Pelvic Osteotomies in the Management of Bladder Extrophy

Kit M. Song, MD
Children’s Hospital of Seattle
University of Washington
Extrophy

- Initial description 1597, 2000 BC
- Cause unknown - no animal model
- Ischemic injury
- Hole in ant abdominal wall → herniation of developing bladder
- Ant movement, failure to close ventrally
• Classic bladder extrophy 1/10,000-50,000
• Cloacal extrophy 1.200,000-400,00
  » Omphalocele
  » Myelomeningocele
  » Renal anomalies
  » Lower extremity defects
Associated Abnormalities

- Genitalia
- Anorectal displaced anteriorly
- Abnl pelvic floor inferiorly
- Thickened anterior portion of pelvic diaphragm between symphysis
Natural History

- Non lethal
- Chronic UTI’s
- Incontinence
- Bladder Pain
- Adenocarcinoma Bladder
Treatment Goals

• Secure closure of bladder/abdominal wall
• Provide for urinary continence
• Preserve renal function
• Reconstruct functional/cosmetically acceptable genitalia
Strategies for Repair

• Removal of Exstrophic bladder with urinary diversion (ileal conduit)

• Reconstruction
  » Anatomic - Trendelenberg 1906
  » 1 stage
  » 3 stage
  » 1 stage
- **Early 1 stage**
  - Continence rates 10-30%
  - Hydronephrosis, renal damage up to 90%

- **3 stage** (Robert Jeffs)
  - Primary bladder closure (conversion to epispadias) - Newborn
  - Epispadias repair - 12-18 months
  - Bladder neck reconstruction - 4-5 years

Multiple surgeries
Bladder augmentation
• Single stage (Mitchell-Seattle)
• Complete disassembly
• Primary defect is anterior position of bladder plate, neck, and urethra
• Division of intersymphyseal ligaments posterior to urethra to allow contents to drop into pelvis
• Allows early bladder growth and function
• Done in newborn period
Treatment Principles

- Replacement of bladder/urethra into pelvis
- Reapproximation of anterior abdominal wall
- Correction of epispadias
- Reconstruction of external genitalia
- Narrowing of pelvic ring
Role of Osteotomy

- Decrease tension on anterior abdominal wall closure
- Reconstruction of pelvic floor muscles
Osteotomy History

• Trendelenburg 1906
• Bilateral Iliac osteotomy
  » Schulz 1958
  » O’Phelan 1963
  » Aadalen 1980
• Anterior pubic osteotomies
  » Cook 1962
  » Edgerton 1986
  » Frey 1989
Osteotomy History

• Anterior osteotomy
  » Gibbon 1991
  » Sponseller 1991 - 2001

• Anterior diagonal osteotomy
  » McKenna 1994
  » Ozcan 2000
  » Jones 2006

• Anterior / Posterior osteotomy
  » Sponseller 2001
Anatomy

• Ligamentous structures
  » Sacrosciatic ligaments
  » Short ramus between sacrum/ischial spine
  » Long ramus between sacrum/ischial branch
Osseous Anatomy

- Posterior segment normal length
- Anterior segment 30% less
- Interpubic diastasis
  - Birth 4.2 cm
  - Adult 14.2 cm
Osseous Anatomy

• Posterior segment angle ext rotated avg. 12° - Decreases with age
• Anterior segment angle ext rotated avg. 18° - Unchanged with age
• Retroversion avg. 13°
• Triradiate distance 31% increased
Osseous Anatomy

- Iliac wings more vertical
- Posteriorly tilted
Posterior Osteotomy

- Classic approach
- Good initial closure rate
- Urologic success 45%
Posterior Osteotomy

- Dehiscence up to 42%
- Anteversion of acetabulum
- Prone position
- Higher blood loss
- Vertical migration
Anterior Pubic Osteotomy

- Neonates
- Older child
  - Sup/Inf ramus
  - High dehiscence rate
  - Poor relaxation of tissues
Anterior Horizontal Osteotomy

- Salter Osteotomy
- Rotational Osteotomy
Anterior Horizontal Osteotomy
Hopkins Results

- Sponseller 2001
- 86 osteotomies
  - 38 anterior
  - 48 anterior/posterior
- Skin txn. 4 weeks
- External fixation avg. 6 weeks
- Overall continence rates 74%
Anterior Horizontal Osteotomy

- Avg. diastasis closure 62-67% at 3 months
- Diastasis 40-47% at 5 years
- No correlation between diastasis and continence
- Dehiscence rate/bladder prolapse 4%
Anterior Horizontal Osteotomy

• Complications (Okubadejo 2003)
  » 4% overall rate - 26/624 patients
  » 13/26 neurologic (4 incomplete recovery)
    - Femoral 8
    - Peroneal 2
    - Sciatic 2
    - Superior gluteal 1
  » 5/25 bony
  » 4/26 infection
Anterior Diagonal Osteotomy

- McKenna
- Ozcan
Anterior Diagonal Osteotomy

- Greatest AP and transverse diameter
- Smallest interspinal distance
Seattle Experience

• 47 primary closures of 180 extrophy cases
• Anterior oblique osteotomies 40/47 cases (2 days to 3 yrs: Avg 2 wks.)
• Continence 86%; Augmentation 14%
• Avg length hospital stay 5 days
• Reoperation rate 5% for anterior abd wall wound problems
• No nonunions, nerve palsy, infection
Neonate
Immobilization

- Decreased length of stay
  - Cast instead of external fixation
  - 1 operative procedure
Summary

• 1 stage repair in neonatal period as good as multi-stage repair
• Length of stay shorter due to casting of infants rather than txn or fixation
• Fewer operative procedures
• Orthopedists role bilateral osteotomies in newborn period, casting