Penile Transplantation: An Option for Major Genital Loss

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Outline

- Present penile allotransplantation as an emerging paradigm for penile restoration

- Review basic elements in implementing a penile transplant program

- Identify specific areas of study to be considered in advancing penile allotransplantation
Penile Transplantation in the News

**The New York Times**
**Penis Transplants Being Planned to Help Wounded Troops**
By Denise Grady  DECEMBER 6, 2015

**CNN**
**First U.S. penis transplants could help wounded troops**
By Nadia Kounang, CNN
Updated 8:18 AM ET, Thu December 10, 2015

**Medical News & Perspectives**
**US Hospitals Prepare for Penis Transplants**
Bridget M. Kuehn, MSJ
Military Genitourinary Trauma

- >34,000 injuries and deaths from IED in Iraq (Operation Iraqi Freedom) and Afghanistan (Operation Enduring Freedom) between 2005 - 2011

- >1300 soldiers since 2005 have suffered genital injuries

- Average age of those injured was 24yo

- American Forces Institute of Regenerative Medicine (AFIRM) was started to address tissue loss
Conditions of Severe Penile Defects/Loss

- Congenial birth defects (aphillia, micropenis, classic bladder extrophy/epispadias complex, cloacal extrophy)
- Ambiguous genitalia
- History of penile trauma resulting in penile destruction
- Prior penectomy required for malignancy
- Female-to-male gender reassignment

Bladder Exstrophy

Disorder of Sexual Development (DSD)
Sequelae of Severe Penile Loss

- Inability to engage in sexual intercourse
- Inability to urinate while standing
- Abnormal body appearance
- Loss of intimacy/personal relationships
- Feelings of humiliation and emasculation
- Diminished quality-of-life
What Matters to the Soldiers

“Before they went off to fight in Afghanistan, the guys of the 3rd Battalion talked about their deepest fear. Not dying. Not losing a leg or an arm. It was having their genitals blown off...Some guys said they would rather be dead.”

“I remember lying on my side, dust everywhere, and I looked down and saw my arms were split open...my first coherent words to my Marines were, 'Hey! check my nuts!'”

*Huffington Post. Beyond the Battlefield: Afghanistan’s Wounded Struggle with Genital Injuries*
Why Not Autogenous Reconstruction?
Radial Forearm Free Flap Phalloplasty

Schematic for Neophallus Reconstruction

Complications of Autogenous Reconstruction

- Urethral stricture/urethral erosion rates: 10-20%
- Acute vascular compromise and graft loss: 3%
- Chronic wound issues: 10%
- IPP erosion/dysfunction: 20-40%
- 85% report satisfactory cosmetic appearance

2010 EU Garaffa et al., 2013 J Urol Massanyi et al.; 2014 Inter J Impot Segal et al;
2013 JSM Callens et al.

- Traditional reconstructive options do not fully address all of the ideal goals of the phalloplastic reconstruction, including acceptable appearance, a competent urethra, tactile and erogenous sensation, and sufficient rigidity and durability to allow for sexual penetration.

- Key requirement: donor source (extremity)
Arguments Against Penile Transplantation

1. Not a lifesaving organ.

2. Lifelong immunosuppression – increased risk of infections and malignancy.

3. Ethics and psychological factors surrounding donating and receiving a genital organ

4. Technically challenging and unclear if it will meet the patient’s needs.
Critical Considerations

- Do we have reliable and safe techniques to perform the transplant?
- Will penile transplant offer improvement over conventional techniques?
- Indications for transplantation
- Can we justify life long immunosuppression for a penile transplant?
- Ethical considerations
Sexually active or wishes to be
Spouse/partner attitude toward the transplant
Mental health status, including posttraumatic stress disorder
Social support—standing in the community, attitudes of friends and family
Ability to cope with “humor,” stigma, scorn
Economic resources to cover long-term medical needs
Ability to relocate should the transplant team move
Tolerance for publicity
A Statistical Comparative Assessment of Face and Hand Transplantation Outcomes to Determine Whether Either Meets the Standard of Care Threshold

(Plast. Reconstr. Surg. 137: 214e, 2016.)

“When hand transplantation is limited to patients with single and/or bilateral amputation at the elbow or below, in a medical and social environment where immunosuppression is available, outcomes are excellent – and even may be standard of care”
Vascularized Composite Allotransplantation
Success results from patients and surgeons being willing to incur risks to take a novel idea to a practical, functioning reality that enhances the quality of life for properly selected patients.
Penile VCA

Strong need for caution and due diligence as we move the field of penile VCA forward.
Indications for Penile Transplantation

- Indications for penile transplantation are highly individualized and difficult to summarize.
- Absolute indication: Complete loss of penis with no reasonable conventional donor sites
- Weigh the aesthetic and functional benefits of restoration against the risks of surgery and lifelong immunosuppression
• 44yo man who suffered an ‘unfortunate traumatic accident’. 8mo. Later he received a penile transplant from a 22yo donor.

• On POD14, ‘because of a severe psychological problem of the recipient and his wife, the transplanted penis regretfully had to be cut off’.
The First Successful Human Penile Transplant
South Africa December 11th 2014

- 21yo man who had a failed ritual circumcision
- News report in the South African Medical Journal documents this event
- A forearm neophallus for the donor served to overcome reluctance of donor families to bury loved ones without a penis.
- Transplanted portion reportedly becomes tumescent.
Dr. Andre Van der Merwe
Massachusetts General Hospital
Drs. Cetrulo and Ko
Goal of Penile Allotransplant Program

Provide an advanced reconstructive option for patients with severe penile loss/deformity that

1. Improves function over standard techniques
2. Is available to patients who are not candidates for standard reconstruction – other extremity injuries and amputations, failed previous
3. Is safe and reliable – surgical technique and immunoregulation
Penile Transplant Program Implementation

- De novo protocols
  - IRB approval process
  - Ethical reviews

- Patient selection
  - Severe traumatic penile defects initially

- Screening process
  - Intensive psychosocial evaluation
  - Plan for long-term psychosocial support
Penile Transplant Program Implementation

- Donor matching
  - HLA matching
  - Screening for pathogens
  - Physical appearance match

- Immunosuppression
  - “Conventional” triple-drug regimen
  - Short-course depletion induction, augmented by donor bone marrow cell infusion followed by low-dose maintenance monotherapy (tacrolimus)

- Organ procurement
  - Adherence to standard United Network for Organ Sharing (UNOS) cadaveric transplant donation practices
  - Consent performed by trained organ procurement organization recovery coordinators
Penile Transplant Program Implementation

- Multidisciplinary team
  - Urologists
  - Plastic surgeons
  - Psychiatrists
  - Bioethicists
  - Intensivists
  - Immunosuppression/transplant medicine specialists
  - Operating room nurses and staff

- Procedural considerations
  - Cadaver sessions/technical planning
  - Clinical evaluations
  - “Dry” and “wet” runs
Importance of External Pudendal Vasculature

Penile shaft skin necrosis can be avoided with penile replantation by reconstituting blood supply via the external pudendal arteries.

Future Directions

Basic science
- Develop and study pre-clinical models
- Evaluate novel immunosuppression regimens (e.g., donor-specific tolerance) and effects on graft viability and function

Patient selection
- Who are the ideal candidates?

Program development
- How will programs be accessed?
- How will expenses be covered?
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