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Penile prosthesis infection: normalizing salvage surgery from education to practice

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Penile prosthesis infection remains one of the most dreaded complications in prosthetic urology. What begins as an elective procedure to restore quality of life can devolve into severe morbidity, pain, and complex revision surgery. For decades, trainees have been taught that the safest course is complete device explantation. Yet the literature tells a different story: salvage surgery offers success rates as high as 93% while preserving corporal length and sexual function.^{1,2}

Even after years of supporting evidence and prior expert calls to action,¹ adoption has stagnated: salvage rates have been estimated at 17% at best, with no recent studies to support an increase in utilization.² National and international erectile dysfunction guidelines fail to address the potential role of salvage. Standardized exams during urologic training emphasize that the “board answer” is to explant the device in infected cases.

In the absence of broader endorsement and dissemination of existing data, only experienced prosthetic surgeons may feel comfortable proceeding with salvage. Other urologists may envision salvage as an onerous process that only increases the risks of a complicated situation. Defaulting to explantation, however, means condemning patients to an average 3.7 cm corporal length loss and significantly delayed return, if ever, to sexual function.³ For these reasons, salvage must be advanced as the best practice for anatomical preservation and maintenance of sexual function when appropriate.

The first step in increasing the frequency of salvage therapy is defining candidacy. Multiple studies have built on Dr. Mulcahy's foundational work and further expanded inclusion and exclusion criteria.^{2,4} Exclusion criteria—sepsis, necrosis, device erosion, or inability to tolerate prolonged surgery—are well established. However, most patients present in “grey zones” with findings such as fixed pumps, peri-device fluid, tenderness, or mild edema but without overt necrosis. While Dr. Lentz's research has shown that obvious purulence should not preclude salvage,^{1,2} in most scenarios, surgeon expertise and patient-shared decision-making are paramount in determining whether to proceed with salvage. More research is

needed to define best practices in these common but ambiguous cases.

Proper practices for salvage have been better defined in recent years.⁴ Cultures should be obtained as early as possible, ideally by needle aspiration.⁴ This allows for pathogen identification and resistance profiling to guide perioperative antimicrobials. Patients should be admitted for intravenous broad-spectrum antimicrobials, most commonly piperacillin-tazobactam, vancomycin, and fluconazole, and these can be tailored based on allergies, wound cultures, and local antibiograms.^{1,4}

The conventional wisdom has changed, and now it is felt that salvage can be offered to non-septic patients after a brief cooling off period with inpatient broad-spectrum antimicrobials. This paradigm shift mirrors the evolution in testicular tumor management, where the longstanding adage that “the sun should never set on a testicular mass” has given way to a more nuanced approach. This change has increased time for improved counseling, sperm cryopreservation, and testicular prosthesis discussion. Similarly, hospital admission and treatment with intravenous (IV) antimicrobials while awaiting culture data allows for thoughtful discussions and shared-decision making for patients who are candidates for salvage. A few days of targeted treatment allows time to consult with experts in the field within or across institutions, assess clinical response, finalize surgical plans, and schedule procedures during regular hours with the most experienced team. For patients with prior prosthetic revisions or limited surgical records, cross-sectional imaging aids in locating the reservoir and evaluating fluid collections for surgical planning.

Detailed counseling should occur during preoperative admission. Explantation offers the advantage of immediate source control and possibly faster resolution of infection and pain. The long-term risks of explant, including corporal fibrosis, irreversible erectile dysfunction, significant length loss, and complex future device surgery, are rarely emphasized.^{3,4} Conversely, salvage preserves corporal length and the potential for sexual activity post-recovery. Risks include

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longer operative time, prolonged postoperative recovery, and a 7%-18% chance of persistent infection necessitating explantation.^{1,2}

Once salvage is chosen, key surgical planning includes removing all components of the infected implant, extensive irrigation of all device spaces, and exchange of gowns, drapes, gloves, and instruments prior to the immediate placement of a new prosthesis.^{1,4} While no conclusive data suggests antibiotic irrigation is superior to high-volume, catheter-directed saline, many experts use piperacillin-tazobactam, vancomycin, and amphotericin irrigation to broadly cover most likely causative organisms.⁴ Additionally, a modified Mulcahy protocol using dilute povidone iodine (PVI [250 mL of 10% PVI with 750 mL of normal saline]) or 0.05% chlorhexidine gluconate solution (Irrisept; Irrimax Corporation, Lawrenceville, GA, USA) should be employed.¹

Salvage device selection depends on surgeon discretion and preoperative culture results. Although both inflatable and malleable prostheses are viable options, studies by Köhler et al. (2009) and Gross et al. (2015) demonstrate higher salvage success rates with malleable devices, likely due to reduced operative time, simpler placement while preserving corpora, and avoidance of scrotal pump sites—the most common infection source.² Success in these studies being defined by the successful placement of a penile prosthesis in the corporal space and not requiring an additional surgery to remove the device placed during the salvage surgery.

Patients should remain hospitalized postoperatively until systemic and local signs of infection resolve, pain is manageable with oral medications, and culture results are finalized. Scrotal drainage for 1-3 days is reasonable. While oral antibiotics for 2-6 weeks are typically sufficient, patients with multidrug-resistant organisms may require consultation with infectious disease specialists and parenteral therapy at home.^{1,4}

Salvage surgery has stood the test of time, but it remains difficult to counteract the historical inertia toward explant. Salvage surgery rates in the United States remain low despite increased research attention.² A prospective, randomized clinical trial may prove challenging, but retrospective multi-institutional efforts could demonstrate that the high success rates of salvage are reproducible. Further research can help define whether the type of implant affects salvage success rates. Current data suggest that malleable prostheses offer higher success rates than inflatable devices, but the role of either type of infection retardant coating in preventing further infection remains unknown.

Broader adoption of salvage will require systemic changes. National guidelines must explicitly recognize salvage as a viable option, even as expert opinion statements. Training programs must move beyond teaching explantation as the only “safe” choice and ensure residents gain exposure to salvage protocols. While the American Urological Association Core Curriculum does highlight salvage and its success rates as part of complication management discussion, other widely

used educational resources—such as self-assessment study programs and board preparation materials—rarely mention salvage as a viable option. Without these updates, the next generation of urologists will remain unaware of evidence-based treatment options—and doesn’t informed consent by definition include the discussion of alternatives to the surgery being performed?

Salvage is not experimental; it is an evidence-based, underutilized therapy. Every infected prosthesis should prompt consideration of salvage, not automatic explantation. Aligning practice with evidence requires acknowledging the role of salvage surgery in guidelines, addressing gaps in current urologic training, and facilitating referral pathways to centers of expertise when necessary. Our patients deserve nothing less.

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Author contributions

J.J.A.: Conceptualization-Lead, Writing—original draft-Equal, Writing—review & editing-Equal, J.B.: Conceptualization-Supporting, Writing—review & editing-Equal. M.S.G.: Conceptualization-Equal, Supervision-Lead, Writing—review & editing-Equal, Writing—original draft.

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