Saving the Cavernous Spaces after Infection

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Dilemma with Conservative Therapy

- Limited penetration of oral or systemic antibiotics to area containing the prosthesis
  - Scar tissue surrounds the prosthetic parts as a response to walling off a foreign body
  - Bacterial Biofilm
Biofilm

- Biofilms occur when bacteria and/or other microbes attach to surfaces and surround themselves with protective extracellular polymeric substances (EPS).
- Cells communicating with each other, coordinate expression of certain genes, and organizing their activities.
- *Forming a 'resilient refugia' for bacteria; one that is able to resist natural stressors, and most antimicrobial agents.*
Biofilm

- Bacteria in biofilms can evolve as a result of starvation or other external pressures.
- Significant problem in engineered systems (pipelines) and biomedical processes (e.g. hospital-acquired infections, persistent infections, biofouling of implant devices) (Kraigsl and Finkley, 2009)
Overview

- Modern penile implants provide a predictable/reliable treatment of erectile dysfunction (ED) despite the development of less-invasive therapies.
  - Patient and partner satisfaction is highest with a penile implant among all of the treatments for ED
- Procedure can be complicated by infection
Incidence

- Infection associated with penile implants is
  - Thought to be due to bacterial colonization during surgery
- Infection rates vary from 0.6% to 8.9% for primary procedures
- Pre-Coated Implants: Incidence of up to 13.3% associated with revision surgery
- Post-Coated Implants: 1.77% infection rate compared with 3.09% infection rate in a control group of non-coated implants
- Coated + no-skin-touch group = 0.7%
Offenders

- Coagulase-negative Staphylococcus comprises 58% of infections
- Staphylococcus Lugdunensis, Epidermitis
- *Pseudomonas aeruginosa*
- *Serratia marcescens*
- Enterococcus
- *Proteus mirabilis*
- MRSA
- *Candida albicans*
- *Bacteroides fragilis*
Choices with a Clinical Penile Prosthetic Infection:

- **Removal**
  - Then when or if to place implant in the future

- **Salvage Prosthesis**
  - Malleable
  - Inflatable

- **Stimulan**

Gross, M; Levine, L; Carrion, R; Eid, J, Martinez, D; Perito, P; Munariz, R. ISSM Abstract #045, Improved Infection outcomes after mulcahy salvage Procedure and replacement of infected IPP with malleable prosthesis.
Risk Factors: Comorbidities, Surgical History

- 3X infection rate in diabetic population
- Immunosuppression
- Revision surgery

Does this affect your decision for salvage choice?
Consequences

- **Removal**
  - Negative changes to Morphology
  - Raises difficulty for future implantation

- **Salvage Prosthesis**
  - Preserves morphology and erectile function

- **Stimulan**
  - Preserves morphology
  - Preserves ease of future implantation
Bio-inert Cast

- $\text{CaSO}_4$
- Widely used
  - Dentistry
  - Orthopedics (Osteo-induction)
  - Infection Osteomyelitis
- Biocompatible material
- Completely resorbed following implantation
- Does not evoke a significant host response
Cast Content

- Addition of Anti-microbial to mixture for local infection treatment
- Release of pharmacologic agent from a carrier is directly proportional to dissolution of the CaSO4 (Based on experimental calculations approximately -16.7% volume/week)
Limitations

- Variation in inflammatory period based on risk factors and severity of infection
- Addition of Abx increases diffusion coefficient
- Gradual loss of volume still allows for some volume contracture
THE CARRION CAST: AN UPDATE ON THE USAGE OF THE INTRACORPORAL ANTIMICROBIAL DOPED SPACER FOR THE TREATMENT OF PENILE IMPLANT INFECTION
Daniel R. Martinez, Eihab Alhammali, Justin Emtage, Justin Parker and Rafael E. Carrion
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- Updated series → “Carrion Cast”
  - Antimicrobial spacer
  - Maintains size
  - Treating infection
  - Bridging gap between explant and reimplant

- Not candidates for immediate salvage
  - Failed immediate salvage
  - Septicaemia
Surgical Techniques

The “Carrion Cast”: An Intracavernosal Antimicrobial Cast for the Treatment of Infected Penile Implant

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J Sex Med 2014;11:1355–1358
Mix until a pasty consistency is obtained (approximately 60 seconds).

Open a 20 or 30cc Stimulan “Rapid Cure Pack” and/or “Standard Cure Pack”. Larger corpora may require >30cc per corpora.

Back-load into a 12cc syringe, using the spatula provided in the package.
Once the syringe is filled with the injectable paste, the stopper is replaced and a 14-gauge angiocatheter is used to inject into the intracorporal space.

Care should be taken to work quickly, since once the water is added the paste will begin to harden into a cast in approximately 5 minutes, making injection difficult.
Infected Implant

Infected corpora cause inflammation, swelling and pain

Solidified Intracorporal Antimicrobial Cast Using Synthetic High Purity CaSO4

Immediately after filling the space with the appropriate volume of CaSO4, the preplaced Vicryl sutures should be tied and “water tight” closure of the corpora achieved (extra sutures may be necessary)

Scrotal skin incision

The assistant should hold the glans in a stretch position, from the moment the paste is being injected until it eventually solidifies.
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- 5/2012 - 2/2014
- 9 cases
  - 5 Coloplast Genesis Semirigid Penile Prosthesis (SRPP)
  - 2 Coloplast Titan Inflatable Penile Prosthesis (IPP)
  - 2 narrow SRPP’s
    • Size range $\rightarrow$ 17cm to 23cm

- CaSO$_4$ cast size
  - 20-30cc, split between corpora

- Serum calcium, vancomycin and tobramycin levels $\rightarrow$ stable
- Time to reimplantation
  - 6-18 weeks
    - 6 weeks → cast dissolves
- All had prosthesis replaced
  - 1 SRPP
  - 3 IPP’s
  - 2 narrow SRPP’s
  - 1 narrow IPP
    - Size range → 17cm - 20cm
- Mean loss prosthesis length → 1.1cm
- Average penile length maintained → 95%
Initial Slurry injections
Active Research

- 8 50cc cylindrical casts were placed in 100cc of saline
- Maintained at 78° F
- Weighed weekly for 7 weeks
- Ongoing
Conclusion

- Infections still pose a risk for penile prosthetic surgery
- Management choices can be challenging and have negative outcomes
- Development of a “Spacer” can provide a safe option to manage the acute pathology and preserve optimal eventual prosthetic outcome.
References

References