

Corporoscopic Excavation of the Fibrosed Corpora Cavernosa for Penile Prosthesis Implantation: Optical Corporotomy and Trans-Corporeal Resection, Shaeer's Technique

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ABSTRACT

Introduction. Implantation of a penile prosthesis in cases of neglected or resistant ischemic priapism, or delayed re-implantation following prosthesis infection and extraction, is usually a difficult and risky procedure due to fibrosis of the corpora cavernosa. Among the common complications are perforation of the urethra, tunica albuginea, and infection. The complications are usually due to the use of blind force against resistance.

Aim. We propose the techniques of Trans-Corporeal Resection and Optical Corporotomy as adjuvant measures for excavating the fibrosed corpora cavernosa under vision, without the use of force against resistance.

Methods. Six patients with diffuse fibrosis of the corpora cavernosa were operated on. The instruments and technique are the same as for optical urethrotomy and transurethral resection. Optical Corporotomy was started with, where the corpora are incised from within. After establishment of a satisfactory passage, Trans-Corporeal Resection followed to scrape the fibrous tissue. Implantation of penile prosthesis was completed as usual. The procedure was performed through 1.5 cm incision in the tunica albuginea.

Main Outcome Measures. Length, girth, and straightness in the erect position, as well as the incidence of complications.

Results. Operative time was an average of 90 minutes. No difficulty was encountered during the procedure. No complications were noted through 1 year of follow-up.

Conclusion. Optical Corporotomy and Trans-Corporeal Resection allow for force-free, visually monitored excavation of the fibrosed corpora cavernosa, aiming at safer penile prosthesis implantation. **Shaeer O, and 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.**

Key Words. Penile Prosthesis; Priapism; Peyronie's Disease of Tunica Albuginea

Introduction

With the accumulation of experience in penile prosthesis implantation, the procedure became fairly linear to most specialists. Still remain a paucity of cases where implantation is a formidable experience, often with disappointing outcome. Those are the cases where the corpora cavernosa are afflicted by extensive fibrosis.

Fibrosis may involve the tissues of the phallus in a handful of conditions, including neglected or irresolvable ischemic priapism, delayed re-implantation following extraction of an infected prosthesis, penile irradiation, and in cases of extensive Peyronie's disease.

In such cases, implantation of a penile prosthesis may be far from easy, not to mention safe. Sharp dissection and persistent forceful dilation against resistance are often necessary to form a

tunnel in which the prosthesis will be inserted. The use of blind instrumentation against resistance commonly leads to perforation of the urethra or perforation of the tunica albuginea and migration of the prosthesis that may necessitate another procedure [1]. These cases carry a much higher risk for infection with subsequent removal of the prosthesis [2].

The conservative surgeon may resort to implantation of a smaller cylinder to minimize the risky manipulation. While implantation of a larger prosthesis predisposes to the above-mentioned complications, a smaller prosthesis may have a negative impact on patient-partner satisfaction.

Special procedures and tools were tailored to facilitate implantation, as well as to minimize complications.

Stepwise laterally oriented dilatation of the corpora cavernosa was proposed. In this approach, subtunical tunnels were created using scissors, Heggar dilators, and Dilamezinsert, through two corporotomies, one proximal for dilatation of the crura, and the other distal for dilatation of the pendulous corpora cavernosa. The tip of the instrument was advanced from one incision and received from the other to minimize the distance it had to travel out of sight [3].

Excavation of fibrous tissue through generous corporotomy incisions was attempted [4–6]. Several devoted instruments were designed for easier and safer resection: the cavernotomes [7,8]. Otis urethrotome was used for sharp resection of the fibrous tissue [9]. Implantation of an undersized prosthesis through a peno-scrotal incision after scrapping the fibrous tissue with cavernotomes has been suggested [10]. Expansion of the corpora cavernosa by grafting to accommodate the prosthesis besides the fibrous tissue was also resorted to [11].

However, all the above-mentioned alternatives are hindered by either blind instrumentation or extensive manipulation.

We propose the techniques of Optical Corporotomy and Trans-Corporeal Resection for visually guided, minimally invasive, and force-free excavation of the fibrosed corpora cavernosa, aiming at easier implantation of penile prosthesis with less complications and better outcome.

Methods

Six patients with diffuse fibrosis of the corpora cavernosa were operated on. In one patient, the condition was attributed to neglected ischemic

priapism on top of intracorporeal injection of vaso-active drugs. In three, fibrosis was due to removal of an infected penile prosthesis. In two patients, extensive Peyronie's disease was the cause of induration of the penis, deterioration of erectile function, as well as deviation.

All patients reported shrinkage of the penis, lack of erection upon sexual stimulation, and no response to medical treatment including phosphodiesterase type 5 inhibitors. Three patients reported deviation, which was most pronounced in two cases with Peyronie's disease (more than 30 degrees lateral deviation). Clinical examination revealed diffuse induration of the penis as well as variable degrees of deviation.

In the postpriapism and postprosthesis-removal patients, Duplex examination revealed heterogeneous hyperechoic tissues spanning the whole length of both corpora cavernosa.

As for the two patients with extensive Peyronie's disease, sexual function was evaluated by the International Index of Erectile Function. Both patients reported severe erectile dysfunction. They responded poorly to phosphodiesterase type 5 inhibitors as well as to intracorporeal injection of prostaglandin E1 (PGE1). Duplex studies showed hyperechoic thickening of the tunica albuginea afflicting the pendulous penis and encroaching on the lumen of the corpora cavernosa almost totally. No arterial wave could be detected at the basal state or with PGE1 injection through the afflicted area. However, subnormal arterial response was detectable in the proximal penis that was not totally involved in Peyronie's disease.

Every patient signed a written informed consent clarifying the experimental nature of the intended procedure, its details, possible complication, and outcome.

The procedure was performed under general anesthesia. Penile length (stretched) and average girth as well as the direction and degree of curvature were recorded. A catheter was inserted into the urethra and a stay suture into the glans.

Four patients were placed in the supine position, and two in the lithotomy position. The incision was subcoronal for four patients, and peno-scrotal for the other two. The choices of position and incision were based on the type of prosthesis to be implanted, as well as the point of access available (the area least afflicted by fibrosis as evident by palpation and Duplex examination). Four patients had a semirigid prosthesis (Mentor® Acu-Form®, Mentor Corporation,

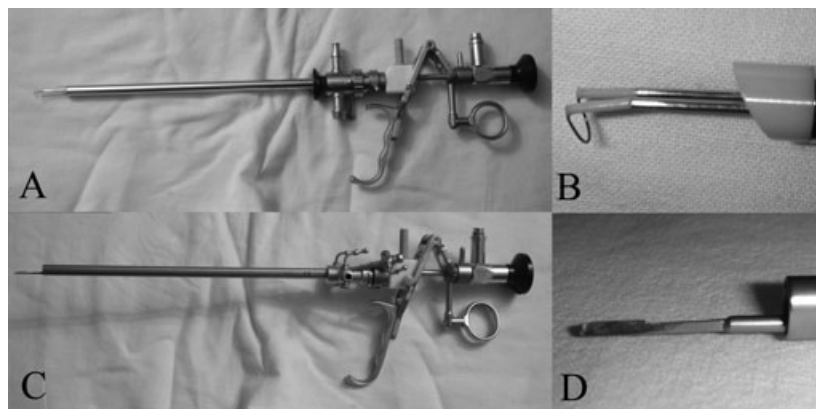


Figure 1 The instruments used for Trans-Corporeal Resection and Optical Corporotomy: (A) the Corporeal Resection unit, (B) the resection loop, (C) the Optical Corporotomy unit, (D) the corporotomy blade.

Santa Barbara, CA, USA) implanted and two had an inflatable (Mentor® Excel™, Mentor Corporation, Santa Barbara, CA, USA). The use of the semirigid prosthesis in four patients (and accordingly the subcoronal incision) was due to financial considerations as prosthesis implantation was not sponsored by health insurance in the country where it was to be conducted.

Stay sutures were placed in the tunica albuginea of the corpora cavernosa on either side of the intended site for corporotomy, which was chosen so as to overly the best access point described earlier. The corpora were incised for a length of 1–1.5 cm. Gentle introduction of size 7 Heggar dilator was attempted but failed in four out of six cases, and failed to proceed to size 8 without the use of force in the other two. Optical Corporotomy was started with to develop a track, and after establishment of a satisfactory passage, Trans-Corporeal Resection followed to scrape the fibrous tissue off the inner surface of the tunica albuginea. Optical Corporotomy was not needed in the two cases with Peyronie's disease, where Trans-Corporeal Resection sufficed.

Optical Corporotomy

The corporotomy kit was the same one used for optical urethrotomy, composed of a 0 or 30 degree lens and a blade, mounted on a working element, within a sheath, 21 French diameter (6 mm) (Figure 1). Smaller pediatric sets can be used, but have the disadvantage of being shorter, which may hinder reaching deep down into the crura without buckling the penis (thus losing orientation).

The assistant held the stay sutures on either side of the corporotomy so as to open it wide. The kit was introduced through the corporotomy, and advanced under vision as far as possible (Figure 2). The assistant applied manual compression on the

base of the penis to minimize blood flow through the corpora—if any, thus improving visibility. With the other hand, the assistant stretched the penis by pulling on the stay suture. Minimal flow of irrigation solution through the kit and into the corpora ensured excellent visibility.

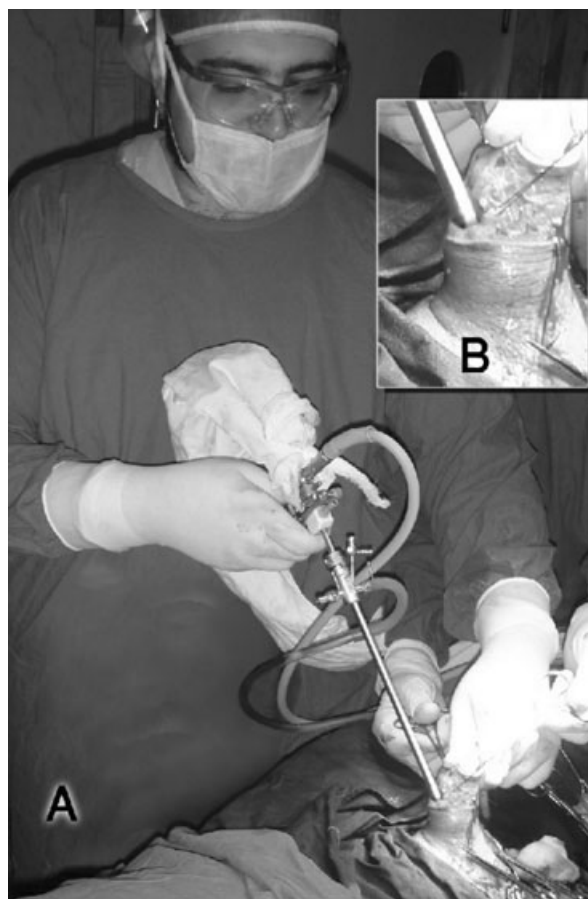


Figure 2 (A) The corporotomy unit introduced into the penis, (B) close-up view.

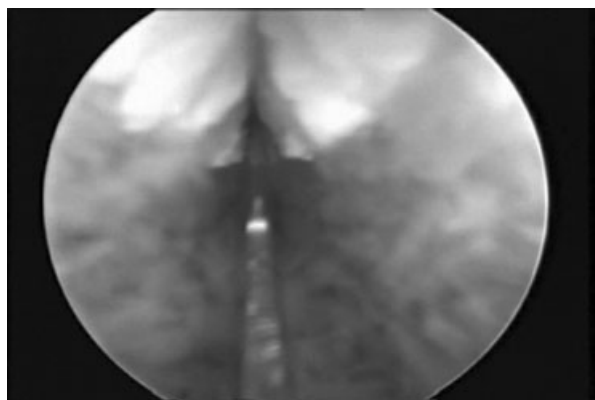


Figure 3 The blade of the corporotomy unit incising the fibrous tissue.

The operator manipulated the working element with the dominant hand and kept the urethra aside with the other. A few trial cuts were made at the edges of the corporotomy for orientation with the looks of the fibrous tissue vs. the looks of the tunica albuginea. This was necessary to determine the appropriate depth of the upcoming cuts further along the penis, that is: to know when to stop.

The set was rotated to direct the blade to the lateral aspect of the penis, away from the urethra. The blade was advanced and withdrawn cutting through the fibrous tissue against the lateral wall of the corpora (Figure 3). With every cut, the corporoscope was advanced further into the corpus cavernosum. This was repeated in alternation with gentle forceless introduction of Heggar dilators to establish the incised passage until a satisfactory track was developed.

In two cases where fibrous tissue was too tough for the blade, a cutting diathermy current was used instead, via an appropriate tip (such as the one used for transurethral incision of the prostate), instead of the blade. For that purpose, an insulated sheath was used instead of the regular urethrotomy sheath. Incision was much easier with cutting diathermy, but the insulated sheath was less convenient being larger than the noninsulated used with the cold blade. We recommend using the cold blade for the first few centimeters then proceed with the cutting diathermy if necessary, after having established sufficient space for its insulated sheath.

In order to operate deep down in the crura, the penis was rotated to the appropriate position, and the operating table was tilted as required. Manual palpation of the kit and its blade was an important adjuvant to visual control in determining their

position along the penis as well as the depth of the cuts.

Finally, the corporotomy unit was withdrawn, and irrigation of the corpora was performed with an antiseptic solution. The corpora were significantly dilated up to Heggar size 12–13 in all cases, with absolutely no force or resistance, and totally under vision.

Trans-Corporeal Resection then followed to smooth out the inner surface of the corpora, thus dilating the passage further and protecting the inflatable prosthesis from friction with the spiky fibrous tissue.

Trans-Corporeal Resection

The resectoscope was the same assembly used in transurethral electroresection of the prostate: a lens and a resection loop mounted on a working element through an insulated sheath, 26 French diameter (8.6 mm) (Figure 1). The unit was introduced as for optical corporotomy and advanced as far as possible, after having established a passage by optical corporotomy if necessary. The areas of fibrosis were clearly identified.

The operator manipulated the resectoscope with the dominant hand and kept the urethra aside with the other. The resectoscope was rotated such that resection was mostly lateral, away from the urethra. Superficial cuts were applied if resection was to be performed on the medial aspect. The resection loop was advanced beyond the near edge of the fibrous tissue plaque (Figure 4), then pulled back with the cutting diathermy current on, thus cutting a canoe-shaped slice of fibrous tissue (Figure 5). Resection was repeated around the circumference of the corpora cavernosa, sparing (as much as possible) the medial aspect to avoid urethral injury. Whenever a segment was cleared off fibrous tissue, the resectoscope was advanced fur-

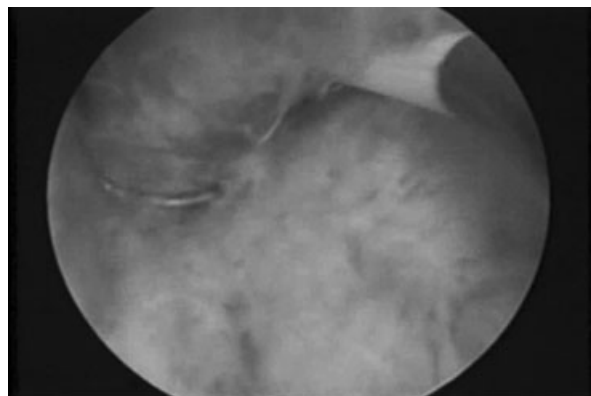


Figure 4 The resection loop before resection.



Figure 5 The resection loop after resection having excavated a canoe-shaped slice of fibrous tissue.

ther and resection proceeded until adequate excavation of the corpora cavernosa was achieved (Figure 6). Resected slices were swept out of the corpora cavernosa with the resection loop. Forceps were used in two cases to extract the resected chips under vision.

Eventually, the two corpora were inspected by corporoscopy, and in one case the urethra was also inspected together with methylene blue injection through the corpora to check for urethral perforation.

Implantation of penile prosthesis was completed as usual. Throughout the procedure, copious irrigation with antiseptic solution was used. After implantation, the length, girth (at the narrowest point), and straightness of the penis were re-evaluated. Special attention was paid to preoperative, intraoperative, and postoperative antibiotic coverage.

Introduction of the instruments into the corpora was not in any way difficult. A 26-French

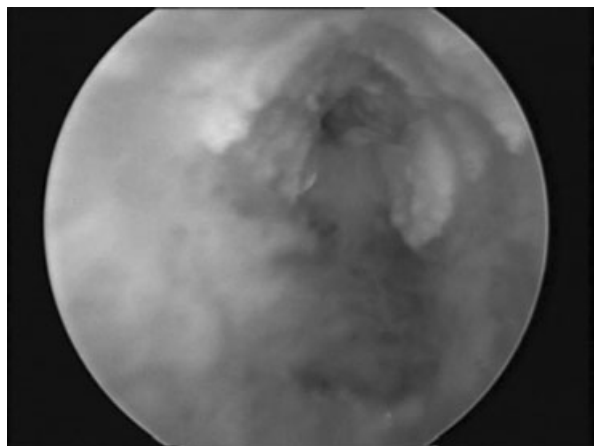


Figure 6 A tunnel created through the fibrous tissue.

sheath is around 8.6 mm in diameter and can be easily introduced through a 1 cm corporotomy (Figure 2), and on through the corpora cavernosa especially after initial incision of fibrous tissue by the smaller 21-French corporotomy kit that is followed by Heggar dilatation. The instruments are advanced on through the track in a piecemeal fashion, that is, whenever a segment is cleared, the instrument is advanced further.

The procedure was significantly easier when compared with scissor dissection and Heggar dilatation for similar cases. Average operative time was 90 minutes. In no case was the procedure difficult or was forceful dilatation needed, or was there urethral or tunical perforation. All patients were discharged in the same day, resumed sexual activity within 1 month following surgery, and were followed up through 1 year.

Results

No adverse outcome was noted in any of our patients, in terms of injury of the urethra, perforation of the tunica, migration, infection, or extrusion of the prosthesis. No hindrance or mechanical failure was observed with the inflatable prosthesis.

There was a 2 cm average increase of penile length over that measured intraoperatively prior to prosthesis implantation. Penile girth showed an increase of around 40%. This was most evident in the patients who received an inflatable prosthesis. All patients had a straight phallus without deformity. These proportions were maintained throughout the 1-year follow-up period.

Patient-partner satisfaction with the quality of erection and the length/girth of the penis was evaluated by the end of the follow-up period (by simple counseling rather than a validated questionnaire), and no complaints were reported in any of those domains.

Immediately following surgery, all patients had variable degrees of pain that was—in our opinion—more than the usual for an easy regular implantation, but comparable to that of a difficult one in a patient with fibrosis. This persisted for an average of 2 days and was ameliorated by analgesics. None of our patients had intolerable pain.

Discussion

Implantation of a penile prosthesis into fibrosed corpora cavernosa is usually a difficult and risky

procedure. In some cases, fibrosis renders implantation impossible [12,13].

The main risks encountered at prosthesis implantation into fibrosed corpora cavernosa are injury to the urethra, perforation of the tunica albuginea, and a higher infection rate [1,2]. Other problems are the possibility of giving the patient a smaller girth or length, as well as the prolonged and tedious nature of the procedure [13,14].

In our opinion, urethral injuries and perforations are the result of forceful blind instrumentation against resistance. The higher rate of infection is probably the result of devitalization of tissues due to vigorous manipulation, in addition to the extensive exposure (generous corporotomies) and prolonged operative time. Anticipation of these complications forces some surgeons to become content with less than maximum dilatation, thus implanting smaller cylinders.

Furthermore, the more conservative surgeon adopts dilatation (blunt) rather than resection (sharp) of fibrous tissue. Fibrous tissue that is left behind often interferes with expansion of the inflatable penile prosthesis and makes implantation of a narrow malleable rod more favorable [13]. The shortening that is the result of longstanding fibrosis commonly leads to implantation of a short prosthesis [14]. Shortening cannot be resolved by mere corporeal dilatation and prosthesis implantation. Resection of the fibrous tissue is necessary for release and restoration of length.

To sum up, the unfavorable outcome is either due to blind instrumentation, the use of force against resistance, extensive exposure, prolonged manipulation, or leaving fibrous tissue behind, unresected.

Alternatives have been proposed, all of which involve one or more of the aforementioned reasons for unfavorable outcome [3–11].

Stepwise, laterally oriented dilatation was performed through corporeal counter incisions, one proximal and one distal, using Dilamezinsert and Hegggar dilators. The tip of the instrument entered from one incision and protruded from the counter incision. Dilatation of the crura was performed via the proximal corporotomy, separate from dilatation of the distal corpora cavernosa (via the distal corporotomy), thus shortening the distance that the dilator had to travel unseen. This, in addition to the lateral orientation of dilatation away from the urethra, helped avoiding injury [3].

Although this method provides better control and safer dilatation, nevertheless, the dilators still traveled blindly and against resistance, although

for half a phallus at a time. The authors reported that expanding the subtunical tract was usually very difficult at the start, but with persistent and patient dilatation, the fibrous tissue gradually yielded [3].

Moreover, in our opinion, the devitalization resulting from persistent dilatation against resistance may be a predisposing factor for prosthesis infection. Although the authors had no infected cases, blunt dilatation was associated with a higher rate of infection as reported by other authors who operated through a single corporotomy on each side [2].

The authors stated that an obvious disadvantage of this procedure was that it depended mainly on tissue stretching rather than creating a wide corporeal tunnel by excising the fibrous core or by using graft material. They reported that although this worked well for implanting a malleable rod, they expected that this would not be suitable for implanting an inflatable prosthesis as the tight space might compress the cylinders and hinder inflation [3]. Dilatation rather than fibrous tissue resection was also the reason why they were unable to seal corporotomy defects as large as 4 cm after insertion of the malleable rods [3]. Such defects may be a predisposing factor for infection, and may lead to herniation of the cylinders if an inflatable prosthesis was to be used. Accordingly, the authors fairly decided that extended corporotomies and corporeal reconstruction may be necessary for fibrous tissue resection in some cases with severe corporeal fibrosis [3].

Extended corporotomies and open excavation of the corpora have been suggested [4,5]. Access was through an inverted T incision through the peno-scrotal junction and along the ventral midline of the penis, followed by bilateral corporotomies extending along the whole length of the corpora cavernosa. Metzenbaum scissors were used to establish a plane of dissection between the undersurface of the tunica albuginea and the fibrotic tissue core. After circumferential mobilization of the fibrotic core was achieved in one area, a Penrose drain was placed and used as a retractor to facilitate core dissection both proximally and distally. The fibrotic core was then excised and a CXM cylinder of appropriate length laid into the corporeal bed. Primary closure of the tunica albuginea followed [4,5].

Although this approach provides better access, safer excavation, and unhindered prosthesis implantation, it requires extensive manipulation attributed to the extended corporotomies, as well

as the use of force, as firm fibrous tissue is sometimes difficult to cut by scissors. These elements may be predisposing factors for prosthesis infection, injury of the urethra, or perforation of the tunica.

Another approach to excavation that carries less manipulation was the application of electroresection through the extended corporotomies. Bilateral longitudinal corporotomies were made at the penoscrotal junction of the tunica albuginea and extended to the glans penis. The extensive corporeal fibrotic tissue was dissected from the tunica albuginea with scissors and the remaining fibrotic tissue was resected and evaporated with the resectoscope and the resection loop commonly used for transurethral resection [6].

Electroresection omits the use of force in excavating fibrous tissue as it can dig right into it more easily and effectively than with scissors. However, still an extended corporotomy and scissor dissection were required.

Both techniques of excavation through extended corporotomies help creating ample space for unhindered prosthesis placement and inflation as well as restoring penile length that is lost due to fibrous tissue contraction. They also provide visual guidance for dissection to avoid complications. However, the extensive exposure may predispose to infection and adds to the operative time and effort. It has to be noted that none of the extended corporotomy techniques reaches deep down to the fibrous tissue in the crura, which is where blind dissection is reverted to, rather than excavation [6], predisposing to perforation.

Cavernotomes were invented to assist corporeal dilatation in cases with severe fibrosis. Two forms are available. The Rossello Barbara and Carrion cavernotome [7] is a set of four cavernotomes of 9, 10, 11, 12 mm girth. The working area has a smooth facet and a scraping facet. The latter consists of 75 scraping edges and nine furrows. Through a corporotomy, cavernotome No. 9 is introduced in order to scrap and dilate the proximal portion. The smooth facet should be placed against the medial wall of the corpora cavernosa to protect the urethra, and the scraping surface should face laterally. Through an inward and outward movement of the cavernotome, fibrous tissue is scrapped, thereby increasing the inner diameter of the corpora cavernosa with each application. Progressively increasing diameters of the cavernotome are used until satisfactory dilatation is achieved.

Another cavernotome [8] comes in a set of five cavernotomes between 6 and 13 mm in diameter. They have a cutting edge that can drill a space in fibrotic corpora with controlled 1 mm cuts. The cavernotomes are advanced in an oscillating fashion for cavity development.

Problems common to both cavernotomes are the blind instrumentation and extensive manipulation. This may be the reason tunical perforation was as common as nine out of 16 patients with the latter cavernotome. The authors reported that this rate of complication was acceptable for such a difficult procedure [8].

The urethrotome has also been used to sharply incise the fibrous tissue core [9]. After a narrow cavity is created underneath a corporotomy, the urethrotome is advanced in a direction away from the urethra. Thinning out of the corporeal scar is achieved with multiple cuts from this device. This alternative involves sharp dissection without visual control. It has been reported to be more risky and more difficult to use in comparison with cavernotomes [10].

A combination of approaches has been used to tackle cases with extensive fibrosis. Cavernotomes were used to develop a track through a transverse scrotal incision that provided safer access to proximal corpora, and implantation of an undersized prosthesis [10]. Again, this involved the aforementioned drawbacks of cavernotomes as well as the lower patient satisfaction due to the lower girth and accordingly lower length of the implant [10]. The authors suggested replacement of the undersized cylinders with full-sized ones after the former have acted as expanders for some time.

Corporeal reconstruction to expand the space for accommodating the prosthesis besides the fibrous tissue can be achieved by various methods, among which are laying the cylinders within two longitudinal ventral corporotomies and closing the defect using a Dacron patch or a longitudinal vascularized pedicle of dermis [11].

Despite the omission of the use of force in corporeal reconstruction, infection rate is higher than with primary cases [15], especially if synthetic material is used for grafting [16]. The fibrous tissue that is left behind may interfere with filling the device especially if contracture of autologous graft occurs. Moreover, if shortening has set in, it cannot be resolved solely by corporeal reconstruction and requires resection of fibrous tissue off the tunica albuginea.

Unlike the aforementioned procedures, Optical Corporotomy and Trans-Corporeal Resection are

at all times under vision, thus minimizing the risk of perforation of the urethra and tunica albuginea. Corpus cavernosum endoscopy has been safely used to detect perforations of the tunica albuginea and to extract fragments of a ruptured penile prosthesis [17,18].

Our procedure requires virtually no force, again avoiding perforation. Resection can easily be carried down to the crura without the need for extended corporotomies. A 1–1.5 cm corporotomy on each side suffices, thus minimizing manipulation, infection rate, and decreasing operative time.

Full resection of the fibrous tissue can easily be accomplished, allowing restoration of length, facilitating placement of the largest possible malleable penile prosthesis, and ensuring that expansion of an inflatable prosthesis will not be hindered. Modifications to this technique, such as laser-assisted resection and the utilization of a dedicated specially designed instrument are currently being evaluated.

Conclusion

Optical Corporotomy and Trans-Corporeal Resection allow for force-free, visually monitored excavation of the fibrosed corpora cavernosa, aiming at safer penile prosthesis implantation.

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Conflict of Interest: None declared.

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