Sexual Medicine
Open Access

CASE REPORT

Two Fungal Infections of Inflatable Penile Prostheses in Diabetics

Brittney H. Cotta, MD,* Michael Butcher, DO,† Charles Welliver, MD,‡ Kevin McVary, MD,† and Tobias Köhler, MD, MPH†

*Urology, University of California San Diego, San Diego, CA, USA; †Urology, Southern Illinois University School of Medicine, Springfield, IL, USA; ‡Urology, Albany Medical College, Albany, NY, USA

DOI: 10.1002/sm2.86

ABSTRACT

Introduction. Penile prosthesis infections have decreased since the introduction of antibiotic-coated implants. Infections that do occur can be from more rare and virulent organisms than the traditional skin flora historically implicated.
Aim. In this report, we present two cases of inflatable penile prosthesis (IPP) infection from *Candida* organisms in insulin-dependent diabetic patients.
Methods. Case report with literature review.
Main Outcome Measures. Resolution of the two cases.
Results. Both patients were found to have insulin-dependent diabetes. Both patients also presented with infection of the device with *Candida* species, with the implant pump adherent to their scrotal skin.
Conclusions. This report supports the emerging literature that the flora of IPP infections is changing. We suggest considering adding antifungal agents to antibiotic coatings, dips, or washout solutions at the time of penile prosthesis surgery in diabetic patients. **Cotta BH, Butcher M, Welliver C, McVary K, and Köhler T. Two fungal infections of inflatable penile prostheses in diabetics. Sex Med 2015;3:339–342.**

Key Words. Penile Prosthesis; *Candida*; Erectile Dysfunction; Diabetes

Introduction

Significant progress has been made in inflatable penile prosthesis (IPP) operations over the years, with infections occurring in as little as 1% of novel cases with the use of antibiotic-impregnated implants in the hands of frequent implanters [1]. However, revision operations still have a higher rate of infection, with studies citing 7–18% [2]. As intravenous (IV) antibiotics are inadequate at clearing the infection due to presence of a biofilm, any attempt at preventing infection is significant. Here we present two cases of IPP infections with *Candida*, a common medical device pathogen but one that is still very rarely encountered in penile prosthesis operations.

Case Presentations

TW

TW was a 60-year-old male with insulin-dependent type 2 diabetes (HbA1c 14.4%), obesity, and sleep apnea presenting 6 months following implantation of an AMS 700 3-piece inflatable prosthesis complaining of difficulty inflating and deflating the scrotal pump.

Because of extreme difficulty inflating the device, the decision was made to exchange the AMS

pump with a Coloplast Touch pump, leaving the remainder of the functional AMS implant in place. Despite the potential increased risk of infection by not exchanging the entire device, the patient opted for pump component exchange only. Perioperative antibiotics vancomycin and gentamicin were given and a Mulcahy salvage procedure was performed with a washout solution containing iodine, hydrogen peroxide, and antibiotics [3]. The original pump and capsule was entirely removed. A rifampin and gentamicin Coloplast dip was utilized for the newly implanted pump.

Postoperatively, the patient was able to cycle his device successfully for intercourse. However, 4 months after the pump exchange operation, the patient returned to the clinic complaining of isolated pain in the area of pump placement and on examination the pump was found to be fixed to the scrotum with localized erythema. A 10-day course of TMP-SMX was attempted with no improvement in symptoms. It was decided to remove the entire device and replace it, with the patient choosing to have a Coloplast Genesis malleable implant. Perioperative gentamicin and vancomycin were given within 1 hour of incision. The surgical site was prepped with a combination of chlorhexidine and alcohol [4] in addition to an iodine-based skin cover to avoid skin contamination. When dissecting down into the area of the pump within the scrotum, a purulent drainage was noted and sent for culture. After complete device removal, a Mulcahy washout procedure was performed in the implant space containing iodine, hydrogen peroxide, and antibiotic solutions [3]. Results of the culture of the purulent drainage and previous implant capsule obtained from surgery grew *Candida glabrata*. The patient experienced no complications postoperatively and the device was functional with no signs of infection at any follow-up appointments, up to 1 year at the time of publication.

MW

MW was a 52-year-old male with insulin-dependent type 2 diabetes (HbA1c unknown), hypertension, and dyslipidemia presenting for consultation 2 years after implantation with a Coloplast Titan 3-piece IPP. He complained of scrotal pain and examination revealed localized erythema and pump fixation to the skin. Despite a 6-week course of TMP-SMX, the patient's symptoms persisted and the area developed a draining sinus tract in the anterior scrotum. A wound culture grew *Candida albicans*. He then underwent revision surgery and complete device replacement with a Coloplast Genesis malleable device. Perioperative vancomycin, ceftriaxone, and fluconazole were given. Upon entry into the pump capsule, purulent drainage was noted. The washout solution irrigated into the previous implant spaces included iodine, hydrogen peroxide, vancomycin, gentamicin, and the addition of fluconazole to cover for the *Candida* grown from the wound drainage cultured preoperatively. The dip utilized for the malleable implant was a combination of fluconazole, rifampin, and gentamicin. Culture of the drainage and capsule also grew *C. albicans*. His postoperative course was uneventful and he was doing well with no signs of infection at any of his follow-up appointments, his most recent visit being 1 year postoperatively.

Discussion

Here we present two cases of IPP component infections with *Candida* species. Both patients had a long history of type 2 diabetes requiring insulin. Each presentation was delayed, with TW experiencing infectious complications 4 months after a pump exchange and MW presenting 2 years after original device placement. Both patients presented with scrotal pain and displayed similar physical exam findings of an implant component adhered to their scrotal skin with erythema and no systemic signs of infection. Not surprisingly, neither infection responded to antibiotics despite recent literature supporting success with this technique in nonsystemic localized implant infections [5]. Of note, these cases were the only two implant infections with "non-aggressive organisms" with classic, historically described pump fixation seen at our institution over the last 7 years.

Fungal Device Infections

Candida infections are a common cause of medical device infections, likely due to their ability to form a biofilm. As all humans are colonized with yeast as a commensal organism, their virulence is related to impairment of host defenses. The most common conditions leading to overgrowth of *Candida* include immunocompromised states, diabetes mellitus, antibiotic use, indwelling devices, and IV drug use [6]. *Candida* is responsible for less than 1% of joint prosthesis infections, 2.6–7% of periotoneal dialysis infections, 2–10% of prosthetic heart valve infections, 4.5% of pacemaker infections, and 21% of catheter-associated urinary tract infections [6].

Candida is estimated to be responsible for 5–9% of penile prosthesis infections in the nonantibiotic device coated era [3] and most of these infections are recorded in the literature as case reports [7].

Impact of Diabetes on IPP Infection Risk

It has long been known that diabetic patients are more likely to suffer from infectious complications after surgery. This increased risk may be due to impaired host resistance, high blood glucose levels promoting bacterial growth, and poor blood supply to the wound. In fact, a long-term study comparing IPP infection rates in diabetic and not diabetic men found that diabetic men had a significantly higher rate of infection of the IPP at 7 years [8]. However, this increased risk is difficult to quantify. In a study tracking IPP infection rates in patients with risk factors for infection, diabetes was found to lead to a statistically insignificant increase in initial implant infections (1% to 3%) and an even larger increase in infections at revision surgery (8% to 18%), but again not significant [9]. Levels of diabetes control as quantified by glycosylated hemoglobin (HbA1c) have also been studied as a proxy measurement for IPP infection risk. Bishop et al. initially reported a difference of 31% vs. 5% of implant infections in poorly controlled diabetics defined by a HbA1c level of greater than 11.5% [10]. However, a similar study performed by Wilson et al. found that while an increased incidence of infections developed in diabetics (10 diabetics [8.8%] and 11 nondiabetics [4.0%] [$P = 0.06$]), only one infection occurred among poorly controlled diabetics, again defined by HbA1c levels above 11.5% [11]. Additionally, no difference was found among diabetics when stratifying them further by level of preoperative fasting glucose or insulin dependence. Additional factors not studied that could explain the increased rate of infection independent of glucose control may be duration of diabetes and the associated vascular changes in these patients [11]. Due to conflicting reports and the fact that these studies were done prior to the evolution of antibiotic-impregnated implants, it may be time to restudy diabetes control as a risk factor for IPP infections, particularly in rare cases of opportunistic infections such as the fungal infections we report.

Antibiotic Coated Implants: Are We Selecting for More Virulent Organisms?

The source of microbes causing implant infections is most commonly skin flora, as seen in most prosthetic device infections. This was especially true in IPP infections before the widespread use of antibiotic-coated implants, where up to 75% of device infected were due to coagulase negative *Staphylococcus* [12]. However, there is increasing evidence that the flora of IPP infections is changing. Kava et al. cultured tissue from implant spaces at the time of revision surgery and found that only 5% contained *Staphylococcus epidermidis* [13]. Additionally, of the small number of cases revised for infectious reasons, the infecting organism was *Staphylococcus aureus* in half of cases and none was due to coagulase negative *Staphylococcus*. The second most common infecting organism was *Enterobacter aerogenes* [13]. Furthermore, case reports of IPP infections with rare organisms such as *Salmonella* [14] and *Actinomyces neuii* [15] have surfaced. Antibiotic use has been proven to be the number one risk factor contributing to *Candida* infections [16]; therefore, it is reasonable to assume that antibiotic coatings and prophylactic antibiotics in our prosthetic patients may open the door for these commensal organisms to become pathogens.

Future Considerations

Since their introduction in the early 2000s, infection retardant coatings on IPPs have dramatically decreased device infections, such that recent evidence indicates that the most common reason for device failure may now be mechanical [17]. However, of those infections that do occur, the microbial flora may become increasingly more virulent. For this reason, the traditional antibiotics, originally tested for their ability to combat common skin organisms, may become less efficacious over time. Recent reports of atypical infections of IPPs and our experience of two *Candida* infections in a short (one month) time period may provide incentive for adding antifungal medications to perioperative administration protocols, antibiotic dips, and washout solutions. As both of our patients were also diabetic, further identifying risk factors in patients for device infection and further establishing the risk of diabetic control on this vulnerable population are also warranted.

Conclusion

Penile prosthesis implantations have become increasingly successful in their near 40 years of use. With a markedly reduced number of infections in primary implantations and further reduction in revision infections with the use antibiotic-coated

implants and washout procedures, most surgeons experience relatively few infectious complications. However, when the rare infection occurs, we may become victims of our own success by selecting for potentially more virulent or nontargeted organisms.

Corresponding Author: Brittney H. Cotta, MD, Urology, UC San Diego Health System, 200 W. Arbor Drive #8897, San Diego, CA 92103-8897, USA. Tel: (619) 543-2628; Fax: (619) 543-6573; E-mail: brittneycotta@gmail.com

Conflict of Interest: The author(s) report no conflicts of interest.

Disclosures: No sources of funding were used in preparation of this article. Tobias S. Köhler is a Speaker for Auxilium and Allergan and Consultant/Surgical Proctor for AMS and Coloplast. Kevin T. McVary is a Principal Investigator for AMS, Sophiris, Astellas, and Lilly/ICOS and a Consultant/Advisor for Watson Pharmaceuticals.

References

1 Carson CC 3rd, Mulcahy JJ, Harsch MR. Long-term infection outcomes after original antibiotic impregnated inflatable penile prosthesis implants: Up to 7.7 years of followup. J Urol 2011;185:614–8.
2 Henry GD, Carson CC, Wilson SK, Wiygul J, Tornehl C, Cleves MA, Simmons CJ, Donatucci CF. Revision washout decreases implant capsule tissue culture positivity: A multicenter study. J Urol 2008;179:186–90.
3 Mulcahy JJ. Long-term experience with salvage of infected penile implants. J Urol 2000;163:481–2.
4 Darouiche RO, Wall MJ Jr, Itani KM, Otterson MF, Webb AL, Carrick MM, Miller HJ, Awad SS, Crosby CT, Mosier MC, Alsharif A, Berger DH. Chlorhexidine-alcohol versus povidone-iodine for surgical-site antisepsis. N Engl J Med 2010;362:18–26.
5 Henry G, Price G, Pryor M, Greenfield J, Jones L, Perito P, Morey A, Bella AT, Kohler T. Observation of local clinical penile prostheses infections instead of immediate salvage rescue/removal: Multicenter study with surprising results. J Urol 2014;191:e612–3.
6 Kojic EM, Darouiche RO. Candida infections of medical devices. Clin Microbiol Rev 2004;17:255–67.
7 Peppas DS, Moul JW, McLeod DG. Candida albicans corpora abscess following penile prosthesis placement. J Urol 1988;140:1541–2.
8 Mulcahy JJ, Carson CC 3rd. Long-term infection rates in diabetic patients implanted with antibiotic-impregnated versus nonimpregnated inflatable penile prostheses: 7-year outcomes. Eur Urol 2011;60:167–72.
9 Wilson SK, Delk JR 2nd. Inflatable penile implant infection: predisposing factors and treatment suggestions. J Urol 1995;153:659–61.
10 Bishop JR, Moul JW, Sihelnik SA, Peppas DS, Gormley TS, McLeod DG. Use of glycosylated hemoglobin to identify diabetics at high risk for penile periprosthetic infections. J Urol 1992;147:386–8.
11 Wilson SK, Carson CC, Cleves MA, Delk JR 2nd. Quantifying risk of penile prosthesis infection with elevated glycosylated hemoglobin. J Urol 1998;159:1537–9, discussion 1539–1540.
12 Brant MD, Ludlow JK, Mulcahy JJ. The prosthesis salvage operation: Immediate replacement of the infected penile prosthesis. J Urol 1996;155:155–7.
13 Kava BR, Kanagarajah P, Ayyathurai R. Contemporary revision penile prosthesis surgery is not associated with a high risk of implant colonization or infection: a single-surgeon series. J Sex Med 2011;8:1540–6.
14 Sausville J, Gupta G, Forrest G, Chai T. Salmonella infection of a penile prosthesis. J Sex Med 2009;6:1487–90.
15 Hsi RS, Hotaling JM, Spencer ES, Bollyky PL, Walsh TJ. Isolated infection of a decommissioned penile prosthesis reservoir with Actinomyces neuii. J Sex Med 2011;8:923–6.
16 Wey SB, Mori M, Pfaller MA, Woolson RF, Wenzel RP. Risk factors for hospital-acquired candidemia. A matched case-control study. Arch Intern Med 1989;149:2349–53.
17 Mandava SH, Serefoglu EC, Freier MT, Wilson SK, Hellstrom WJ. Infection retardant coated inflatable penile prostheses decrease the incidence of infection: A systematic review and meta-analysis. J Urol 2012;188:1855–60.