Surgical Approaches to the Acetabulum: Anterior Intrapelvic & Ilioinguinal

Jonathan Eastman, MD
Associate Professor
University of California, Davis
Learning Objectives

• Appreciate anterior surgical approaches and associated access
• Comprehend iliopectineal fascia and implications
• Understand fracture patterns
• Recognize limitations of anterior surgical approaches
Ilioinguinal Approach

• Originally described by Letournel in 1961
• Several modifications described since
• Standard approach for anteriorly based acetabular fractures
• Primary access to anterior column and quadrilateral plate

Thorough preoperative planning

- Need detailed understanding of osseous injury
- Understand normal and disturbed underlying pelvic anatomy
- Role of previous surgeries: ex-lap vs. prior hernia
- Search for non osseous pathology
  - Iliac vein injury
  - Bladder injury
  - Hernias laterally and central/inguinal
Ilioinguinal Approach

- Contemporary three separate intervals
  1. Lateral
  2. Middle
  3. Medial

Fractures typically addressed through ilioinguinal

- Anterior wall fractures
- Anterior column fractures
- Associated both column fractures
- Anterior column/wall and posterior hemitransverse fractures
- Transverse fracture (with major displacement through anterior column)
- T-shaped fracture (displaced anterior column segment and rarely posterior column)
- Atypical or extended posterior wall fractures
Fractures not typically addressed through ilioinguinal

- Typical posterior wall fractures
- Posterior column fractures
- Posterior column posterior wall fractures
- Transverse posterior wall fractures
- Transverse (with major displacement through posterior column)
- T-shaped (displaced posterior column)
Positioning

- Supine
- Foley necessary
- Flat top radiolucent table or traction table
- Lumbosacral bump
- Leg can be prepped out or in
- Hip flexion to relax iliopsoas
  - Towel bump, bone foam ramp, or table
- Prep to chest cranially and buttock posteriorly

Courtesy of Dr. Routt and Dr. Mark Adams
Superficial Landmarks

- Iliac crest
- ASIS
- Pubic tubercle
- Pubic symphysis

Courtesy of Milton L. Chip Routt, Jr. MD and Mark Adams, MD
Superficial Landmarks

• Incision:
  - 2 cm cranial to symphysis
  - Starting 2 cm on contralateral side
  - Curve to ASIS
  - Continue posterior along iliac crest
  - Cauterize superficial epigastric vessels
Superficial Dissection

- Dissect to external oblique fascia throughout
- Palpate ASIS
- Identify:
  - Inguinal ligament
  - Spermatic cord
  - External inguinal ring
  - Linea alba

Courtesy of Milton L. Chip Routt, Jr. MD and Mark Adams, MD
Lateral Window

• Delineate external oblique insertion from tensor origin on iliac crest
• Cautery between both on outer iliac crest starting at ASIS
• Stay out of external oblique fascia until at least posterior to medius pillar
• Incise external oblique fascia in line with muscle fibers

Courtesy of Milton L. Chip Routt, Jr. MD and Mark Adams, MD
Middle Window

- Incise 1-2 cm cranial to palpable inguinal ligament and just medial to external inguinal ring up to ASIS
- Care taken to not damage ilioinguinal nerve below fascia
- Mobilize canal contents proximally offinguinal ligament
- Incise floor of ligament/inguinal canal leaving 2 mm cuff for later repair

Courtesy of Milton L. Chip Routt, Jr. MD and Mark Adams, MD
Middle Window

- Identify lateral femoral cutaneous nerve medial to ASIS
- Can do 2 cm segmental excision to minimize neuroma or mobilize

Courtesy of Milton L. Chip Routt, Jr. MD and Mark Adams, MD
Middle Window

- Identify iliopectineal fascia overlying iliopsoas and palpate femoral vessels medially
- Bluntly dissect onto and just lateral to femoral artery.
- Mobilize artery medial and retract iliopsoas and femoral nerve laterally

Courtesy of Milton L. Chip Routt, Jr. MD and Mark Adams, MD
Middle Window

- Incise iliopectineal fascia down to pelvic brim
- Cautious for perforating vessel within fascia
- Release down to pelvic brim
- Continue releasing anteriorly over ramus and posteriorly into true pelvis

Courtesy of Milton L. Chip Routt, Jr. MD and Mark Adams, MD
Medial Window/Anterior Intrapelvic Approach

- Original Stoppa approach used for inguinal hernia repair with mesh
- Cole and Hirvensalo described use for acetabular surgery in early 1990s
- Depending on the fracture pattern, this interval can be used in isolation, along with lateral window, or as the medial window of ilioinguinal
Medial Window/Anterior Intrapelvic Approach

• Incise linea alba and extend 10 cm proximal to symphysis
• Split rectus and carefully incise posterior rectus sheath
• Use finger to free bladder off posterior rectus sheath and expose periossteum of posterosuperior superior ramus surface
Medial Window/Anterior Intrapelvic Approach

• Insert malleable retractor to mobilize bladder posteriorly
• Release superior rectus insertion working laterally
• Continue releasing iliopectineal fascia working laterally
• Identify and ligate/cauterize/clip vascular anastomosis between iliac and obturator systems

Courtesy of Milton L. Chip Routt, Jr. MD and Mark Adams, MD
Medial Window/Anterior Intrapelvic Approach

- Mobilize obturator neurovascular bundle
- Can retract caudally and work superior to the bundle
- Can also dissect caudal side of bundle, retract obturator bundle superiorly and work inferiorly
- Release iliopectineal fascia back to sacroiliac joint and further expose internal iliac fossa

Medial Window/Anterior Intrapelvic Approach

- Release obturator internus muscle to expose quadrilateral plate and posterior column

Courtesy of Milton L. Chip Routt, Jr. MD and Mark Adams, MD
Lateral Window

• If not already done, back to iliac crest and fully release obliques and then iliacus in subperiosteal fashion
• Malleable or other retractor over brim or towards PSIS helps expose internal iliac fossa

Courtesy of Milton L. Chip Routt, Jr. MD and Mark Adams, MD
Fracture Exposure

• Until now the fracture hematoma and tissue interposed in fracture has been left untouched
• This minimizes creating new and ongoing bleeding while still exposing
• Work through all intervals as needed to clean and irrigate fracture appropriately

Courtesy of Milton L. Chip Routt, Jr. MD and Mark Adams, MD
Fracture Reduction

• Based off injury pattern and displacement
• Shantz pin in medius pillar
• Ball spike pusher with foot plate
• Numerous clamp types and positions possible
• Undercontoured plate can also help achieve reduction


Courtesy of Milton L. Chip Routt, Jr. MD
Fracture Fixation

• Based off injury pattern, fracture morphology, displacement
• Common plating surfaces include:
  • Superiorly on the pelvic brim and superior ramus
  • intrapelvic along the quadrilateral plate
• Sequencing and placement of implants important and varies between injuries
• Independent screws possible but care taken to ensure appropriate location as they can complicate plate contour and plate-bone opposition
Wound Care and Closure

- After fixation completed, copious irrigation performed
- Surgical drains typically placed in Space of Retzius and internal iliac fossa to prevent deep hematoma formation
- Closure of rectus insertion deep and linea alba with interrupted 0 or 2-0 vicryl

Courtesy of Milton L. Chip Routt, Jr. MD and Mark Adams, MD
Lateral Window Closure

- Initial 0 or 2-0 vicryl stitch to origin of inguinal ligament on ASIS
- Sets ligament orientation and allows tension free repair of floor and roof of inguinal ligament

Courtesy of Milton L. Chip Routt, Jr. MD and Mark Adams, MD
Lateral Window Closure

- Layered closure with 0 or 2-0 vicryl
- Internal oblique first deep to external oblique split.
  - Key to prevent potential hernia
- External oblique fascia to crest and abductory fascia second

Courtesy of Milton L. Chip Routt, Jr. MD and Mark Adams, MD
Lateral Window Closure

- Final appearance of two layer lateral window closure

Courtesy of Milton L. Chip Routt, Jr. MD and Mark Adams, MD
Middle Window Closure

- Repair floor of inguinal canal/inguinal ligament first with 2-0 vicryl
- Care taken to reapproximate prior 2 mm cuff of ligament and avoid tearing

Courtesy of Milton L. Chip Routt, Jr. MD and Mark Adams, MD
Middle Window Closure

- Repair roof of canal/external oblique fascia with 0 or 2-0 vicryl
- Take care to avoid ilioinguinal nerve on superior fascial limb
- Complete fascial closure back to ASIS

Courtesy of Milton L. Chip Routt, Jr. MD and Mark Adams, MD
Wound Closure

- Once all deep layers closed, irrigate superficial layer
- Consider reattaching subcutaneous tissue back down to fascia to minimize dead space
- Superficial drain if desired
- Skin reapproximation with 2-0 vicryl
- Skin closure

Courtesy of Milton L. Chip Routt, Jr. MD and Mark Adams, MD
References

1) Discussion and observation with Dr. Milton L. Chip Routt, Jr. 2011 – Present
Patient Example
28 yo female
MVC
L hip pain
HD stable
NVI L LE
Diagnosis?

Associated Both Column

- Anterior column fragment (1)
- Posterior column fragment (2)
- Intact ilium (3)
- Both the anterior column and posterior column fragments are separate from the intact ilium
Operative Plan?

- Ilioinguinal exposure:
  - Allows exposure of all fractures and is necessary for cleaning, reducing, and implant placement.
- Reduce anterior column (1) to intact ilium (3)
- Place pelvic brim plate and crest screw to buttress column and link anterior column to intact ilium
- Reduce posterior column (2) to intact ilium (3) and anterior column (1)
- Place screws from pelvic brim into posterior column and intrapelvic plate to buttress
Operative Plan?

- Ilioinguinal exposure:
  - Allows exposure of all fractures and is necessary for cleaning, reduction, and implant placement
Reduction and fixation sequence:

- Reduce anterior column (1) to intact ilium (3)
- Place pelvic brim plate and crest screw to buttress column and connect anterior column to intact ilium
- Now it is a two part fracture
- Reduce posterior column (2) onto the intact ilium (3) and anterior column (1)
- Place screws from pelvic brim down into posterior column
- Place intrapelvic plate maintain reduction and buttress posterior column (2) to intact ilium (3) reduction