SINGLE-CENTER, 7-YEAR EXPERIENCE OF INFLATABLE PENILE PROSTHESIS REVISION SURGERY

Ram Pathak, MD; Andrew Ostrowski, MD; Robert Williams, MD; Ciarra Boyne; Gregory Broderick, MD

Sexual Medicine Society of North America
November 4, 2016
Disclosures

• Neither I, nor my family members, have any financial relationships to disclose that are directly or indirectly connected to the topics discussed in this presentation.
Penile Prosthesis

• Effective treatment option for erectile dysfunction (ED) refractory to medical and noninvasive therapy

• 96% survival at 5 years; 60% survival at 15 years for virgin implantation\(^1\)

• Implants are reliable, with high satisfaction rates among patients (85%) and partners (70%)\(^2\)
Methods

• A single center retrospective review of all patients who underwent IPP explant / revision (E/R) from 2008–2015.

• Age, BMI, original surgery date, reason for E/R, and surgical variables including operative duration, blood loss, hospital duration, and time to activation were recorded for each patient.
Evaluation of the IPP

• Main complaints with IPP are penile shortening, pain and malfunction
  • Shortening occurs with fibrosis of the tunica albuginea
    • penile deformity, curvature, pain and restricted inflation

• Pain occurs with infection, mal-position, improper sizing, buckling, erosion, cylinder cross-over, and herniation

• Malfunctions include leak, aneurysm, auto-inflation and detachment of components

Sagittal T2W: Severe fibrosis and penile shortening (arrow) following multiple redo surgeries
Mechanical Malfunction

- Malfunction rates are device dependent, with reported incidence ranging from 0.8 - 17.5%
  - Leak
  - Cylinder aneurysm
  - Cylinder Buckling
  - Autoinflation

Cylinder aneurysm
Leak

- Little or no fluid in the system
- Device inflates poorly or not at all
- Easily diagnosed with physical exam
- Imaging can identify additional abnormalities and help surgical planning
- Location of leak is rarely found but is not important for management, as the entire device is typically replaced

Empty, air-filled reservoir and tubing on CT (arrow).
Patient with 2\textsuperscript{nd} IPP that stopped working after 1 year and does not inflate or deflate at all.

During the exam, the implant could not be inflated. MR demonstrates an empty reservoir in the prevesical space (arrow) and empty cylinders (arrows), compatible with implant leak (a, b). Patient two also has a leak (c).
Aneurysm

• A weakened, damaged or defective cylinder can dilate over time
• As cylinder expands, the fibrous envelope of the corporal bodies will stretch, thin and eventually weaken
• The device should be replaced
Patient reports that his partner has pain with vaginal penetration. There is a palpable bulge at the base of the left penile shaft that enlarges with inflation and never completely goes down.

MR demonstrates aneurysmal dilatation of the proximal left cylinder (★) that enlarges when the device is inflated (★★).
Buckling

• Cylinder buckling is strongly correlated with persistent pain \(^2\)

• Buckling occurs with an excessively long cylinder or an appropriately sized cylinder that does not reach the crural end due to poor placement of the RTE.

Buckled cylinder (arrow). Sagittal T2W and intraop photo:
Patient complains that his implant never worked well, and that he has pain at the base of the penis for 12-24 hours after inflating and using IPP.

MR of the inflated implant demonstrates buckling of the proximal left cylinder (arrow). This causes mild length discrepancy, with the right cylinder extending slightly farther out toward the glans (arrow). Reservoir (★).
Complications

• While IPP are reliable devices with high long-term reliable, complications do occur and up to 20% of all IPP are revised\textsuperscript{4}

• Intraoperative complications can be avoided with careful technique
  • Corporal crossover
  • Corporal perforation and rupture

• Postoperative complications can be avoided with proper sizing and placement of the device, but risk is higher with redo procedures
  • Fibrosis
  • Erosion
  • Infection
Cylinder Crossover

• Passage of a cylinder from one corporal body into the contralateral body.

• A technical complication of the original surgery
  • Avoided with careful surgical technique
  • Easily fixed if detected during initial placement
  • If detected post-operatively requires reoperation

Normal intercavernosal septum (arrow).

Absent septum (arrow).
Cylinder Crossover

- Distal crossover is subtle during surgery and becomes more obvious with inflation
- Proximal crossover occurs with faulty cylinder and rear extender placement
- Patient may have pain and distortion with a full erection

Misplaced or short cylinders may inadequately support the head of the penis, resulting in glans bowing and a Supersonic Transport Deformity (SST)

Distal crossover (arrow) causing poor support of the right glans.
Patient presents one year following IPP reporting penile curvature and pain with inflation.

MRI demonstrates adequate deflation and inflation of the cylinders (a, b). Axial image clearly demonstrate **distal crossover** of the left cylinder (X) into the right corporal body (c), an empty distal left corporal body (★). This results in curvature of the penile shaft and poor support of the left side of the glans (arrow) (a).

A second patient (d) with distal crossover of the deflated left cylinder (arrow).
Patient with third IPP complains of pain in the left glans and difficulty inflating and deflating the device.

MR demonstrates the right rear tip extender (arrow) positioned in the right corporal body (a, d, e), with **proximal crossover** of the left rear tip extender (arrow) into the right corporal body more posteriorly (b, c, d, f). The left crus is empty (★).
Perforation and Rupture

- Perforation is an intraoperative complication that can be unrecognized
- Over aggressive dilatation of the corporal bodies prior to placement of the cylinders and rear extenders can cause perforation or rupture
- Other predisposing factors include reoperation, fibrosis, and prior infection
Patient complains that the left cylinder is considerably shorter than the right cylinder. He also reports a nodular bump and pressure in the left perineum.

Sagittal MR images demonstrates bilateral cylinder buckling (arrow). The right cylinder and rear tip extender (arrow) are adequately positioned within the right cavernosa (a). The left rear tip extender (arrow) has perforated posteriorly through the left crus into the ischiorectal fat (c).

This causes cylinder length discrepancy (arrow) as the left cylinder does not extend as far distally into the glans (a, b).
Fibrosis

• Fibrosis can also occur with redo implant surgery, infection, diabetes and priapism

• Fibrosis of the penile tissues, particularly the cavernosal bodies, makes implanting penile prostheses more difficult, particularly in redo cases

• Can lead to penile shortening and small scarred corporal bodies that can no longer accommodate the implant cylinder
Patient with sixth IPP complains of poor erection and penile deformity.

MR demonstrates extensive fibrosis (arrows) within and surrounding the cavernosal body, causing marked shortening and deformity of the penis. While the implant cylinder inflates well, it does not extend to the distal penis and there is no appreciable erection (arrows).
Erosion

• Erosion is device protrusion beneath or through the skin or urethra that occurs over time

• Risk factors include
  • Semi-rigid prostheses (reduced risk with inflatable devices)
  • Compromised tissue and vascular supply (DM, redo implants)
  • Spinal cord injuries with decreased pain sensation
  • Failure to deflate device
  • Oversized device
Patient with multiple IPPs and prior erosion of implants into the rectum and bladder complains of pain in the tip of the penis.

The device inflates well, however there is erosion of one cylinder through the distal urethra (arrow), confirmed on physical exam.
Infection

• Infection is a rare but potentially catastrophic risk of IPP
  • Meticulous sterile technique and patient prep, intraop IV antibiotics and antimicrobial implant coatings have reduced infection rates
  • Average patient has <1% risk of infection

• Higher rates with the following risk factors
  • Spinal cord injury: 9%
  • DM: 1-10%
  • Revision surgery: 10%
  • Steroids: 20%
Patient with penile pain and signs of infection after being catheterized for 3 weeks in the ICU.

The tip of the left cylinder has perforated through the distal urethra (arrows). Post contrast imaging demonstrates diffuse enhancement around the components of the IPP, including the tubing, cylinders, rear extenders and pump (arrows). T2 reveals extensive periprosthetic edema (arrows). Findings compatible with acute toxic infection secondary to urethral erosion, and urgent removal is required.
Reservoir Complications

- Reservoir complications are infrequent (0.7% of 3-piece IPP)
  - Almost always with penoscrotal approach
- The reservoir can herniate into the inguinal canal and migrate into the scrotum
  - Can be surgically replaced or repositioned
- Erosion can occur into adjacent viscera
  - Extremely rare
  - Risk with previous abdominal and pelvic surgery

Coronal: Herniation of the reservoir into the left inguinal canal (*). There is also buckling of the right cylinder (arrow).
Calcified Implant

• 72 y/o M presents for his 5th revision for penile prosthesis malfunction (first placed in 1986)

• The hardware consisting of the penile cylinders and pump was completely excised.

• Extremely difficult because of dystrophic calcifications that had set in around the pump, as well as into the capsule of each corporotomy.

• The calcifications appeared to be around the entry to the corporotomy site for a length of perhaps 3 cm.
Results

• 57 patients with a mean age and BMI of 68 years and 29.3, respectively, underwent E/R between 2008 and 2015.

• 15% (9/57) of patients had a prior history of multiple (>2) IPP surgeries prior to E/R at our institution.

• The date of original implantation ranged from 1977 to 2014.
Results

- The most common reason for E/R was IPP malfunction (82.5%), followed by infection (12.3%), upgrade from semi-rigid to three-piece IPP (3.6%), and erosion (1.8%).

- E/R surgery resulted in an average blood loss of 44.9 mL, operative duration of 130.2 minutes (including prep time), and hospital duration of 1.1 days. Time to activation of IPP was approximately 52.7 days.
Conclusions

• Our research represents single center contemporary series of penile prosthetic revisions.

• Device malfunction accounts for the majority of cases necessitating IPP revision.

• Careful history of device satisfaction and penile appearance can be clues to initial unrecognized complications of cylinder cross over or late complications of crural hernia, lateral extrusion, impending urethral erosion.

• In these cases abdominal – pelvic imaging with CT or MRI provides both a surgical road map and allows for better informed consent for IPP.
Conclusion

• Implantable penile prostheses are an effective and increasingly popular treatment for severe erectile dysfunction

• Problems can occur with implants, and physical exam may not be sufficient for diagnosis or surgical planning

• A judicious use of MRI may be helpful in certain cases

• Correlation with clinical findings is key to accurate interpretation and diagnosis
Questions & Discussion
References


