




REVIEW

Recent advancements in penile prosthetics [version 1; referees: 2 approved]

Mathew Q Fakhoury¹, Joshua Halpern², Nelson Bennett ²

¹Department of Urology, Cook County Hospital, Chicago, IL, USA
²Department of Urology, Northwestern University, Chicago, IL, USA

v1 **First published:** 18 Feb 2019, 8(F1000 Faculty Rev):193 (<https://doi.org/10.12688/f1000research.17407.1>)
Latest published: 18 Feb 2019, 8(F1000 Faculty Rev):193 (<https://doi.org/10.12688/f1000research.17407.1>)

Abstract



Since the original inflatable penile prosthesis in the 1970s, several enhancements to penile prosthesis implant design, implant surgical technique, and post-operative care have been developed to increase overall patient (and partner) satisfaction rates. We, in this communication, seek to discuss these advancements and the overall impact in combating erectile dysfunction. As we continue to pursue avenues of effective and definitive treatment modalities for erectile dysfunction refractory to medical therapy, rates of infection and mechanical failure will hopefully continue to decline in the perioperative setting.

Keywords

Erectile dysfunction, Penile prosthesis, Surgery

Open Peer Review

Referee Status:  

	Invited Referees	
	1	2
version 1 published 18 Feb 2019		

F1000 Faculty Reviews are commissioned from members of the prestigious F1000 Faculty. In order to make these reviews as comprehensive and accessible as possible, peer review takes place before publication; the referees are listed below, but their reports are not formally published.

- 1 **Aaron C Lentz**, Duke University Medical Center, USA
- 2 **Steven K Wilson**, Institute for Urological Excellence, USA

Discuss this article

Comments (0)

Corresponding author: Nelson Bennett (nbennettjrmd@gmail.com)

Author roles: **Fakhoury MQ:** Investigation, Writing – Original Draft Preparation; **Halpern J:** Conceptualization, Investigation, Writing – Original Draft Preparation, Writing – Review & Editing; **Bennett N:** Conceptualization, Data Curation, Investigation, Methodology, Project Administration, Supervision, Writing – Original Draft Preparation, Writing – Review & Editing

Competing interests: No competing interests were disclosed.

Grant information: The author(s) declared that no grants were involved in supporting this work.

Copyright: © 2019 Fakhoury MQ *et al.* This is an open access article distributed under the terms of the [Creative Commons Attribution Licence](#), which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

How to cite this article: Fakhoury MQ, Halpern J and Bennett N. **Recent advancements in penile prosthetics [version 1; referees: 2 approved]** *F1000Research* 2019, **8**(F1000 Faculty Rev):193 (<https://doi.org/10.12688/f1000research.17407.1>)

First published: 18 Feb 2019, **8**(F1000 Faculty Rev):193 (<https://doi.org/10.12688/f1000research.17407.1>)

Introduction

Since its initial description by Scott *et al.* in 1973, the penile prosthesis has remained a mainstay of treatment of erectile dysfunction (ED)¹. Insertion of a penile prosthesis is an excellent option for men with ED refractory to pharmacotherapy or those men who wish to forego pharmacotherapy in favor of a permanent solution. Indeed, both patient and partner satisfaction is highest for penile prosthesis relative to alternative treatments for ED²⁻⁴. Accordingly, the American Urological Association recommends that all men with ED be informed regarding penile prosthesis as a potential treatment option⁵.

Over the past four decades, penile prostheses have undergone numerous iterations and advancements. The arrival of the inflatable penile prosthesis (IPP) led to a cascade of device innovation over the ensuing years. Cylinder material and design have evolved to improve durability while maximizing penile length and girth⁶. Of note, options for increases in tube length—"Optimized Tubing Length" by Boston Scientific (Marlborough, MA, USA)—have allowed greater surgical flexibility, as the input tubing increases in length with the length of the cylinder placed. (One to five centimeters of additional length of tubing is offered.)

Implants impregnated with minocycline and rifampin have helped to reduce the risk of infection following implantation^{7,8}. Similarly, devices with hydrophilic coating allow absorption of aqueous antibiotic solutions, enabling the surgeon to select an individualized antibiotic regimen and thereby decreasing bacterial adherence^{7,8}. Evolution of pump design, such as the one-touch release, has optimized the patient experience, rendering the devices easier to use⁹. Two- and three-piece IPPs allow individualized device selection that incorporates patient-specific anatomic considerations. Lock-out valve reservoirs have virtually eliminated the risk of auto-inflation¹⁰.

Advances in the devices themselves have been paralleled by expanded indications and improved techniques for implantation. In recent years, prosthetics have been used for not only ED but also treatment of Peyronie's disease, penile deformity, and even penile augmentation^{11,12}. Moreover, a number of innovative surgical techniques have emerged to improve the safety, efficacy, and cosmesis of implantation. These include the subcoronal approach, ectopic reservoir placement, concurrent scrotoplasty, and many others^{13,14}. In many instances, the technology has evolved to accommodate these surgical innovations such as low-profile reservoirs devised for optimal submuscular ectopic placement^{15,16}. Furthermore, adjunctive concomitant procedures have been employed with promising results. In a subset of patients with both post-prostatectomy ED, as well as climacturia or mild stress urinary incontinence (or both), placement of a "Mini-Jupette" graft provides a gentle urethral lift intended to provide improvement in continence¹⁷.

In patients with both ED and Peyronie's disease, placement of a penile prosthesis may not correct a severe penile curvature. In those cases, plaque incision with grafting (PIG) during IPP

placement will be necessary. Tachosil (Baxter International, Deerfield, IL, USA) is a new grafting material that is coated with tissue sealant. It is simply pressed over the tunical defect for several seconds without the need to suture it in place¹⁸.

Most recently, there have been a number of new advancements in penile prosthetics related to peri-operative pain management, surgical technique, and device innovation. This review aims to examine these specific areas of improvement in penile prosthetics.

Peri-operative pain management

The opioid epidemic in the US has dramatically altered the approach to peri-operative pain management. Surgeons have been implicated in one of the many factors contributing to the opioid epidemic: over-prescribing post-operative narcotics for surgical pain management¹⁹. Indeed, about 1 in 1,111 urological surgery patients will develop opioid dependence or overdose²⁰. As such, urologists have begun to devise multi-modal approaches to the management of post-operative pain for a variety of urological procedures²¹⁻²³.

A number of studies have reported the use of novel, intra-operative local anesthetic regimens to improve post-operative pain management and reduce narcotic utilization following penile prosthesis placement. Reinstatker *et al.* performed a retrospective analysis of intra-operative dorsal penile nerve block using an extended-release bupivacaine liposomal suspension (Exparel[®], Pacira Pharmaceuticals, Inc., Parsippany-Troy Hills, NJ, USA), which led to substantially lower utilization of narcotic pills in the experimental versus control group (8.2 versus 24.1 tablets, $P < 0.001$)²⁴. Likewise, Cotta *et al.* found that men receiving an extended-release bupivacaine liposomal suspension had significantly decreased narcotic use after implantation relative to those who did not²⁵. However, the authors reported significantly higher costs in the extended-release bupivacaine group, which may limit its routine use²⁵. A variety of other local anesthetic approaches (dorsal penile nerve, pudendal nerve, crural, and intracorporal) and medications (lidocaine, bupivacaine, and ropivacaine) have been studied and employed with varying success^{24,26}.

Most recently, Tong *et al.* described a multi-modal analgesic (MMA) protocol that uses a series of pre-operative, intra-operative, and post-operative interventions to optimize peri-operative pain control and minimize narcotics²⁷. Pre-operatively, patients on protocol received 975 mg acetaminophen, 300 mg gabapentin, and 7.5 or 15 mg meloxicam prior to induction of anesthesia. Intra-operatively, a combination dorsal penile and pudendal nerve block was performed using a mixture of 1% lidocaine and 0.5% bupivacaine prior to incision. Post-operatively, patients were administered 975 mg acetaminophen every 6 hours, 300 mg gabapentin every 8 hours, and 7.5 or 15 mg meloxicam daily. Compared with those not on the MMA protocol, MMA patients were discharged home with fewer narcotics (mean 12.7 versus 51.3 tablets, $P < 0.001$) and required fewer narcotic refills (11% versus 49%, $P = 0.007$)²⁷. Though

limited by its retrospective nature and small sample size, this study suggests a growing role for an MMA approach in penile prosthetics.

Operative advances

Preservation of penile length is important to both the patient and the surgeon. Unfortunately, many men want to have the penile girth and length that they experienced as an adolescent. Patients with decreased penile length and girth have higher rates of dissatisfaction and decreased quality of life. Men commonly associate the length of their penis with their degree of masculinity²⁸. As a result, surgical enhancements have been introduced to preserve penile length.

Ventral phalloplasty (release of penoscrotal webbing) in combination with prosthetic implant has increased in popularity as it enhances the perceived length of the penis. Release of the penoscrotal web has been shown to enhance the patient perception of increased penile length and further improve satisfaction as reported by Miranda-Sousa *et al.*²⁹. A more recent technique, dorsal phalloplasty, has also been described in order to increase visible penis length by using permanent sutures to tack the dermis and pre-pubic fat to the pubic symphysis. Shaer *et al.* reported a 23% increase in visible length in the dorsal phalloplasty group³⁰. Of those who underwent simultaneous phalloplasty and implant placement, only 6.1% reported penile shortening compared with 80% in the prosthesis-only group³⁰.

Ziegelmann *et al.* recently reported on a modified glanulopexy technique for correcting supersonic transporter (SST) deformity and glandular hypermobility (GH) in men undergoing IPP implantation³¹. The authors note that this technique to correct SST/GH after IPP placement had no reported impact on penile sensation. Positively, the small incision required does not necessitate manipulation of Buck's fascia compared with previously reported techniques for SST deformity in the setting of IPP placement.

For patients with severe penile shortening, Rolle *et al.* introduced the sliding technique in order to maintain pre-operative length in which the penis is essentially transected mid-shaft and elongated with the assistance of a penile prosthesis adding an estimated increase of up to 3.2 cm³². The sliding technique was later revised into the modified sliding technique (MoST) and the multiple slide technique (MUST). However, Wilson *et al.* demonstrated a 33% rate of glans necrosis after performance of a sliding technique for penile lengthening; thus, most implanters are now avoiding the technique³³. Although length may be preserved, it is proposed that the necessary mobilization of the neurovascular and urethra during the sliding technique may compromise distal penile circulation³³.

Other adjunctive measures have been pioneered with the goal of penile length and girth preservation while preventing prosthetic surgical complications such as glans necrosis, mentioned previously. Ediygo's multiple-slit technique was subsequently

introduced as an evolution of the aforementioned techniques (MoST)³⁴. Herein, the tunica defects created during the sliding maneuver are not covered with a graft, highlighting a crucial difference previously described. More specifically, the MUST results in multiple smaller tunical defects as opposed to two large tunica defects. This development may also overcome potential bulging of cylinders by distributing the defect among multiple small slices. In those patients that have narrowed penile girth, placing of multiple longitudinal slits into the tunica albuginea will allow the penis to regain its natural girth³⁴.

Future directions

In Plato's *Republic*, Socrates states: "Necessity is the mother of invention". A need or problem encourages creative efforts to meet the need or solve the problem. Both Boston Scientific and Coloplast (Humblebæk, Denmark) have continually improved components of their devices. Currently, modifications of the IPP pump are being developed to assist with inflation of the prosthesis. Additionally, researchers are developing advanced drug-eluting cylinder materials that may decrease the rate of infection. Similarly, a few companies are developing the electronically activated artificial urinary sphincter^{35,36}. This implanted device would be activated by a mobile telephone application to facilitate voiding. Suffice it to say that the development of the electronic version of the penile prosthesis is on the horizon.

The most dreaded complication of penile prosthetic implantation is infection. Current guidelines recommend removal of the prosthesis followed by irrigation of the penis and scrotum and a lengthy course of antibiotics. Unfortunately, if another device is not immediately placed, the patient develops corporal fibrosis and then penile shortening. Carrion recently developed a synthetic plaster-like vancomycin/tobramycin cast which is inserted into the infected corporal space to facilitate clearance of offending bacteria³⁷. This calcium sulfate internal cast has also been shown to prevent penile shortening while preserving the intracorporal space for future implantation of a prosthesis³⁷.

Investigators are beginning to think about the mechanics of penile prosthetics in new ways. Traditionally, IPPs have been based on a hydraulic phenomenon. Prostheses in development rely on the expansion and contraction of metal alloys to create a rigid erection. The implant is a nickel-titanium-based shape memory alloy that is heat-activated and alternates between a flaccid and erect configuration solely by the application of heat (that is, a heating pad) or cold (that is, an ice pack). Le *et al.* were able to demonstrate that this prosthesis can produce the mechanical forces necessary for producing a penetration-quality erection comparable to that produced by hydraulic-based devices³⁸.

Conclusions

As a result of the numerous enhancements of the IPP over the last 40 years, as well as, improved techniques for implantation, the IPP, when compared to other types of implant, is the less likely to need surgical revision. In a comparison of prosthetics

in urology with implants used in the orthopedic, cardiac, ophthalmology, and breast realms, the 10- and 15-year revision-free survival rates demonstrated that the IPP is one of the most dependable medical devices implanted into humans, as reported by Wilson *et al.*³⁹. Most recently, a number of advances have led to reduced infection rates, device durability, improved outcomes, and better patient satisfaction. To date, IPP offers the highest patient satisfaction of any ED treatment available, and the

continued innovation in this field aims to ensure that this remains true for years to come.

Grant information

The author(s) declared that no grants were involved in supporting this work.

References

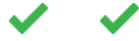


- Scott FB, Bradley WE, Timm GW: **Management of erectile impotence. Use of implantable inflatable prosthesis.** *Urology.* 1973; 2(1): 80–2.
[PubMed Abstract](#) | [Publisher Full Text](#)
- Mulcahy JJ: **Current approach to the treatment of penile implant infections.** *Ther Adv Urol.* 2010; 2(2): 69–75.
[PubMed Abstract](#) | [Publisher Full Text](#) | [Free Full Text](#)
- Bernal RM, Henry GD: **Contemporary patient satisfaction rates for three-piece inflatable penile prostheses.** *Adv Urol.* 2012; 2012: 707321.
[PubMed Abstract](#) | [Publisher Full Text](#) | [Free Full Text](#)
- Mulcahy JJ, Wilson SK: **Current use of penile implants in erectile dysfunction.** *Curr Urol Rep.* 2006; 7(6): 485–9.
[PubMed Abstract](#) | [Publisher Full Text](#)
- Burnett AL, Nehra A, Breau RH, *et al.*: **Erectile Dysfunction: AUA Guideline.** *J Urol.* 2018; 200(3): 633–41.
[PubMed Abstract](#) | [Publisher Full Text](#) | [F1000 Recommendation](#)
- Levine LA, Becher EF, Bella AJ, *et al.*: **Penile Prosthesis Surgery: Current Recommendations From the International Consultation on Sexual Medicine.** *J Sex Med.* 2016; 13(4): 489–518.
[PubMed Abstract](#) | [Publisher Full Text](#) | [F1000 Recommendation](#)
- Mandava SH, Serefoglu EC, Freier MT, *et al.*: **Infection retardant coated inflatable penile prostheses decrease the incidence of infection: a systematic review and meta-analysis.** *J Urol.* 2012; 188(5): 1855–60.
[PubMed Abstract](#) | [Publisher Full Text](#)
- Wilson SK, Costerton JW: **Biofilm and penile prosthesis infections in the era of coated implants: a review.** *J Sex Med.* 2012; 9(1): 44–53.
[PubMed Abstract](#) | [Publisher Full Text](#)
- Bettocchi C, Palumbo F, Spilotros M, *et al.*: **Penile prostheses.** *Ther Adv Urol.* 2010; 2(1): 35–40.
[PubMed Abstract](#) | [Publisher Full Text](#) | [Free Full Text](#)
- Wilson SK, Henry GD, Delk JR Jr, *et al.*: **The Mentor Alpha 1 Penile Prosthesis With Reservoir Lock-out Valve: Effective Prevention of Auto-inflation With Improved Capability For Ectopic Reservoir Placement.** *J Urol.* 2002; 168(4 Pt 1): 1475–8.
[PubMed Abstract](#) | [Publisher Full Text](#)
- Barrett-Harlow B, Clavell-Hernandez J, Wang R: **New Developments in Surgical Treatment for Penile Size Preservation in Peyronie's Disease.** *Sex Med Rev.* 2019; 7(1): 156–66.
[PubMed Abstract](#) | [Publisher Full Text](#) | [F1000 Recommendation](#)
- Anaissie J, Yafi FA: **A review of surgical strategies for penile prosthesis implantation in patients with Peyronie's disease.** *Transl Androl Urol.* 2016; 5(3): 342–50.
[PubMed Abstract](#) | [Publisher Full Text](#) | [Free Full Text](#) | [F1000 Recommendation](#)
- Pagliara TJ, Smith DW, Viers BR, *et al.*: **Alternative Reservoir and Balloon Placement in Complex Patients Undergoing Urologic Prostheses.** *Curr Urol Rep.* 2018; 19(6): 40.
[PubMed Abstract](#) | [Publisher Full Text](#) | [F1000 Recommendation](#)
- Hakky TS, Wilson SK, Salem EA, *et al.*: **Subcoronal rod penile prosthesis placement with scrotoplasty.** *J Sex Med.* 2012; 9(9): 2202–5.
[PubMed Abstract](#) | [Publisher Full Text](#)
- Perito P, Wilson S: **The History of Nontraditional or Ectopic Placement of Reservoirs in Prosthetic Urology.** *Sex Med Rev.* 2016; 4(2): 190–3.
[PubMed Abstract](#) | [Publisher Full Text](#)
- Clavell Hernandez J, Ring J, Trost L, *et al.*: **PD18-02 EMERGING COMPLICATIONS AFTER ECTOPIC PLACEMENT OF RESERVOIRS DURING INFLATABLE PENILE PROSTHESIS SURGERY: A MULTI-INSTITUTIONAL EXPERIENCE.** *J Urol.* 2018; 199(4s): e390.
[Publisher Full Text](#) | [F1000 Recommendation](#)
- Yafi FA, Andrianne R, Alzweri L, *et al.*: **Andrianne Mini-Jupette Graft at the Time of Inflatable Penile Prosthesis Placement for the Management of Post-**
Prostatectomy Climacturia and Minimal Urinary Incontinence. *J Sex Med.* 2018; 15(5): 789–96.
[PubMed Abstract](#) | [Publisher Full Text](#) | [F1000 Recommendation](#)
- Falcone M, Preto M, Ceruti C, *et al.*: **A Comparative Study Between 2 Different Grafts Used as Patches After Plaque Incision and Inflatable Penile Prosthesis Implantation for End-Stage Peyronie's Disease.** *J Sex Med.* 2018; 15(6): 848–52.
[PubMed Abstract](#) | [Publisher Full Text](#) | [F1000 Recommendation](#)
- Theisen K, Jacobs B, Macleod L, *et al.*: **The United States opioid epidemic: a review of the surgeon's contribution to it and health policy initiatives.** *BJU Int.* 2018; 122(5): 754–9.
[PubMed Abstract](#) | [Publisher Full Text](#) | [F1000 Recommendation](#)
- Shah AS, Blackwell RH, Kuo PC, *et al.*: **Rates and Risk Factors for Opioid Dependence and Overdose after Urological Surgery.** *J Urol.* 2017; 198(5): 1130–6.
[PubMed Abstract](#) | [Publisher Full Text](#) | [F1000 Recommendation](#)
- Matulewicz RS, Patel M, Jordan BJ, *et al.*: **Transversus Abdominis Plane Blockade as Part of a Multimodal Postoperative Analgesia Plan in Patients Undergoing Radical Cystectomy.** *Bladder Cancer.* 2018; 4(2): 161–7.
[PubMed Abstract](#) | [Publisher Full Text](#) | [Free Full Text](#) | [F1000 Recommendation](#)
- Deniz MN, Erakgun A, Sergin D, *et al.*: **Evaluation of a Multimodal Approach to Postoperative Pain in Patients Undergoing Flank Incision in the Urology Operating Room.** *Turk J Anaesthesiol Reanim.* 2014; 42(1): 19–22.
[PubMed Abstract](#) | [Publisher Full Text](#) | [Free Full Text](#) | [F1000 Recommendation](#)
- Sternlicht A, Shapiro M, Robelen G, *et al.*: **Infiltration of liposome bupivacaine into the transversus abdominis plane for postsurgical analgesia in robotic laparoscopic prostatectomy: a pilot study.** *Local Reg Anesth.* 2014; 7: 69–74.
[PubMed Abstract](#) | [Publisher Full Text](#) | [Free Full Text](#) | [F1000 Recommendation](#)
- Reinstatler L, Shee K, Gross MS: **Pain Management in Penile Prosthetic Surgery: A Review of the Literature.** *Sex Med Rev.* 2018; 6(1): 162–9.
[PubMed Abstract](#) | [Publisher Full Text](#) | [F1000 Recommendation](#)
- Cotta BH, Welliver C, Brahmamdam A, *et al.*: **Long-acting liposomal bupivacaine decreases inpatient narcotic requirements in men undergoing penile prosthesis implantation.** *Turk J Urol.* 2016; 42(4): 230–4.
[PubMed Abstract](#) | [Publisher Full Text](#) | [Free Full Text](#) | [F1000 Recommendation](#)
- Xie D, Nicholson M, Azaiza M, *et al.*: **Effect of operative local anesthesia on postoperative pain outcomes of inflatable penile prosthesis: prospective comparison of two medications.** *Int J Impot Res.* 2018; 30(3): 93–6.
[PubMed Abstract](#) | [Publisher Full Text](#) | [F1000 Recommendation](#)
- Tong CMC, Lucas J, Shah A, *et al.*: **Novel Multi-Modal Analgesia Protocol Significantly Decreases Opioid Requirements in Inflatable Penile Prosthesis Patients.** *J Sex Med.* 2018; 15(8): 1187–94.
[PubMed Abstract](#) | [Publisher Full Text](#) | [F1000 Recommendation](#)
- Mondaini N, Ponchietti R, Gontero P, *et al.*: **Penile length is normal in most men seeking penile lengthening procedures.** *Int J Impot Res.* 2002; 14(4): 283–6.
[PubMed Abstract](#) | [Publisher Full Text](#)
- Miranda-Sousa A, Keating M, Moreira S, *et al.*: **Concomitant ventral phalloplasty during penile implant surgery: a novel procedure that optimizes patient satisfaction and their perception of phallic length after penile implant surgery.** *J Sex Med.* 2007; 4(5): 1494–9.
[PubMed Abstract](#) | [Publisher Full Text](#)
- Shaeer O, Shaeer K, AbdelRahman IFS, *et al.*: **Dorsal phalloplasty accompanying penile prosthesis implantation minimizes penile shortening and improves patient satisfaction.** *Int J Impot Res.* 2018; 3: 743.
[PubMed Abstract](#) | [Publisher Full Text](#) | [F1000 Recommendation](#)
- Ziegelmann MJ, Alom M, Bole R, *et al.*: **Modified Glanulopexy Technique for Supersonic Transporter Deformity and Glanular Hypermobility in Men With**

- Penile Prostheses.** *J Sex Med.* 2018; **15**(6): 914–9.
[PubMed Abstract](#) | [Publisher Full Text](#) | [F1000 Recommendation](#)
32. Rolle L, Ceruti C, Timpano M, *et al.*: **A new, innovative, lengthening surgical procedure for Peyronie's disease by penile prosthesis implantation with double dorsal-ventral patch graft: the "sliding technique"**. *J Sex Med.* 2012; **9**(9): 2389–95.
[PubMed Abstract](#) | [Publisher Full Text](#)
 33. **F** Wilson SK, Mora-Estaves C, Egydio P, *et al.*: **Glans Necrosis Following Penile Prosthesis Implantation: Prevention and Treatment Suggestions.** *Urology.* 2017; **107**: 144–8.
[PubMed Abstract](#) | [Publisher Full Text](#) | [F1000 Recommendation](#)
 34. **F** Egydio PH, Kuehhas FE: **The Multiple-Slit Technique (MUST) for Penile Length and Girth Restoration.** *J Sex Med.* 2018; **15**(2): 261–9.
[PubMed Abstract](#) | [Publisher Full Text](#) | [F1000 Recommendation](#)
 35. **F** Biardeau X, Hached S, Loutochin O, *et al.*: **Montreal electronic artificial urinary sphincters: Our futuristic alternatives to the AMS800™.** *Can Urol Assoc J.* 2017; **11**(10): E396–E404.
[PubMed Abstract](#) | [Publisher Full Text](#) | [Free Full Text](#) | [F1000 Recommendation](#)
 36. Schrag HJ, Ruthmann O, Doll A, *et al.*: **Development of a novel, remote-controlled artificial bowel sphincter through microsystems technology.** *Artif Organs.* 2006; **30**(11): 855–62.
[PubMed Abstract](#) | [Publisher Full Text](#)
 37. Carrion RE: **The "Carrion Cast": Intracorporal Antimicrobial Cast Using Synthetic High Purity CaSO4 for the Treatment of Infected Penile Implant – "Updated" Surgeon Protocol.**
 38. **F** Le B, McVary K, McKenna K, *et al.*: **A Novel Thermal-activated Shape Memory Penile Prosthesis: Comparative Mechanical Testing.** *Urology.* 2017; **99**: 136–41.
[PubMed Abstract](#) | [Publisher Full Text](#) | [F1000 Recommendation](#)
 39. Wilson SK, Delk JR, Salem EA, *et al.*: **Long-term survival of inflatable penile prostheses: single surgical group experience with 2,384 first-time implants spanning two decades.** *J Sex Med.* 2007; **4**(4 Pt 1): 1074–9.
[PubMed Abstract](#) | [Publisher Full Text](#)

Open Peer Review

Current Referee Status:



Editorial Note on the Review Process

F1000 Faculty Reviews are commissioned from members of the prestigious F1000 Faculty and are edited as a service to readers. In order to make these reviews as comprehensive and accessible as possible, the referees provide input before publication and only the final, revised version is published. The referees who approved the final version are listed with their names and affiliations but without their reports on earlier versions (any comments will already have been addressed in the published version).

The referees who approved this article are:

Version 1

- 1 **Steven K Wilson** Institute for Urological Excellence, California, USA
Competing Interests: No competing interests were disclosed.
- 2 **Aaron C Lentz** Division of Urology, Duke University Medical Center, Durham, USA
Competing Interests: No competing interests were disclosed.

The benefits of publishing with F1000Research:

- Your article is published within days, with no editorial bias
- You can publish traditional articles, null/negative results, case reports, data notes and more
- The peer review process is transparent and collaborative
- Your article is indexed in PubMed after passing peer review
- Dedicated customer support at every stage

For pre-submission enquiries, contact research@f1000.com

F1000Research