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Management of Intraoperative Complications of Penile Prosthetic Surgery

Learning Objective: At the conclusion of this continuing medical education activity, the participant will be able to discuss intraoperative complications that can arise during penile prosthesis surgery, review anatomical considerations for preventing such injuries, and describe diagnostic techniques for identifying and discuss strategies for management of said complications.

This AUA Update aligns with the American Board of Urology Modules on Core/General Urology and Impotence, Infertility, Infection and Andrology. Additional information on this topic can be found in the AUA Core Curriculum section on Sexual Medicine.

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INTRODUCTION

Erectile dysfunction (ED) is defined as the inability to achieve or maintain an erection satisfactory for sexual performance.[1] It is a common problem for males worldwide and is associated with impaired quality of life.[2] There are several non-surgical treatment options available, including oral phosphodiesterase inhibitors, intracavernosal injection therapy, urethral suppositories and vacuum erection devices, with a myriad of studies supporting their safety, tolerability and efficacy. Nevertheless, there are shortcomings associated with each of these treatments, and the reported associated dropout rates for these therapies are substantial.[3]

The surgical implantation of a penile prosthesis,[1] the vast majority of which consist of 3-piece inflatable penile prostheses (IPPs),[4] is a well-established, highly effective treatment for enabling successful sexual intercourse. Either as a salvage treatment, when the lesser invasive treatment options have not been effective or tolerated, or as primary treatment based on informed decision-making between physician and patient, they have been proven safe, effective and durable,[5] with satisfaction rates for both patients and their partners exceeding those seen with other ED treatment options.[6]

As with any surgery, potential complications arise with penile prosthesis implantation. The most common and feared of these include device infection, erosion and mechanical failure, which require surgical revision with or without device replacement. However, certain misadventures may arise during device implantation itself, resulting in such complications as urethral and crural perforation, cylinder crossover and mis-sizing, and injury of adjacent organs, specifically visceral or vascular structures. Ideally, these complications are recognized and managed at the time of surgery, although it is possible that they are only identified postoperatively, even remotely from surgery, prompting the need for revision surgeries to address the problem(s). The objective of this Update is to highlight the causes, frequency, detection and management of intraoperative penile complications of penile prosthetic surgery.

SURGICAL CONSIDERATIONS

The principal surgical approaches for penile prosthesis implantation are penoscrotal and infrapubic, although more recently the subcoronal approach has also gained favor. While an analysis of the relative merits and outcomes of each is beyond the scope of this Update, the principles required for prosthesis implantation are similar across approaches. Namely, these include exposure of the corporal bodies, after which a coroporotomy is performed. Corporal dilation, both proximally and distally, is next, and once the stretched penile length measurement is performed, the appropriate prosthesis is selected and implanted. The site for reservoir placement is chosen, typically in the retropubic space of Retzius or, as more recently described, in the potential submuscular space between the rectus muscle anteriorly and the peritoneal lining posteriorly, and the reservoir is placed and filled. Finally, the pump's position within the scrotum is prepared and secured within.

In acknowledgment that certain anatomical considerations affect the surgical plan for penile prosthesis implantation, surgeons should acquire an in-depth knowledge of the patient's medical and surgical history. As examples, the concomitant presence of Peyronie's disease should be fully evaluated preoperatively, with assessment of the extent and location of plaques as well as the degree of deformity. These factors may impact the surgical approach, consideration of adjuvant procedures (such as modeling, plication, excision and grafting) and choice of the type of prosthesis. A history of penile fracture or priapism is noteworthy. Prior pelvic radiation could increase fibrosis or scarring within the penis. Morbid obesity could impact which surgical approach is employed (eg a penoscrotal incision may be favored to avoid difficult dissection through a large infrapubic fat pad), whereas the presence of sizable scrotal angiokeratomata may compel the infrapubic approach. A history of prior surgeries, including inguinal herniorrhaphy, extirpative oncologic (colorectal, urological) surgeries of the pelvic region, prosthetic device (penile prosthesis and/or artificial sphincter) surgeries and endoscopic procedures (urethral or prostate) may all impact choice of surgical approach or manner of reservoir placement, and may contribute to surgical risk. Preoperative cross-sectional imaging with computerized tomography or magnetic resonance imaging may be indicated and used at the discretion of the surgeon, such as for cystoscopy to rule out urethral stricture or bladder neck contracture when appropriate.

PERFORATION INJURIES

Crural perforation. Likely underreported, crural perforation carries an unknown occurrence rate. It occurs during corporal dilation, when the dilating instrument perforates the crus proximally. This perforation occurs at the medial aspect of the corpora, which bows adjacent to the lateral flare of the ischial bone. The junction of the inferior pubic and ischial rami is evident by resistance in passing the dilator to the proximal extent of each corporal body. **If unrecognized and unaddressed, a crural perforation may result in proximal cylinder migration and malposition, which may manifest as pain on penetrative intercourse and patient dissatisfaction with function of the device.**

Concern for crural perforation should be raised when a sudden loss of resistance occurs during proximal dilation. Discrepant corporal measurements may further suggest (though are not diagnostic of) proximal perforation of the longer side. A simple evaluation to assess for crural perforation is the "field goal" test,[7] wherein dilators are concurrently placed proximally in both corpora. The tips of the dilators should be at the same level or height (fig. 1); a difference in the positions of the dilator tips of >1 cm is suggestive of perforation.

In terms of prevention, care should be taken to employ limited force when dilating the corporal bodies. Whereas many practitioners employ sequentially larger dilators up to 13 mm, some advocate a passage of a single dilator.[8] There is no

ABBREVIATIONS: ED=erectile dysfunction, IPP=inflatable penile prosthesis, RALP=robot-assisted laparoscopic radical prostatectomy, SST=supersonic transporter

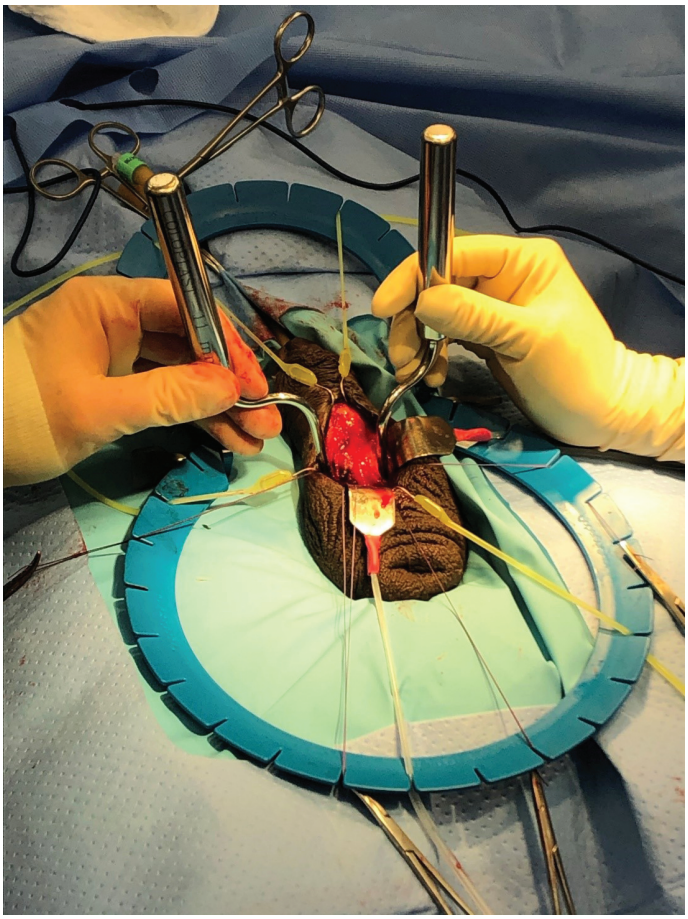

Figure 1. "Field goal" test. Handles of Brooks dilators are at same height, suggesting tips of dilators are at same level within proximal corpora, indicating no crural perforation.

evidence that one type of dilator, whether using the Brooks™ dilator (rod with a wide tip) vs. Hegar dilator (curved instrument mimicking the shape of the corpora) vs. Furlow inserter (standard straight small caliber tool), minimizes the risk of perforation. Others avoid dilation altogether and prefer hydrodistension of the corpora.[9]

A variety of strategies have been described to address crural perforation when identified, although no comparative evidence dictates a preferred approach. An option is the proximal wind-sock repair,[10] whereby a holster of non-absorbable mesh (polytetrafluoroethylene) is constructed, placed into the proximal aspect of the perforated corpora via the corporotomy and then sutured in place prior to device placement. It is likely of historical interest only, however—outmoded presumably due to cost and complexity. In contemporary practice, it is possible to secure the exit tubing from the cylinder at the time of corporotomy closure when implanting an inflatable prosthesis. If using the Boston Scientific inflatable penile prosthesis, an adjunctive technique is to suture fix the polytetrafluoroethylene material covering the exit tubing to the adjacent corporal tunica albuginea[9] rather than strip and discard it. Another commonly employed strategy involves suturing through the rear-tip extender of the ipsilateral cylinder, anchoring it to the tunica albuginea on both sides of the corporotomy.[11]

Urethral perforation. Urethral perforation may also occur when performing corporal dilation, a more consequential event than crural perforation. Unlike crural perforation, which is often corrected without altering the completion of surgery, urethral injury may differ in this regard.

A brief discussion of pertinent corporal anatomy is warranted. **In a cadaveric anatomical and microscopic study, Hsu et al noted that the tunica albuginea of the corpus cavernosum, typically a bilaminar structure, forms a single layer and hence is thinner between the 5 o'clock and 7 o'clock positions where each corpus abuts the corpus spongiosum.[12]** Furthermore, this study revealed that the mean ventral and dorsal tunical thickness was reduced as much as 27% in corporal bodies of previously impotent men compared with that of previously potent men. These observations emphasize that the ventral portions of the corpora cavernosa, adjacent to the urethra, are susceptible to injury in individuals who are candidates for penile prosthesis surgery.

When performing corporal dilation distally, care must be taken to pass the dilator gently, guiding the tip of the dilator dorsolaterally.[13] This manner ensures that the dilator tip is directed away from the urethra, and it creates a buttress of corporal tissue between the urethra and the subsequently placed prosthetic cylinder.

Resistance at the distal corpora is expected when performing corporal dilation. **A sudden yield of the dilator, or direct visualization of the dilator (or cylinder) or blood emanating from the external urethral meatus, should raise concern for a fossa navicularis injury.** This risk is heightened in men with corporal fibrosis, for whom the surgeon may need to push harder to advance the dilator to a proper mid-glans position for optimal cylinder situation. In circumstances where there is a concern for urethral injury, or even routinely, surgeons may elect to irrigate the distal corporal bodies with saline after dilation to evaluate a possible urethral injury ("distal fluid challenge test"). **Leakage of the fluid out of the urethral meatus confirms a urethral perforation. This complication has been noted to occur in up to 3% of IPP surgeries,[14] over 70% of which are associated with corporal dilatory maneuvers.[15]** Proximal urethral injuries are uncommon, and likely occur during corporal exposure when performing the penoscrotal approach. A possible risk factor is revision surgery, in which normally virginal tissue planes have been altered. Visualization of the catheter at dissection evinces the complication.

Once a urethral injury is identified, the manner of proceeding largely depends on surgeon experience and familiarity with management options. Historically, the recommended management approach was to abort prosthesis placement to avert the risk of device infection associated with microbial dispersion with urine extravasation into the adjacent corporal body at the site of injury. The plan then is to allow the injury to heal and return at a subsequent time for prosthesis implantation. Although this course of action remains acceptable, the trade-off for the surgical delay is the development of corporal fibrosis from the preceding surgical attempt, which renders subsequent prosthesis implantation more problematic. Some expert surgeons have elected to repair the urethral defect if it is accessible and proceed with bilateral cylinder placement, while others have opted for inserting a cylinder only in the uninjured side, planning for a follow-up surgery weeks to months later to insert a cylinder on the injured side once the urethra has healed.

Although there is no standard as to how long a urethral catheter should be kept after urethral repair in the event that cylinders are placed, there is a theoretical concern that prolonged catheterization could itself increase the risk of localized infection or cylinder erosion. Mulcahy has asserted that a catheter does not need to be left in place for an extended period, reasoning that the urinary stream will draw tissue fluid into the urethral lumen away from the perforation site rather than toward the corporal cavity (Bernoulli's principle).[16]

Although high-level evidence is lacking, several small studies have documented satisfactory outcomes without increased risk of infectious complications by performing urethral repair prior to immediate completion of prosthesis implantation. In a single institution case series, 4 patients underwent urethral repair with urinary diversion via placement of a suprapubic catheter.[17] The catheter was kept for 4 to 8 weeks postoperatively, with delayed activation of the IPP a few additional weeks after catheter removal to further promote urethral healing. There were no device complications (infection, erosion or failure) after 6 months of follow-up. Yi et al reported on their experience with urethral reconstruction in urological prosthesis cases (both IPP and artificial urinary sphincters) in both planned (ie elective repair of urethral stricture or diverticulum) and unplanned (ie concurrent urethral injury) situations.[18] In their experience, retaining a suprapubic catheter for a mean duration of 4 weeks with its removal once a voiding cystourethrogram confirmed full healing of the urethral defect resulted in no urethral stricture occurrence or adverse prosthesis outcomes. In another report, a staged repair that involved creating a temporary hypospadiac meatus to allow access to the urethral injury for primary repair was described.[19] The penile prosthesis implantation was then completed without correcting the hypospadias defect. A 14Fr urinary catheter was then left in place for 5 days and the prosthesis was not activated for up to 6 weeks, at which time the hypospadiac defect was closed. For the latter approach, the surgeon should be aware of the patient's goals, and consultation with his partner/family as a surrogate for the patient should be considered. While this technique allows completion of the IPP implantation, meatal repair is done in a staged fashion that requires a second procedure, and in the interim the patient may be left with a less than desirable cosmetic outcome.

Particular mention should be made of urethral injury, which may occur as much as 3% of the time during penile modeling in the course of IPP implantation for ED associated with Peyronie's disease.[20] This maneuver is indicated when placement of the cylinders alone does not result in adequate straightening of the penis. In so doing, the cylinder may inadvertently perforate the urethra distally, through the fossa navicularis. The urethral perforation results from aggressive bending when trying to straighten the penis with cylinders maximally inflated. Oversized cylinders and distal calcified plaques may also contribute to this complication risk. **Steps to mitigate the risk of a distal urethral rupture during modeling include placing the bending hand on the shaft of the penis, not the glans, while the other hand firmly holds pressure over the corporotomies. The bending hand also supports the fossa navicularis, squeezing immediately proximal to the glans to protect it from the forward pressure exerted on it from the cylinders. Finally, the impulse to achieve total straightening should be avoided, as regular prosthesis use will often produce further penile straightening.[21]**

CYLINDER COMPLICATIONS

Cylinder crossover. Cylinder crossover occurs during insertion of the cylinder, whereby it is routed inadvertently into the contralateral corporal body. It can occur either proximally or distally. The result is a penis that appears asymmetric, wherein corporal measurements are different, and commonly difficulty arises when inserting the second cylinder or the urethral catheter does not appear to course correctly in the midline between the two inflated cylinders. If the problem is identified intraoperatively, it should be corrected promptly, because it will not self-resolve over time. The resultant deformity yields an unsatisfactory outcome for the patient (fig. 2), and a subsequent corrective procedure is required for resolution.

The frequency of cylinder crossover is unknown, although it is likely fairly common. **It describes the malposition of the cylinder that perforates the fenestrated middle or distal corporal septal wall, coursing over to the contralateral corporal body.** It has been postulated that more often than not, crossover occurs at the point of initial passage of the Furlow insertion tool use prior to directing the instrument laterally.[22] As a result, a crossover injury may even involve the cylinder crossing over the septum to the contralateral side and then back to the ipsilateral side. When occurring proximally, it relates to corporal fibrosis or technical error, whereby the natural lateral course of the crura is misjudged.

The best way to address the issue is avoidance, which implies ensuring lateral positioning of the dilator upon initial dilation, at the 3 and 9 o'clock positions. Care should be taken to direct the dilator against the skin as the dilation progresses distally.[16] Moreover, to avoid inadvertent cylinder injury in the event that crossover occurs, both Keith needles should routinely be passed through the glans before guiding either cylinder distally in the corporal body.[23]

If identified, the correction should be straightforward. Once the anatomical abnormalities as discussed above are recognized, the cylinders should be removed and the dilators should be repositioned in the corpora, starting with the unaffected side. If the clink of metal-on-metal (of the dilators) is heard when the

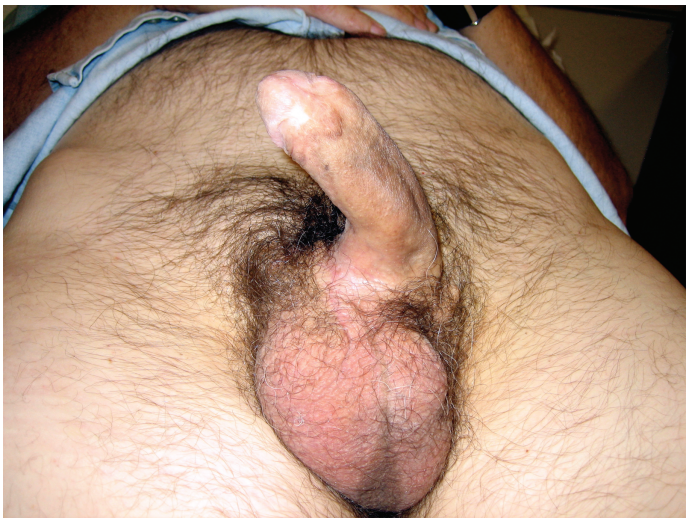

Figure 2. Unrecognized cylinder crossover (left to right) resulting in unsatisfactory aesthetic and functional outcome. Photo courtesy of Steven K. Wilson, MD, La Quinta, California.

second dilator is positioned in the affected side, then crossover is confirmed. **To address the issue, the dilator on the affected side should be removed, and a new tract, lateral to the initial one, should be created.**[24] If no metal-on-metal sound is heard, then the new tract is satisfactory, and the case may continue as planned (fig. 3).

Cylinder mis-sizing. Preserving penile length after device implantation is commonly a matter of critical importance to the patient.[25] Selection of cylinder size frequently depends on preferences of the surgeon and intraoperative anatomical findings. By historical teaching, routine downsizing of cylinders by 1 to 2 cm from stretched penile length was utilized.[25] In contemporary practice, most surgeons will utilize a cylinder corresponding to the stretched penile length, and it has been demonstrated that longer cylinders in general are being employed.[26] **Furthermore, it is preferred to maximize cylinder length while minimizing rear-tip extender size, since rigidity is understood to be optimized with longer cylinders.**[27]

Cylinder mis-sizing occurs when dilation does not extend to the ends of the corporal bodies either proximally or distally. This complication often is associated with the presence of corporal fibrosis, which may interfere with dilation maneuvers and give the surgeon a false sense of confidence that the stretched penile length has been appropriately measured. With device use, however, device foreshortening is apparent, with cylinder tips that do not extend to their ideal position distally in the mid-glans. This defect may also become apparent with unrecognized perforation or crossover injuries. Termed "floppy glans syndrome" or "droopy glans," it manifests as an unstable or hypermobile glans, which may compromise penile penetrative ability and ultimately lessen patient satisfaction. The droop may occur in any direction. **If ventral, it is colloquially referred to as SST ("supersonic transporter," similar to the Concorde aircraft) deformity, whereas if it is dorsal, it is called reverse-SST, or "owl-eyes deformity." The latter condition possibly is associated with cylinder oversizing. Severe undersizing of the cylinders, whereby a portion of the distal penile shaft is drooping, produces a "flail penis phenomenon." This is in direct contrast to a hypermobile glans, which occurs despite proper cylinder placement (confirmed by cross-sectional imaging, such as magnetic resonance imaging, where the cylinder tips are noted to be properly positioned), and results from structural anomalies of the corpora-glans ligament, or soft glans, which results from inadequate engorgement of the glans/spongiosum and is irrespective of cylinder placement.**[28] **Up to 5% of penile prosthesis revision surgeries are performed as a result of SST deformity.**[29]

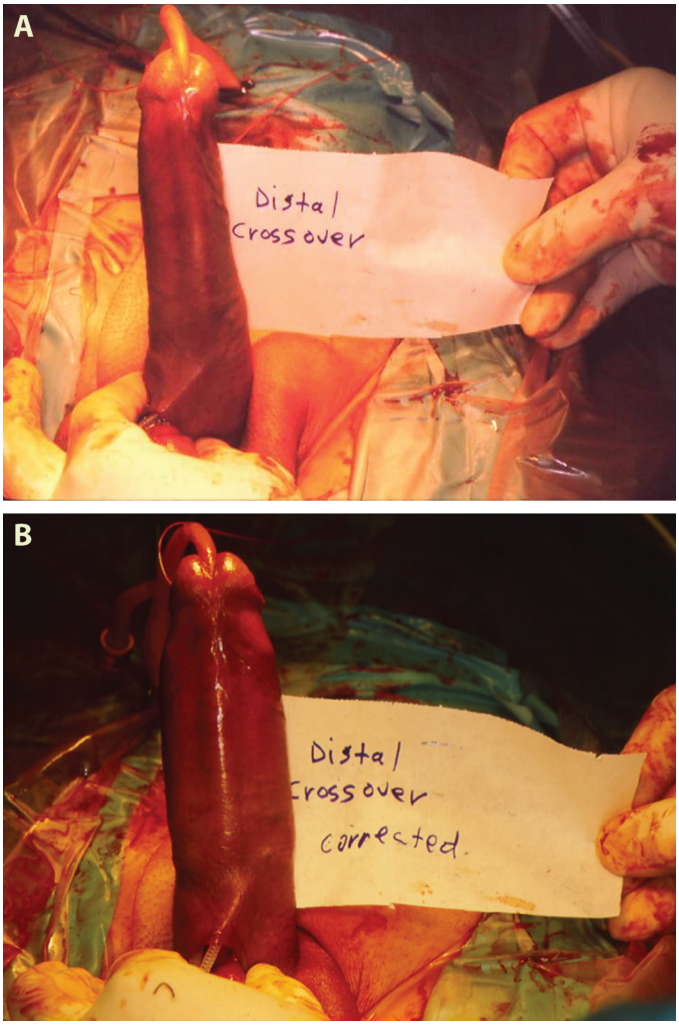

Figure 3. *A*, distal crossover. *B*, corrected distal crossover. Photos courtesy of Steven K. Wilson, MD, La Quinta, California.

If cylinder mis-sizing is recognized during surgery, there are several options for correcting the problem (fig. 4). Care should be taken to ensure the tip of the dilator is advanced to both proximal and distal ends of the corporal bodies. If glans hypermobility persists yet is not considered significant, the surgeon may elect to do nothing, as scarring after distal dilation may minimize the appearance of the droop. On the other hand, several adjunctive maneuvers may be employed to correct a floppy glans. "Glanspexy" or "glanulopexy" refers to realignment of the glans at the distal penile shaft, whereby the glans is repositioned opposite to its tilt. This repair, as originally described, involves making a circumferential incision to expose the plane between the glans and the corpora, and fixing the deep tissue of the glans to the distal corporal tunica albuginea in a plication manner using permanent sutures.[30] Care is taken to avoid damaging the dorsal neural and vascular structures of Buck's fascia, as well as the urethra and cylinders. A modified glanspexy involves a less invasive approach, in which two small distal penile shaft incisions are made, followed by a similar fixation technique (passage of the needle from one incision, through the deep glans tissue, to the other).[31] Finally, a distal penoplasty technique may be performed.[32] Briefly, it involves imbrication of the skin and dartos fascia with clamps on the penile aspect opposite that of the droop, after which the imbricated tissue is excised elliptically and then closed transversely with simple interrupted absorbable suture. This technique in effect avoids the more invasive steps of tunical dissection and possible injury to the underlying structures, including the device.

RESERVOIR COMPLICATIONS

One of the commonly cited disadvantages of the penoscrotal surgical approach is blind reservoir placement, which by contrast can be done under more direct vision via the infrapubic approach. Access into the space of Retzius typically involves either blunt digital dissection or a puncturing maneuver with an instrument through the transversalis fascia comprising the floor of the inguinal canal at the external inguinal ring or through

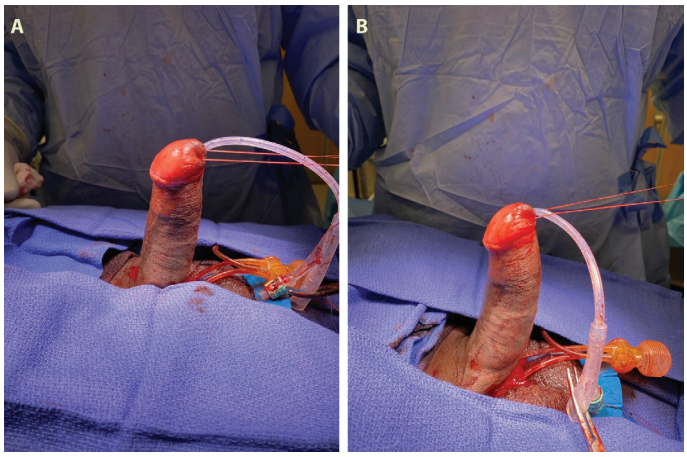

Figure 4. Cylinder mis-sizing. *A*, floppy glans due to cylinder undersizing. *B*, after cylinder was properly sized, deformity is corrected.

the rectus fascia in the midline suprapubic region. Anatomical cadaveric studies have demonstrated that critical pelvic visceral as well as vascular organs are within close proximity to where the reservoir is positioned.[33] Notably, the distance from the inguinal ring is 5–8 cm (average 6.45) at 15–30 degrees (average 22.8) from the decompressed bladder, and 2–4 cm (average 2.61) from the filled bladder medially and 2.5–4 cm (average 3.23) at 20–60 degrees (average 36.4) from the external iliac vein laterally.

Specifically, under conditions of penile prosthetic surgery for ED associated with prior robot-assisted laparoscopic radical prostatectomy (RALP), special considerations are raised when considering reservoir placement via penoscrotal approach. **During RALP, the parietal peritoneum overlying the bladder and anterior pelvis is typically incised, thus exposing the space of Retzius to the peritoneal cavity. The re-peritonealization of this space is unpredictable, such that the normal extraperitoneal access is altered. This alteration increases the risk of inadvertent entry into the peritoneum as the transversalis fascia of the groin is perforated during conventional IPP reservoir placement.** Besides prior radical prostatectomy by any technique, other conditions in which there may be instances of inguinal or pelvic scarring with difficult extraperitoneal access include prior inguinal hernia repair, pelvic renal transplantation, radical cystectomy, neobladder reconstruction and pelvic radiation.

Given the potential complication risks of transversalis perforation, an alternative approach for reservoir placement involves positioning it under the abdominal musculature at a location that completely avoids entry into the space of Retzius. Referred to as "ectopic" or high-submuscular reservoir placement, the inguinal canal is accessed ventrally, and the potential space between the transversalis fascia and the transversus abdominis or rectus abdominis is developed by passage of the finger and/or a longer instrument, directed toward the ipsilateral nipple or shoulder.[34] **When this technique is employed, reported patient satisfaction is high, with low risk of reservoir palpability or need for surgical revision due to reservoir herniation.[35–37] Of equal importance, there have not been reports of intraoperative visceral or vascular complications.[34,36]** Nevertheless, the drawback of this technique is that it is still done in a blinded manner, and the final position of the reservoir remains possibly variable. In a cadaveric study,[38] in which reservoirs were placed bilaterally in 10 fresh male cadavers through a penoscrotal incision via high submuscular technique, 80% of the reservoirs (16/20) were found anterior to the transversalis fascia, including 7 (35%) deep to the rectus muscle and 9 (45%) deep to the external oblique fascia and lateral to the rectus muscle belly, whereas two (10%) were identified in the retroperitoneal space, 1 (5%) was preperitoneal (deep to transversalis fascia) and 1 (5%) was intraperitoneal.

Accordingly, the risk of inadvertent injury to the bowel, bladder or vascular structure is not negligible with any approach for reservoir placement. Preoperative planning is essential, and the surgeon must be cognizant of the patient's past medical and surgical history that may present difficulty with this procedure. Some situations may warrant consideration to proceed with a lower abdominal counter-incision if it is felt that this manner of access would lower the risk of inadvertent structural injury during reservoir placement. Alternatively, either a 2-piece inflatable or a malleable device (both omitting reservoirs) may be preferred if the risk of intraoperative surgical complication associated with reservoir placement is believed to be significant.

IPP revision surgery presents similar complication risks. When a non-functional device was replaced historically, attempts were made to retrieve the old reservoir at the time of device replacement, as this is done standardly in the context of explanting an infected device, whereby all hardware must be removed.[39] **However, the concept of "drain and retain" for non-functional, uninfected reservoirs has gained traction and can be considered. Essentially, the fluid from the reservoir is drained, and the tubing is divided and released as high as possible, with the remainder retracting out of the field of view. The defunctionalized reservoir is left in place, with the new reservoir being placed either adjacent to it or contralaterally away/separate from it.** The advantages of this approach include its ease and efficiency and apparent absent risk of surgical trauma to nearby visceral or vascular structures. Its overall safety is suggested based on reports of no increased risk of device infection compared to virgin cases.[40] Nevertheless, as with a newly placed reservoir, there is a slight but non-negligible risk of a retained reservoir causing delayed localized complications, such as erosion into adjacent structures (vascular, bladder, bowel) or bowel obstruction. These risks must be considered in relation to the prospect of retaining a defunctionalized reservoir. Another revision strategy is to retain and repurpose an indwelling reservoir that is connected to newly replaced cylinders and pump, after confirming that the retained reservoir is intact and has sufficient fluid capacity.

To minimize the risk of bladder injury at the time of reservoir placement, the bladder should always be drained immediately prior to reservoir placement. If gross hematuria is encountered, or there is a gush of urine when digitally developing the space for reservoir placement, then cystoscopy may be performed to evaluate the possibility of vesical violation. Alternatively, a cystogram may be performed to confirm bladder integrity. **If bladder injury is confirmed, an immediate 2-layered repair, with contralateral or ectopic placement of the reservoir, is recommended. If succus entericus or stool is encountered, then bowel injury must be suspected. At that point, prosthesis placement should be abandoned, and the general surgery service should be consulted. Similarly, if vasculature is injured, direct pressure and hemostatic/packing agents should be applied, along with immediate vascular surgery service consultation.** IPP implanta-

tion may be reattempted at some later time once the patient has fully healed.

Intraperitoneal placement of the reservoir may not result in any immediate intraoperative complications, although it may lead to delayed problems, such as erosion into or obstruction of bowel, inguinal herniation as a result of the peritoneal violation with or without device involvement, and vascular compression resulting in deep vein thrombosis (fig. 5).[41,42] **Risk factors include low patient body mass index and smoking history.**[43] In slender patients receiving high submuscular reservoir placement, a low-profile, flat reservoir may be considered. However, maneuvers to ensure that the reservoir is not palpable may result in an unrecognized intraperitoneal placement. Once more, awareness of patient history and anatomy is critical, and in such situations, barring contraindications, space of Retzius reservoir placement may be preferable.

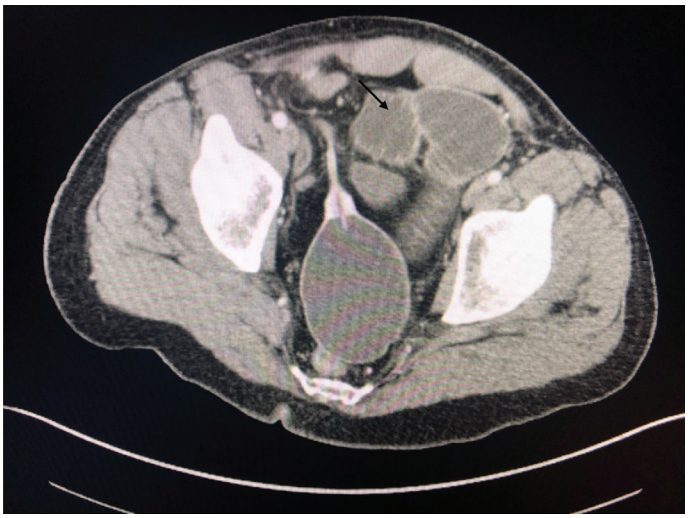

Figure 5. Inadvertent intraperitoneal reservoir placement resulting in small-bowel obstruction (arrow).

CONCLUSION

IPP implantation offers definitive treatment for ED and is associated with favorable outcomes for both patient and partner. Surgeons need to be aware of the potential risks associated with this surgery and be prepared to address intraoperative complications that may arise. Avoidance of possible surgical misadventures is heightened by being aware of pertinent aspects of the patient's past medical and surgical history and implementing strategic planning. Fortunately, most intraoperative complications, if recognized in a timely manner, can be corrected with successful outcomes.

DID YOU KNOW?

- Intraoperative complications associated with penile prosthetic surgery are likely underreported.
- Most such complications, if identified at the time of surgery, can be corrected without compromising successful completion of the surgery or long-term satisfactory outcomes.
- The best way to avoid such complications is by careful, deliberate and strict adherence to the standard steps involved with penile prosthesis implantation.
- Because anatomical factors affect the surgical plan for penile prosthesis implantation, surgeons should understand the patient's medical and surgical history.

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Study Questions Volume 40 Lesson 25

1. During insertion of a penile prosthesis a crural perforation is suspected. The next step to confirm the diagnosis is
   a. cystoscopy
   b. "field goal" test
   c. distal fluid challenge test
   d. intraoperative ultrasound

2. In a patient with Peyronie's disease and ED, a unique complication of modeling to achieve penile straightening at the time of inflatable penile prosthesis implantation is
   a. cylinder crossover
   b. crural perforation
   c. bladder injury
   d. urethral rupture

3. Prosthesis placement should be abandoned in the case of
   a. bowel injury
   b. bladder injury
   c. urethral injury
   d. cylinder crossover

4. Following insertion of a penile prosthesis there is drooping of the distal shaft of the penis. This is due to severe undersizing of the cylinders and is referred to as
   a. SST deformity
   b. owl's eye deformity
   c. flail penis phenomenon
   d. floppy glans syndrome

5. A 64-year-old man with a history of a prior RALP and bilateral inguinal herniorrhaphy desires a 3-piece IPP. He should be advised that
   a. the reservoir will be placed in the space of Retzius
   b. the reservoir will be placed in the high submuscular space
   c. a 3-piece is not possible and he should consider a 2-piece IPP
   d. a 3-piece is not possible and he should consider a semirigid prosthesis