Endourology

Failure of the inflatable penile prosthesis due to abnormal folding of a low-profile reservoir — A selected case from an overall series and systematic review

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A B S T R A C T

We present a case from a running series of inflatable penile prosthesis failure due to improper folding of the Conceal™ reservoir. The Conceal™ Low-Profile reservoir gained popularity due to claims of improved cosmesis and ease of implantation. As the number of patients receiving this and other low-profile reservoirs increases, it is imperative to review and document any novel complications. While the Conceal™ reservoir may be preferred in ectopic placement, it may be more prone to fluid lockout facilitated by conformational change. Our review did not identify prior reports of improper folding, which we believe is unique to these low-profile reservoirs.

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Introduction

First described in 1973, the inflatable penile prosthesis (IPP) has become one of the mainstays of therapy for erectile dysfunction (ED). The original IPP, developed by American Medical Systems (AMS), suffered from high rates of both infection and mechanical failure. Over the past 40 years, AMS has incrementally improved and evolved this early device into what is now marketed as the AMS 700. With satisfaction rates of over 90% in some studies and device survival rates of 86%–91.0%, and 76%–79% at 5 and 10 years respectively, the IPP is arguably one of the most efficacious treatments for ED. However, as with any new innovation, some of those improvements have brought their own challenges. Here we will discuss the new Conceal™ low-profile reservoir and present a case report from a running series to highlight what appears to be a complication unique to this type of reservoir. In addition, we will present findings from a systematic literature review in search of reported complications associated with low-profile reservoirs.

The IPP reservoir has undergone few changes since the 1980s. The original rectangular reservoir was quickly switched out for a seamlessly spherical model. Reservoir placement has traditionally been within the space of Retzius. The boundaries for this potential space include the pubic symphysis, prostate, and anterior bladder wall. The availability of this space, however, may be obviated in men with a history of selected surgeries such as robotic prostatectomy and radical cystectomy. Attempts to use this space in such men has resulted in reports of some major complications, including injury to bowel and major blood vessels and erosion of the reservoir into the bladder and colon. More recently, ectopic placement of the reservoir into a submuscular pocket above the transversalis fascia has been advocated. However, pairing this technique with a spherical reservoir has been noted to result in a palpable and, occasionally, visible mass.

Prosthesis autoinflation has also been noted in the setting of ectopic reservoir placement, presumably due to increased pressure within the submuscular pocket as compared to the extraperitoneal space of Retzius. The Conceal™ low-profile reservoir was introduced in 2011 as an alternative to the conventional reservoir. The disc-shape seems to have garnered popularity based on perceptions of improved cosmesis and ease of implantation, particularly in patients where ectopic placement is desired.

Case presentation

A 71-year old gentleman received a 15 cm AMS 700 LGX implant with 3.5 cm of rear-tip extension and a Conceal™ reservoir for treatment of ED. Device placement was performed through a single penoscrotal incision. A 100 mL capacity Conceal reservoir was placed in the left retropubic space. The reservoir was filled with
70 mL of sterile saline and intraoperative cycling showed an excellent result. Following activation, the patient did well until 11 months postoperatively, when he complained of incomplete filling with use of the pump. Examination confirmed these findings, and the pump would stay dimpled once filled to the newly allowable limit, but with no suggestion of fluid loss or air within the system. Deflationary capacity was normal.

CT scan revealed the Conceal™ reservoir was folded in half, a finding we have termed the ‘Pac Man sign’, locking out fluid on one half of the crease (Figs. 1 and 2). The patient underwent revision surgery and the low-profile reservoir was replaced with a standard reservoir filled to capacity. The remainder of the existing prosthesis was left unaltered. Subsequent clinical evaluation demonstrates normal device function.

**Discussion**

This case is presented from our running series (Table 1) — all cases involved filling of the 100 mL capacity reservoir with between 65 and 70 mL and no ectopic placement. In each instance, patients presented with delayed inability to fully inflate their device. The case presented here highlights a novel complication associated with a more recently designed IPP reservoir. In addition to the compressible nature of the reservoir walls, deliberate filling to a volume below capacity and/or incomplete evacuation of cylinders may facilitate tissue collapse around a folded reservoir. Clinically, the perception may be one of pump failure or fluid loss. Imaging proved to be quite informative in these patients and seems advisable if this situation is encountered. The high-volume surgeons included for this report have collectively placed over 100 Conceal™ reservoirs, but have generally placed them in the retropubic space through a penoscrotal approach, without the need for a second incision and regardless if the patients have had prior robotic prostatectomy. However, based on encountering this complication, we have adjusted technique to routinely use standard reservoirs and to avoid under-filling. Patients are also instructed on thorough cylinder emptying following device use.

For providers interested in using the Conceal™ reservoir, we recommend an evaluation of back pressure at the time of placement. Although modern design renders autoinflation less of a concern than in decades past, significant back pressure may indicate a need for further dissection to develop the reservoir pocket to potentially reduce the chances for the folding described. In addition, while under-filling may reduce palpability and visibility, we advise filling to capacity to limit the possibility of pocket collapse. Of note, we have never encountered a fluid lockout facilitated by conformational change in a standard reservoir, even if those units were under-filled. An extensive literature review failed to reveal reports of complications unique to the Conceal™ reservoir. However, an analysis of 632 patients receiving a Conceal™ reservoir from the Prospective Registry of Outcomes with Penile Prosthesis for Erectile Restoration (PROPPER) noted two incidents of reservoir
herniation into the scrotum, and an instance of reoperation for encapsulation.5

Conclusions

The Conceal™ reservoir has been found susceptible to folding resulting in fluid lockout and compromised function of a penile prosthesis. This abnormality may be initially presumed as pump failure but axial imaging may help identify the problem. The compressible nature of the reservoir seems to be a predisposing factor, although filling below capacity at time of placement and/or incomplete emptying between episodes of use may also contribute to this phenomenon. Further study is needed to determine the overall incidence and mechanism of this novel complication.

| Patient | Age (y) | Time from placement to presentation | Management |
|---------|---------|-----------------------------------|------------|
| A       | 71      | 11 months                         | Conceal™ reservoir replaced with standard reservoir (filled to 100 mL), successfully cycled intraoperatively |
| B       | 45      | 5 months                          | Conceal™ reservoir replaced with standard reservoir (filled to 100 mL), successfully cycled intraoperatively |
| C       | 56      | 3 months                          | Conceal™ reservoir repositioned, successfully cycled intraoperatively |
| D       | 52      | 26 months                         | 20 mL added to Conceal™ reservoir (previously filled to 75 mL), successfully cycled intraoperatively |

Followed by post-operative failure
Scheduled for full reservoir removal and replacement

Table 1
Multiple cases of Conceal™ reservoir failure following IPP implantation.

Conflict of interest
None.

References

1. Henry GD. Historical review of penile prosthesis design and surgical techniques: part 1 of a three-part review series on penile prosthetic surgery. J Sex Med. 2009 Mar;6(3):675–681.
2. Perito PE, Wilson SK. Traditional (retroperitoneal) and abdominal wall (ectopic) reservoir placement. J Sex Med. 2011 Mar;8(3):656–659.
3. Al-Enezi A, Al-Khadhari S, Al-Shaiji TF. Three-piece inflatable penile prosthesis: surgical techniques and pitfalls. J Surg Tech Case Rep. 2011;3:76–83.
4. Levine LA, Hoeh MP. Review of penile prosthetic reservoir: complications and presentation of a modified reservoir placement technique. J Sex Med. 2012;9:2759–2769.
5. Karpman E, Brant WO, Kansas B, et al. Reservoir alternate surgical implantation technique: preliminary outcomes of initial PROPPER study of low profile or spherical reservoir implantation in submuscular location or traditional prevesical space. J Urol. 2015 Jan;193(1):239–244.