Pelvic Osteotomies

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DDH Management Overview

• 0-6 months
  – Pavlik harness

• 6 Months – 2 years, failed Pavlik
  – Closed reduction ± tenotomies, hip spica cast 3 months

• 2-3 years, failed closed reduction
  – Open reduction

• 3+ years
  – Open reduction ± femoral osteotomy ± pelvic osteotomy
Overview

• Four general types of osteotomies
  – Single innominate (Salter)
  – Acetabuloplasty (Pemberton)
  – Triple innominate (Steel)
  – Shelf (Chiari)
Salter Single Innominate

- Age – 18 months – 6 years
- Requires concentrically reduced hip
  - Open reduction at same time possible
  - Iliopsoas and adductor tenotomies often required
- Covers antero-lateral acetabular deficiency
  - Up to 15° of acetabular index corrected
Salter

• Anterior approach to acetabulum
  – Exposing inner and outer ilium
  – Expose hip capsule if reduction needed
  – Transverse osteotomy just above acetabulum
    • G. sciatic notch to AIIS
  – Rotate on pubic symphysis antero-lateral
  – Hold correction with bone graft wedge & K-wires
Pemberton Acetabuloplasty

• Age – 18 months – 10 years
• Requires reduced hip
• Decreases acetabular volume (small head)
  – Remodeling of acetabulum required
• Corrects >15° AI
• Reduces antero-lateral acetabular defects
  – Cuts altered to cover more anteriorly or laterally
Pemberton

• Anterior Approach - Exposure as for Salter
  – Cut inner and outer table with small osteotome
    • Anterior – transverse plane, lateral – lateral incline
  – 1 cm above AIIS, staying 1 cm above capsule
  – Do not cut through to sciatic notch
  – Lever through cut until coverage acceptable
    • Levers on tri-radiate cartilage
  – Hold correction with bone graft wedge
Dega Acetabuloplasty

• Similar to Pemberton
• Larger posterior hinge
  – Hinges on horizontal tri-radiate limb
• Less inner table osteotomized
  – More inner table – more anterior coverage
  – Less inner table – more lateral coverage
Albee Acetabuloplasty

• Similar to Pemberton
• Outer table only osteotomized
  – Cut into cancellous bone to tri-radiate cartilage
  – Lever outer table laterally, hinging on tri-radiate cartilage
  – Hold open with bone graft
• Provides some posterior coverage
  – Cerebral palsy
Steel Triple Innominate Osteotomy

- Age – Skeletally mature
- Requires congruent hip joint
- Divides ilium, ischium and superior ramus
  - Acetabulum rotationally free
  - Indicated when other osteotomies not possible
- Rotates to cover any acetabular defect
Steel

• Multiple incision technique
  – Posterior between gluteal and hamstrings
    • Allows osteotomy of ischium
  – Anterior freeing medial attachments
    • Allows Salter and superior ramus osteotomy
  – Rotate acetabulum as desired
    • Avoid externally rotating
  – Bone graft wedge, fix as per Salter type
Chiari Medial Displacement

- Age – skeletally mature
- Salvage operation only
  - Used when no other osteotomy possible
  - Possible with subluxed hip
- Covers well laterally
  - Anterior and posterior augmentation may be necessary
- May be useful in other conditions
  - Coxa magna, OA in dysplastic hips
Chiari Medial Displacement

• Anterior approach – as per Salter
  – Identify superior extent of capsule
  – Cut from AIIS to notch following capsule curve
    • Angle osteotome 10-20° cephalad
  – Displace distal fragment medially 50-100%
    • Ensure complete head coverage
    • Leg abduction, hinges on pubic symphysis
  – Secure with hardware
From: ATLAS OF PEDIATRIC ORTHOPAEDIC SURGERY, 3rd Edition
Staheli Shelf Procedure

• Age – older child to skeletal maturity
• Salvage operation
• Indicated for non-concentric hips
• Augments supero-lateral deficiency
  – Slotted bone graft over capsule deepening acetabulum
Staheli

• Anterior approach, outer wall exposure only
  – Identify superior acetabular edge
  – Create slot 1 cm deep along edge, angled cephalad
  – Remove 1 cm cortical strips from outer table
    • Insert into slot, cutting at desired lateral overhang
    • 2\textsuperscript{nd} layer inserted lengthwise
    • Use remaining to fill in above slot edge
  – Hold in place with reflected fascia and adductors
Ganz Periacetabular Osteotomy

- Age – adults
- Osteoarthritis 2° to lateral acetabular defect
  - Decreased coverage increases articular surface stresses leading to early OA
- Easily combined with trochanteric osteotomy
- Technically extremely difficult
Ganz

- Anterior approach – lateral wall exposed
  - Superior ramus osteotomy, Salter osteotomy
    - stopping 1 cm from posterior edge
  - Angle 120° along posterior acetabular edge
    - Stop 1 cm from inferior edge
  - Cut along postero-inferior acetabular border into obturator foramen
  - Insert Shantz pin superior as a lever
  - Fix with screws, insert bone graft as needed
Summary

• Most require remodeling
  – Not as useful in older child (age>8)

• Careful match of procedure to patient needed

• Steep learning curve for more complex types