



Management of the anatomically complex penile implant candidate through an infrapubic incision: a review of surgical techniques and benefits

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Abstract: This article provides a comprehensive discussion of 3-piece inflatable penile implant surgery when performed through an infrapubic approach in patients presenting with challenging anatomy or corporal fibrosis. The infrapubic approach is one of the primary approaches for inflatable device placement with excellent long-term functional outcomes. While the literature is rich in descriptions of infrapubic placement in the primary, uncomplicated setting, its role in the management of complex patients presenting to centers of excellence is less elucidated. In uncomplicated cases, the infrapubic approach offers several theoretical advantages including shorter operative time and quicker return to sexual function. In addition to describing specific details of our infrapubic technique and perioperative management, I discuss scenarios in which an infrapubic approach may allow for better exposure for correction of dorsal deformity, facilitate secondary surgical maneuvers such as suprapubic lipectomy, or protect existing incontinence prosthetics already in place. Specific technique and surgical pearls from our prosthetic center of excellence are reviewed for each of these challenging scenarios. Ultimately, prosthetic surgeons should be adept at placing, revising, and removing devices through both approaches so that various forms of anatomical deformity and device failures can be addressed proficiently. In addition to my own clinical reflections, a critical review was performed using the Medline database to support our statements.

Keywords: Erectile dysfunction (ED); artificial urinary sphincter (AUS); penile implant; penile prosthesis; buried penis

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Introduction

The suprapubic incision was the first approach described by Brantley Scott for the very first inflatable penile prosthesis (IPP) surgeries (1). After the development of kink-resistant tubing which allowed for smaller incisions, surgeons transitioned to the infrapubic incision due to familiarity with the suprapubic exposure. Since then, several alternative techniques have been described (2-5). While each surgical approach has potential advantages, as others have stated, a well-done implant can be done through any of the incisions described (2,6).

Our preference towards using the infrapubic incision is rooted in the extensive experience amassed by one of the pioneers in prosthetic surgery, Stuart D. Boyd, who is now an Emeritus Professor of Urology at the University of Southern California. Similar to Doctor John Mulcahy, Doctor Boyd's time with Doctor William Furlow during the infancy of urologic prosthetics cemented his preference for an infrapubic approach during initial placement (2). In the subsequent 4 decades, we have amassed a robust surgical experience on using this approach in a broad range of complex patients with excellent outcomes and in

combination with the artificial urinary sphincter (AUS) (7-9). With that, the focus of this review is to elaborate on how to utilize the infrapubic approach in the management of surgically complex patients and to share with the reader several pearls that can help improve outcomes and mitigate some anxieties that implanters may have when faced with complex anatomy.

Infrapubic versus penoscrotal versus subcoronal: is infrapubic superior?

As mentioned earlier, a well-done implant can be performed through any described approach and the outcome is primarily determined by surgeon skill and the clinical scenario. Successful prosthetic surgeons should be well-versed in performing implantations and revisions through each approach. With that in mind, an infrapubic approach offers several potential advantages including decreased scrotal swelling, less surgical time, quicker return to sexual activity, and decreased risk of urethral injury (6). In both short- and mid-term follow-up, studies have shown positive device related and patient satisfaction outcomes when using the infrapubic approach and minimally-

invasive modifications (10,11). An infrapubic approach has the increased potential for injury to the neurovascular bundle. Fortunately, this risk is more theoretical rather than commonplace and we have not seen this complication during penile prosthesis placement. Ultimately, there is no clear winner. Each approach has its relative merits and surgeons should be facile with each implantation technique. I present this article in accordance with the SUPER reporting checklist (available at <https://tau.amegroups.com/article/view/10.21037/tau-23-182/rc>).

Preoperative preparations and requirements

Starting 3 days before surgery, patients are asked to begin using a chlorhexidine gluconate-based solution to clean the body during bathing including the morning of surgery. In the pre-operative holding area, the hair is trimmed and the body is wiped using chlorhexidine gluconate impregnated cloths. After administration of broad-spectrum antibiotics (vancomycin, piperacillin-tazobactam), antifungals in diabetic patients, and the surgical field is sterilized using a chlorhexidine-based surgical prep.

All procedures performed in this study were in accordance with the ethical standards of the institutional and/or national research committee(s) and with the Helsinki Declaration (as revised in 2013). Written informed consent was obtained from the patient for publication of this study and accompanying images. A copy of the written consent is available for review by the editorial office of this journal.

Step-by-step description

The penile structures are approached using a vertical or transverse incision just above the base of the penis. The neurovascular bundle is the critical structure that must be identified when approaching the penis dorsally and injury may cause permanent hyposthesias to the glans. Once the bundle is identified, stay sutures are placed lateral to it into each corpus.

In order to prevent injury, we typically incise Buck's fascia just lateral to the bundle so that we clearly identify the longitudinal fibers of the tunica albuginea and the lateral edge of the bundle prior to suture placement and corporotomy. It is important to avoid placing the stay sutures *too* lateral as this can cause lateral deviation of the dilation, suboptimal cylinder positioning in the glans, and in rare cases injury to the urethra. A 2-cm incision is made in the corpora and dilation is performed both proximally

Highlight box

Surgical highlights

- An infrapubic approach is utilized with various modifications depending on patient anatomy or the clinical scenario.

What is conventional and what is novel/modified?

- The neurovascular is identified in the midline.
- Penile prosthesis placement cylinders are placed using the Furlow introducer device.
- The pump is placed in the midline of the scrotum using blunt dissection and eversion of the scrotum.
- Reservoir is placed in the Space of Retzius through an open approach in the midline just above the pubic symphysis or in an alternate location in the lateral retroperitoneum accessed through an incision medial to the anterior superior iliac spine.

What is the implication, and what should change now?

- Suprapubic lipectomy and concurrent penile prosthesis placement can be performed through a transverse suprapubic incision.
- Placement of the penile prosthesis through an infrapubic approach may protect the urethra with an artificial urinary sphincter in patients with stress urinary incontinence.
- Dorsal exposure of the penile structures can allow for elevation of the neurovascular bundle to address severe dorsal deformity.
- An infrapubic approach may be helpful in patients with previous corporal fibrosis from a prior penoscrotal device.

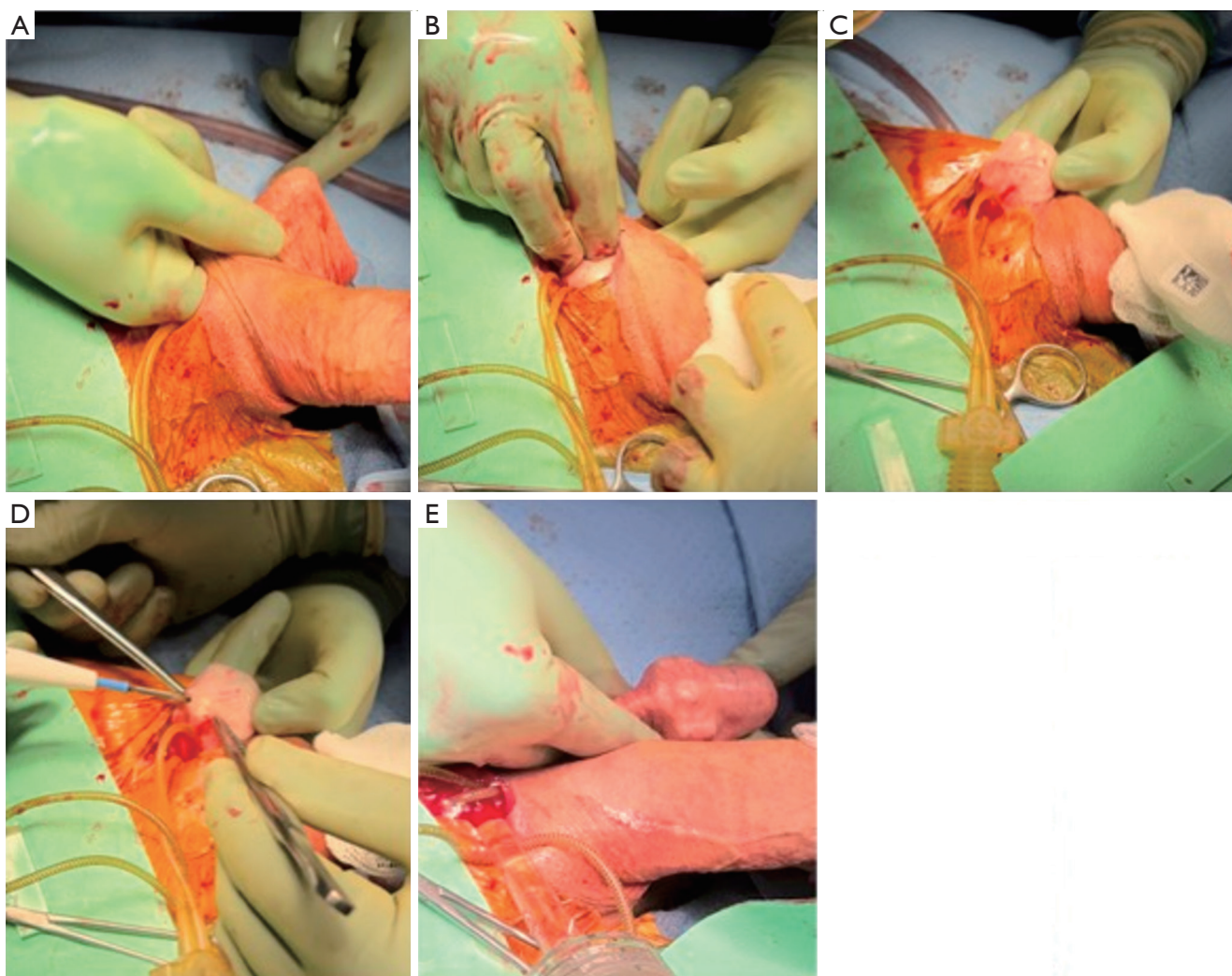


Figure 1 Subdartos pump placement. (A) Creation of subdartos pocket. (B) Initial eversion of scrotum. (C) Complete eversion of pocket created. (D) Separation of fibers away from scrotal wall using electrocautery and sharp dissection. (E) Pump placement into pocket.

and distally using Hagar dilators, Brooks dilators, and/or the Furlow tool depending on surgeon preference. Once the total penile length is determined, an appropriately sized device is selected, prepared, and inserted in the usual customary manner using the Furlow introducer tool. A Luer-Lock syringe is used as a surrogate reservoir and the erection is tested. Modeling and other straightening maneuvers can be performed as indicated. The device is then left partially inflated depending on surgeon preference.

Pump placement through an infrapubic approach should be done with the goal of preventing cephalad migration of the pump. Various techniques have been described but ultimately the pump should be placed in a location that will

be easy for the patient to manipulate and isolated away from the testicles, the penile shaft, and an AUS pump, if present. Our specific technique involves creation of a subdartos pouch using blunt dissection and eversion of the scrotum as shown in *Figure 1*. Others have described successful use of a nasal speculum (10). It is either during preparation of the cylinders or after cylinder and pump placement that the reservoir is placed. Various locations and techniques for reservoir placement have been discussed extensively in the prosthetic literature but at our institution, we rely on two locations: the retropubic space (Space of Retzius) and the lateral retroperitoneum (12,13). While there is heterogeneity among prosthetic surgeons on the use of

surgical drains, perioperative antibiotics, and dressings, the above describes our specific technique for the placement of an inflatable penile implant through an infrapubic incision (14).

Postoperative considerations and tasks

In general, patients are kept overnight in the hospital and discharged the following day. The surgical drain is removed and patients are seen within 2–3 weeks of surgery. During that visit, patients are then taught how to cycle the device. Patients are subsequently seen until they are proficient in how to use the device. For the rest of the text, we will discuss challenging patient scenarios and the potential advantages of the infrapubic incision.

Tips and pearls

Fibrosis/scarring of the Space of Retzius

While reservoir location and placement technique are largely based on surgeon preference and experience, there are certain advantages afforded by the infrapubic incision when placing reservoirs in patients with challenging pelvic anatomy. Through an infrapubic incision, reservoirs can be placed safely in the Space of Retzius despite bilateral inguinal hernia repairs. Rather than placing a reservoir through the external ring, the anterior rectus fascia can be identified in the midline just above the pubic symphysis as described by Levine and has been practiced routinely at our institution for 4 decades (15). After the fascia is incised, the rectus muscle can be split in the midline and a space can be created with blunt dissection in the retropubic space. This “open” technique allows for exposure of the anatomy and development of the space. In patients that have had previous violation of the Space of Retzius after prostatectomy or cystoprostatectomy, the reservoir can be placed in an alternate location in the lateral retroperitoneum as described previously and as shown in a peer-reviewed online video (13,16).

Patients with an AUS

After treatment for urologic malignancies, many patients can have concomitant erectile dysfunction (ED) and stress urinary incontinence. In patients considering a penile implant and AUS, it is important to consider the long-term health of the urethra, the penis, and the prosthetics. We typically treat incontinence before erectile restoration but

the order of placement is ultimately up to shared-decision making between patient and surgeon. It is important to counsel patients that a penile implant may be a risk factor for erosion of the urethra (17). While no studies exist that compare AUS outcomes stratified by penile implant surgical approach, our successful experience using an infrapubic penile implant approach and perineal AUS suggests that complete separation of both prosthetics may be preferable due to intraoperative considerations as well as long term outcomes (9).

From a surgical standpoint, an infrapubic approach allows the surgeon to avoid exposure and violation of AUS components such as the pump, cuff, and tubing that may be present in the scrotum during IPP placement. By separating the two devices as far anatomically as possible, this also may prevent potential crossover contamination if one device becomes infected. A review of 28 patients with an infrapubic penile implant presenting with AUS erosion at our institution found no instances of crossover infection to the penile prosthesis.

An infrapubic incision also allows for placement of the cylinders further away from the urethra when compared to placement through a penoscrotal approach which we hypothesize may preserve vascularity of the urethra and promote longer-term survival of the AUS. After corporotomy and during dilation, the space just underneath the dorsal aspect of the tunica albuginea is developed when approached through an infrapubic incision as shown in *Figure 2*. This theoretically pushes the corpus spongiosum towards the ventral aspect of the penis and the urethra and allows it to “cushion” the urethra when compared to the direct compression that a penile prosthesis cylinder may exert placed penoscrotal.

Lastly, an infrapubic approach is particularly advantageous in the compromised urethra where a transcorporal dissection is required for cuff placement. Based on direct experience, it is typically more difficult doing a transcorporal urethral mobilization in patients with a penoscrotal implant and often times the corporal cylinders are encountered with a penoscrotal device.

Complex dorsal deformity secondary to Peyronie’s disease

Several techniques have been described to correct penile curvature secondary to Peyronie’s disease at the time of penile prosthesis placement including aggressive modeling, scratch techniques, plication, and plaque incision with or



Figure 2 Subtunical dilation. (A) Metzenbaum scissors used to create a space just underneath the tunica albuginea. (B) Space to be dilated. (C) Dilation with dilator.

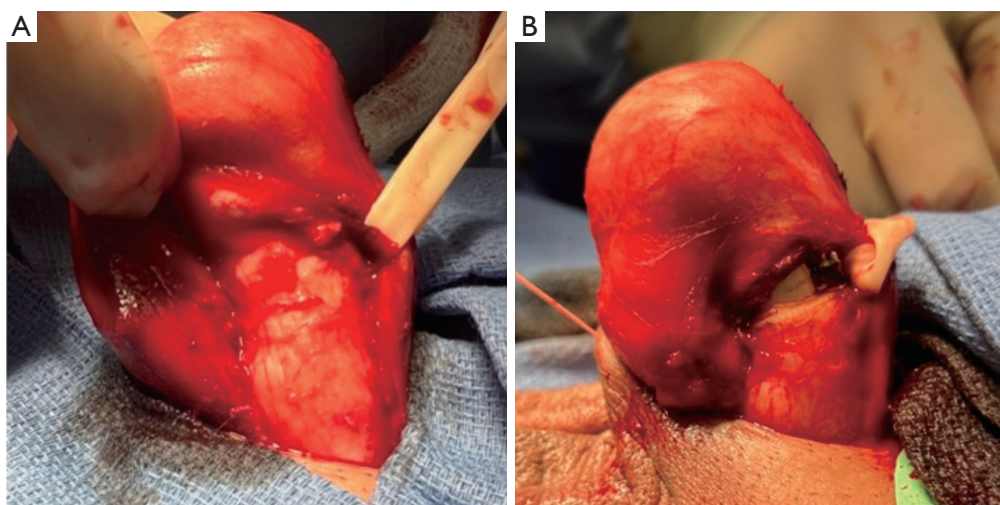


Figure 3 Penile Inversion and dorsal plaque incision for correction of dorsal penile curvature. (A) Eversion of penis through infrapubic incision and elevation of neurovascular bundle. (B) Incision of Peyronie's plaque prior to grafting.

without grafting (18-22). While straightening maneuvers can be performed through each approach, for patients presenting with severe dorsal deformity, the infrapubic approach allows for direct access to the neurovascular bundle and dorsal plaques. After initial dissection and identification of the neurovascular bundle, an artificial erection helps identify the area of maximum curvature. With the exception of a longer phallus, the penis can then be everted out of the infrapubic incision until the area of maximum curvature is delivered. At this point, the neurovascular bundle can be elevated prior to device placement in anticipation of subsequent plaque incision as illustrated in *Figure 3*. With elevation of the neurovascular bundle, glans paraesthesias can occur and appropriate

patient counselling is mandatory. We tend to aggressively size the cylinders after dilation and measurement in anticipation of the length gains achieved by plaque incision. With the cylinders in place and the device partially inflated, the plaque is incised transversally through the dorsal plaque and extended laterally to the urethra. The lateral limits of the incision are darted to allow for longitudinal and vertical expansion as described previously by Gelbard (23). The resulting defect can then be covered with graft material such as cadaveric pericardium or fibrin sealant patch. Conversely, for patients with ventral curvature, the infrapubic incision provides great exposure for placement of plication sutures on the dorsal aspect of the penis.

While there is undoubtedly a role for modeling for

correction of mild to moderate curvature, moderate to severe deformities are best served with relaxing incisions, plication maneuvers, or a combination of multiple techniques to correct significant degrees of curvature and the infrapubic incision allows for excellent exposure of dorsal penile anatomy.

Corporal fibrosis from prior penoscrotal device infection and removal

The successful prosthetic surgeon should be adept at placing, revising, and removing implants through both the penoscrotal and infrapubic approaches. This skill set is particularly useful in managing patients who have had previous devices that have subsequently become infected and removed. Placing a new device in this setting is typically one of the more complex and challenging surgeries that confronts the prosthetic surgeon (24). It has been our experience that approaching the penis through a contralateral approach can facilitate device placement and an infrapubic incision may be favorable when placing a new implant after removal of an implant that was placed through a penoscrotal incision. It has been our experience that in this setting, the surgeon may encounter spongy corpora cavernosa rather than fibrosis after corporotomy on the dorsal aspect of the penis. In most cases we have avoided needing to use bladed dilators by taking advantage of the healthier tissue plane found on the contralateral side of the penis. The same is true for patients in which a previous device was placed and removed infrapubically. In these cases, a penoscrotal approach may be advantageous for the same reasons as previously discussed.

Buried penis from prominent suprapubic lipodystrophy

While its primary purpose is to restore erectile function, the penile implant can also help expose a phallus that has become retractile either due to post-lymphadenectomy changes, corporal fibrosis from long-standing ED, or surrounding suprapubic fat. Increasingly, patients have presented to my clinic requesting for excess suprapubic fat to be removed because it hangs over the base of the penis. In those patients, we have become increasingly adept at removing this fat and exposing more penis at the time of penile prosthesis surgery. As others have noted, this can all be achieved through a single incision when the penile implant is placed through the dorsum rather than two incisions if the device were placed through a penoscrotal

incision (25,26). In this surgery, a large elliptical shaped area of dystrophic suprapubic fat is removed and the resulting defect is then closed in multiple layers to create a single transverse incision as shown in a video and initial series that was recently published (27). In our initial experience of 9 patients, 1 patient experienced an infection of his device and subsequently underwent successful salvage replacement of his device.

Discussion and conclusions

In certain clinical and anatomical scenarios, the infrapubic incision can be used to facilitate anatomical exposure, correct penile deformity, and promote longer-term health of the AUS. As such, prosthetic surgeons should be adept with this approach to address surgical challenges often encountered at prosthetic centers of excellence.

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Footnote

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