corporeal reconstruction with synthetic vascular graft material.** *J Urol* 1995, **154:**80–84.
6. Pathak AS, Chang JH, Parekh AR, et al.: **Use of rectus fascia graft for corporeal reconstruction during placement of penile implant.** *Urology* 2005, **65:**1198–1201.
7. Palese MA, Burnett AL: **Corporoplasty using pericardium allograft (tutoplast) with complex penile prosthesis surgery.** *Urology* 2001, **58:**1049–1052.
8. Rosselló Barbará M, Carrión H: **Cavernotomy [in Spanish].** *Arch Esp Urol* 1991, **44:**185–186.
9. Mooreville M, Adrian S, Delk JR 2nd, et al.: **Implantation of inflatable penile prosthesis in patients with severe corporeal fibrosis: introduction of a new penile cavernotome.** *J Urol* 1999, **162:**2054–2057.
10. Wilson SK: **Reimplantation of inflatable penile prosthesis into scarred corporeal bodies.** *Int J Impot Res* 2003, **15(Suppl 5):**S125–S128.
11. Hall SJ, Basile G, Bertero EB, et al.: **Extensive corporeal fibrosis after penile irradiation.** *J Urol* 1995, **153:**372–377.
12. Park JK, Kim HJ, Kang MH, et al.: **Implantation of penile prosthesis in a patient with severe corporeal fibrosis induced by cavernosal injection therapy.** *Int J Impot Res* 2002, **14:**545–546.
13. Lopes EJ, Santos TC, Jacobino M: **Bovine pericardium in penile prosthesis reimplantation.** *Int Braz J Urol* 2007, **33:**74–76.
14.•• Montague DK, Angermeier KW: **Corporeal excavation: new technique for penile prosthesis implantation in men with severe corporeal fibrosis.** *Urology* 2006, **67:**1072–1075.

This work describes experience with full open exposure and incision of the corpora cavernosa and excavation of fibrous tissue.

15.•• Wilson SK, Delk JR 2nd, Mulcahy JJ, et al.: **Upsizing of inflatable penile implant cylinders in patients with corporal fibrosis.** *J Sex Med* 2006, **3:**736–742.

This is a two-stage procedure in which the corpora are initially dilated with cavernotomes, and a downsized inflatable prosthesis is implanted and is used as a tissue expander for 8 to 12 months, after which it is replaced by a standard-sized prosthesis.

16.•• Shaeer O, Shaeer A: **Corporoscopic excavation of the fibrosed corpora cavernosa for penile prosthesis implantation: optical corporotomy and trans-corporeal resection, Shaeer's technique.** *J Sex Med* 2007, **4:**218–225.
This is the first report on minimally invasive endoscopic incision and resection of corporeal fibrous tissue.
17.• Shaeer O: **Penoscopy: optical corporotomy and resection for prosthesis implantation in cases of penile fibrosis, Shaeer's technique.** *J Sex Med* 2007, **4:**1214–1217.
This is an illustration of endoscopic cavernostomy.
18.•• Shaeer O: **Penile prosthesis implantation in cases of fibrosis: ultrasound-guided cavernotomy and sheathed trochar excavation.** *J Sex Med* 2007, **4:**809–814.
This is the first report on sharp cavernotomy with ultrasound guidance to avoid perforation and maintain the sharp tip in safe confinement.
19.•• Shaeer O: **Implantation of penile prosthesis in cases of corporeal fibrosis: modified Shaeer's excavation technique.** *J Sex Med* 2008, Jul 1 (Epub ahead of print).
This is refinement of Shaeer's penoscopy in which a guidewire is inserted under ultrasound guidance to guide the penoscope, making the procedure easier and safer.
20. Mulcahy JJ: **Distal corporoplasty for lateral extrusion of penile prosthesis cylinders.** *J Urol* 1999, **161:**193–195.