

## ARTICLE



# Scrotal approach for tunica expansion procedure (TEP) for penile girth and length restoration during penile prosthesis implantation in patients with penile angulation due to Peyronie's disease and erectile dysfunction: technique and outcomes

Shirin Razdan <sup>1</sup>✉, Ariel Zisman<sup>1</sup> and Robert Valenzuela<sup>1</sup>

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Peyronie's disease is often comorbid with erectile dysfunction and can cause significant penile shortening. We describe our modified tunica expansion procedure (TEP) technique of penile length preservation and girth enhancement with correction of penile angulation in patients with mild Peyronie's disease (<30 degree angulation, or hourglass deformity, no hinging) and erectile dysfunction presenting for inflatable penile prosthesis (IPP) surgery. A retrospective review of IPP placement from one high volume surgeon was performed. A total of 474 patients' charts from June 2017 to June 2021 were reviewed and those charts of patients undergoing modified TEP in the setting of Peyronie's disease were analyzed. Average increase in length and girth were measured and means with standard deviations calculated. The modified TEP is performed through a scrotal approach and involves complete eversion of the penis with dissection of Buck's fascia off the underlying tunica. Subsequently, staggered scorings of the underlying tunica are performed allowing for circumferential girth enhancement and length preservation. In men with Peyronie's disease, these scorings are preferentially concentrated on the side of the plaque to allow straightening without loss of length. A total of 32 patients with Peyronie's disease from the larger cohort underwent the modified TEP. Mean increase in length of distal corpora was  $2.8 \pm 0.8$  cm (range 2.0–3.4 cm) (measured using Furlow before and after penile eversion with TEP), while mean increase in girth (measured at midphallus prior to prosthesis insertion and after IPP inflation) was  $1.6 \pm 0.4$  cm (range 1.2–2.2 cm). There were no reported complications. A scrotal approach to TEP is an easy to perform technique that can be used to restore length and enhance girth in men with Peyronie's disease undergoing insertion of IPP. Additionally, it is a customizable approach that can also be used to correct mild penile angulation.

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## INTRODUCTION

Peyronie's disease is a condition manifested by a fibrous inelastic scar of the tunica albuginea, resulting in palpable penile plaque in the flaccid condition and causing penile deformity, including penile curvature, hinging, narrowing, shortening, and painful erections associated with loss of penile length [1, 2]. It affects anywhere from 1 to 10% of men [2]. Progressive loss of length is due to corporal scarring from the Peyronie's plaque and penile angulation. This phenomenon is not limited to those men with large plaques and severe angulation. The pro-inflammatory corporal milieu of men with Peyronie's disease results in less pliable corporal tissues that is not restricted to plaque location [3, 4]. In other words, these men typically do not have sufficient penile stretch and consequently lose length as a result.

Inflatable penile prosthesis (IPP) surgery represents an option for men with erectile dysfunction refractory to medical

management [5]. While overall satisfaction with penile prosthesis approaches 98% in some series, one of the greatest predictive factors for dissatisfaction post-prosthesis placement is perceived loss of length or girth [6–8]. In those men with multiple risk factors and underlying pathology for loss of penile length, techniques to optimize penile length and girth are crucial to ensure ultimate patient and partner satisfaction with their prostheses.

The tunica expansion procedure (TEP) was first developed by Egydio as a non-grafting method for penile enlargement in men with penile shortening irrespective of Peyronie's disease status [9]. The original technique was performed using a subcoronal incision. Longitudinal paraurethral incisions in Buck's fascia were performed along with proximal neurovascular bundle (NVB) mobilization [9]. This allowed for upwards of 3 cm increase in penile length. However, penile enhancement techniques involving

<sup>1</sup>Department of Urology, Icahn School of Medicine at Mount Sinai Hospital, New York, NY, USA. ✉email: [shirin.razdan@mountsinai.org](mailto:shirin.razdan@mountsinai.org)

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dissection of the NVB or urethra has resulted in reported cases of glans necrosis, a devastating complication [10].

We describe our technique of penile length preservation and girth enhancement with correction of penile angulation in patients with mild Peyronie's disease (<30 degree angulation, or hourglass deformity, no hinging) and erectile dysfunction presenting for penile prosthesis surgery. Our technique is a modification of the original TEP procedure albeit with a scrotal approach and without neurovascular or urethral mobilization. We also present our surgical outcomes with focus on improvement in penile length and girth.

## MATERIALS AND METHODS

After obtaining Institutional Review Board (IRB) approval for patient chart review (IRB-20-01505), a retrospective review of IPP placement from one high volume surgeon was performed. A total of 474 patients' charts from June 2017 to June 2021 were reviewed and those charts of patients undergoing modified TEP in the setting of Peyronie's disease were analyzed. Average increase in length and girth were measured and means and standard deviations calculated. Informed consent was obtained from all patients prior to surgery, and the consent included performance of both IPP insertion as well as TEP. Surgical consent also included consent for photography and videography along with publication of surgical photos.

## TECHNIQUE AND RESULTS

### Full circumferential TEP for girth & length. Partial TEP for girth enhancement

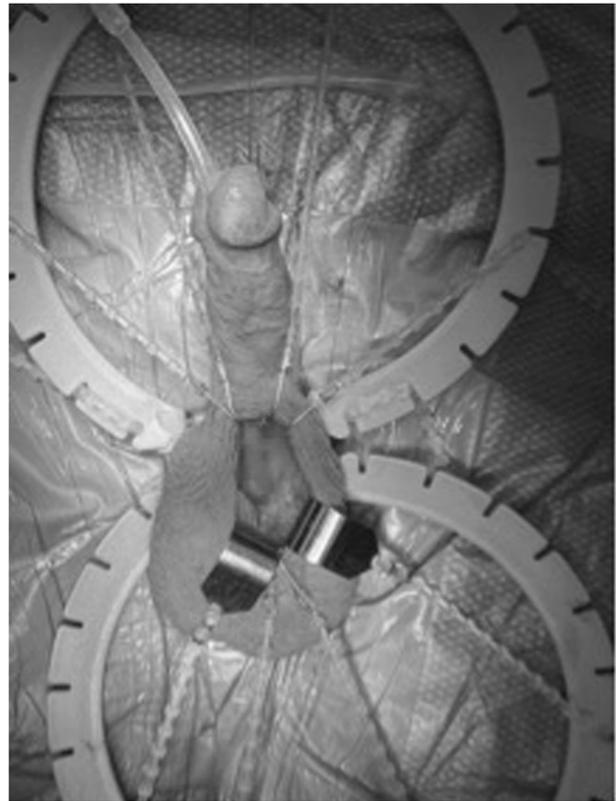
In our modified TEP approach, a midline incision is made in the scrotum ~2 cm inferior to the penoscrotal junction. (Fig. 1). The incision is mobilized to the level of the left phallus above the penoscrotal junction. After placement of the Wilson retractor, the penile compartment is entered to expose the left corpora. Dartos

is then bluntly retracted to expose both corpora and urethra. Dissection within the penile compartment is carried proximally to the level of the bulbospongiosus at the base of the phallus. Care is taken not to violate the scrotal compartment. (Fig. 2). We place stay sutures on the proximal corpora. Corporotomies are created. Distal dorsal corporal channels are created using Metzenbaum scissors. The Furlow is then used to measure the corpora. At this point, to perform a full TEP, the retracting hooks are removed. Penile eversion is initiated at the level of the penoscrotal junction. Progressive eversion is achieved by freeing up the dartos using a combination of sharp and blunt dissection. Minimum electrocautery is used to avoid damage to the corpus spongiosum. Once the penis has been everted, Buck's fascia is then carefully mobilized 1 cm lateral to the corpus spongiosum, 1 cm proximal to the penoscrotal junction, and distally 2 cm proximal to the coronal sulcus. (Figs. 3 and 4).

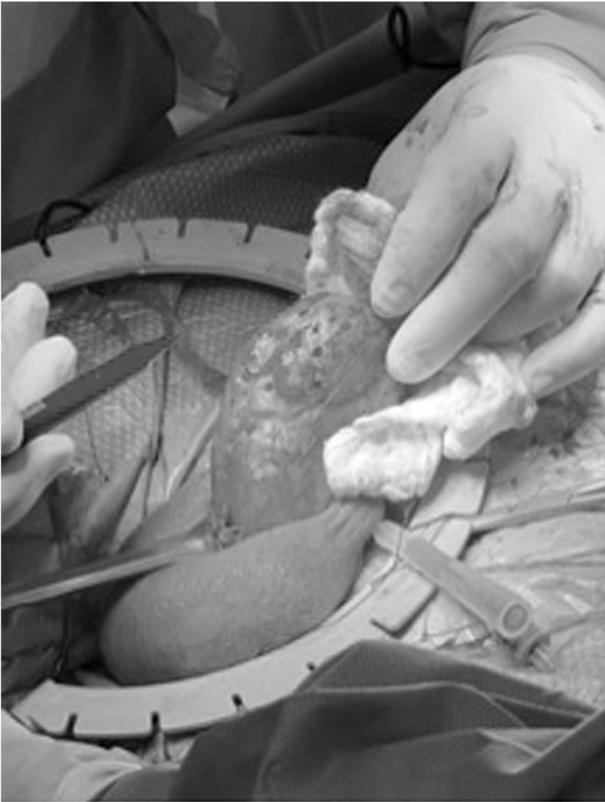
Buck's fascia is then carefully mobilized laterally to the 2 and 10 o'clock positions on either side of the corpora. Care is taken to preserve the NVB running dorsally by ensuring the lateral dissection of Buck's fascia ends within 1 cm of the bundle. Alternatively, complete mobilization of Buck's can be performed, and a penrose drain can be placed to facilitate elevation of the NVB. The wings of Buck's fascia are dissected off the corporal bodies using a combination of blunt and sharp dissection with the aid of fine Freeman Kaye scissors. Using cutting current on the Bovie electrocautery set at 15, superficial horizontal cuts are made in a staggered fashion into the exposed tunica albuginea. This is carried out along the entire length of the exposed tunica, ending 2 cm distal to the penoscrotal junction. (Fig. 5). We pass the tips of small mosquito clamps through these scorings and provide extra



**Fig. 1 Scrotal Incision.** With aid of Wilson retractor and median bar, a 3–4 cm vertical incision is made 2 cm below the penoscrotal junction.



**Fig. 2 Visualization of entire proximal corpora and urethra without violation of scrotum.** Six blue hooks are used to retract Dartos layers and skin. Blunt dissection using Debakey forceps is used to strip layers of fascia off the corpora and urethra. Metzenbaum scissors are used to cut the fascia tethering urethra to scrotum, and scrotum is packed with gauze.



**Fig. 3 Two centimeters proximal to coronal sulcus marked.** This represents the distal most extent of TEP as the dorsal nerve begins to fan out at this point. Further distal dissection risks injury to this nerve complex.



**Fig. 4 One centimeter lateral to urethra marked.** Further lateral dissection risks injury to the neurovascular bundle.



**Fig. 5 Extent of TEP from distal marking to ischiocavernosus.** Small mosquito clamps can be used to stretch each TEP scoring to maximize length and girth attainment with prosthesis inflation.

stretch to the tunica. This maneuver allows for expansion of the tunica to obtain extra length. Additional length and girth will be achieved upon inflation of the subsequent penile cylinders by allowing full stretching and expansion of the elastin and collagen fibers of the tissue. Without freeing up the tissue in such a fashion, the extent of girth enhancement is limited by the inherent fastidiousness of the tunica.

The width of the staggered cuts determines the gain in girth by allowing radial expansion of the prosthesis cylinders. The length of the cuts along the long axis of the phallus contributes to length preservation by allowing for proximal and distal stretch of the tunica with inflation of the prosthesis. In men with small Peyronie's plaques or other penile curvatures, the modified TEP can also be used to correct angulation by preferentially concentrating cuts in the tunica at the point of curvature or location of plaque. This zonal sequestration of tunical scorings maximizes the gain of width or length at this location. In patients with lateral angulation, unilateral TEP can be performed on the side of curvature. This will preferentially stretch this tissue, allowing for correction of angulation with inflation of the prosthesis. This is an alternative to the commonly performed plication technique, albeit with the added benefit of girth enhancement.

After completion of the TEP, the wings of Buck's fascia are then reapproximated using a running locking 3-0 monofilament absorbable suture. The penis is then reverted back in proper anatomical position and Furlow used to measure the proximal and distal lengths of the corpora, making note of the change in distal length to select appropriate prosthesis size. The rest of the prosthesis surgery is carried out per surgeon's usual technique. Further penile modeling can be performed as needed to tweak any residual angulation without risking compromise of the TEP. In our cohort of men, we used the Coloplast Titan IPP as per our

surgeon's preference. The TEP did not affect how we ultimately made our corporotomies as we routinely make our corporotomies very proximally on the corporal bodies, just distal to where they bifurcate, whereas the TEP is performed much more distally within the phallic portion of the corporal bodies. In addition, while the TEP is performed laterally on the corporal bodies, our corporotomies are performed ventrally on tissue that was not dissected during the TEP. Depending on the extent of raising of the Buck's fascia during TEP, dorsal corporotomy, as would be performed via infrapubic approach, may be more challenging.

A total of 32 patients with Peyronie's disease from the larger cohort underwent the aforementioned modified bilateral TEP. Bilateral TEP was performed to maximize increases in length and girth rather than preferentially target penile angulation only with unilateral TEP. Mean age was 64 years (range 50–72). Hypertension was comorbid in 20 patients, diabetes mellitus in 12 patients. Eight patients were post radical prostatectomy. Mean degree of penile curvature was  $20 \pm 6$  degrees (range 10–30). Mean increase in length of distal corpora, measured using Furlow before and after penile eversion with TEP, was  $2.8 \pm 0.8$  cm (range 2.0–3.4 cm), while mean increase in girth, measured at midphallus prior to prosthesis insertion and after IPP inflation, was  $1.6 \pm 0.4$  cm (range 1.2–2.2 cm). Mean persistent penile curvature was  $5 \pm 1.0$  degrees (range 0–15 degrees). There were no reported complications at 1 year.

## DISCUSSION

Penile prosthesis surgery is not solely meant for restoration of erectile functionality. It presents an opportunity to reclaim some penile length that has been lost due to comorbid conditions. It additionally has the ability to allay patient anxiety due to perceived penile shortening or poor girth by affording the surgeon the opportunity to make tunical tissue more pliable. Numerous techniques for penile length preservation and girth enhancement have been described in the literature [11–13]. Many of these techniques involve adjunctive procedures to improve perceived length, i.e., ventral phalloplasty, suprapubic lipectomy [14–16]. Other techniques to effect actual length enhancement, such as the modified sliding technique involve greater mobilization of urethra and NVB, thereby risking potential urethral injury or even glanular necrosis from nerve injury [17, 18].

For the traditional TEP as described by Egydio, the risk of glans necrosis is dependent on extent of NVB dissection, as a more rigorous dissection threatens injury to glanular blood supply from the dorsal penile artery [9]. The risk is even higher with concomitant urethral mobilization due to potential injury of terminal spongiosal arteries [19]. The subcoronal approach utilized with traditional TEP has a higher risk of glans necrosis due to potential direct injury of the NVB from initial incision or during bundle mobilization. A less dramatic but more common side effect of the subcoronal approach is diminished glanular sensitivity, which can also prove problematic for patients [20].

While infrapubic approach to TEP has not been described in the literature, it is also possible to evert the penis with this access. That being said, the infrapubic approach has been associated with increased risk of sensory nerve injury and, when compared to the scrotal approach, has been shown to result in 1–2 cm shorter prostheses [21].

One of the greatest strengths of our modified TEP is that it does not necessarily require mobilization of urethra or NVB, thereby minimizing iatrogenic injury to these structures and essentially making risk of glans necrosis and attendant sensory nerve palsies negligible. In addition, it can be easily tailored to the patient. For maximizing length, the length of tunical cuts can be extended as far distally as 2 cm proximal to coronal sulcus and as far proximally as just distal to the ischiocavernosus. For maximizing penile girth, the width of the staggered cuts can be increased, thereby

augmenting radial growth. In addition, a unilateral TEP can be performed if the goal is simply to correct lateral angulation in a patient with Peyronie's disease. A scrotal approach to TEP also allows for untethering of the proximal corporal attachments, increasing corporal mobility, and allowing for greater prosthesis length without need for rear tip extenders.

Postoperatively, early cycling of the prosthesis ensures that the elastin and collagen fibers of the tunica are appropriately stretched and pliable. Consequently, apparent girth will continue to increase postoperatively with increased use of the prosthesis. The TEP is not a static procedure where phallic length is maximized immediately postoperatively. Rather, the more frequently the prosthesis is cycled, the greater propensity for girth enhancement and length preservation. We routinely advise our patients to begin cylinder cycling at 4 weeks postoperatively, ensuring that the device remains inflated for at least 10 min daily. We believe TEP is easy to adopt and can be performed from infrapubic and subcoronal incisions, thereby expanding its accessibility to all high volume prosthesis implanters. With the increasing prevalence of erectile dysfunction and its comorbid conditions that cause loss of penile length, having such an adaptable technique in the surgeon's arsenal is valuable.

While we mainly endeavored to describe a technique with some pertinent outcomes, our study does have its set of limitations. It presents the outcomes of a single high volume surgeon and may not be necessarily reflect the outcomes of more novice prosthetic surgeons. In addition, it is retrospective in design and inherently limited by the variables collected at the time of original surgery. However, this is often the case with technique papers and should not retract from its description. Our study's population of men with Peyronie's disease is also small at 32 patients. This may make it challenging to comment on true complication rates of the modified TEP, although from our small cohort there were no reported complications at 1 year.

In sum, a scrotal approach to the TEP is an easy to perform technique that can be used to restore length and enhance girth in men with Peyronie's disease undergoing insertion of inflatable penile prosthesis (IPP). In addition, it is a customizable approach that can also be used to correct penile angulation in addition to penile modeling at the time of prosthesis implantation. It has the added benefit of decreased risk of urethral and NVB injury, without loss of glans sensitivity.

## DATA AVAILABILITY

The datasets generated during and/or analyzed during the current study are available from the corresponding author on reasonable request.

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#### AUTHOR CONTRIBUTIONS

SR: data analysis and paper writing. AZ: data analysis and paper writing. RV: study design and final paper review and approval.

#### COMPETING INTERESTS

The authors declare no competing interests.

#### ADDITIONAL INFORMATION

**Correspondence** and requests for materials should be addressed to Shirin Razdan.

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