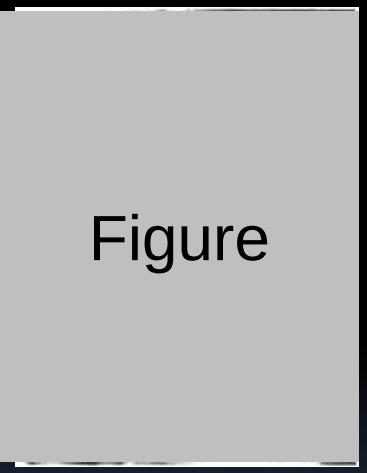
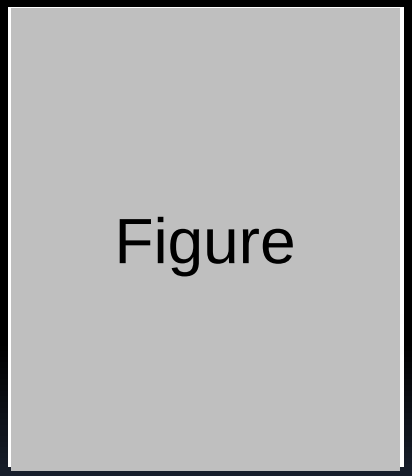
RADIOLOGY OF THE NORMAL ACETABULUM

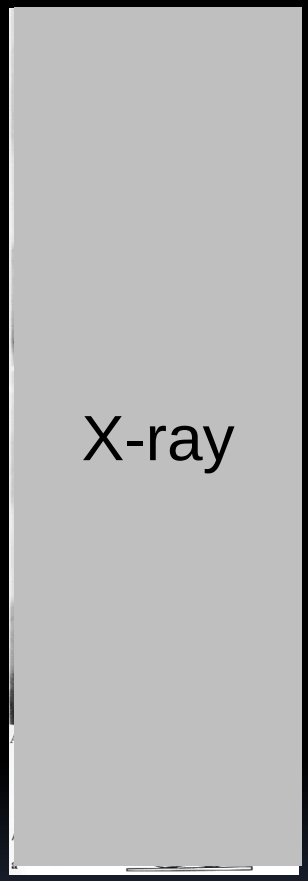
Six radiological landmarks should be recognized on the Anterior – Posterior radiograph:

1. Posterior wall of the acetabulum
2. Anterior wall of the acetabulum
3. Roof / "dome"
4. Tear drop/radiographic U
5. Ilio-ischial line
6. Ilio-pectineal line / brim of true pelvis

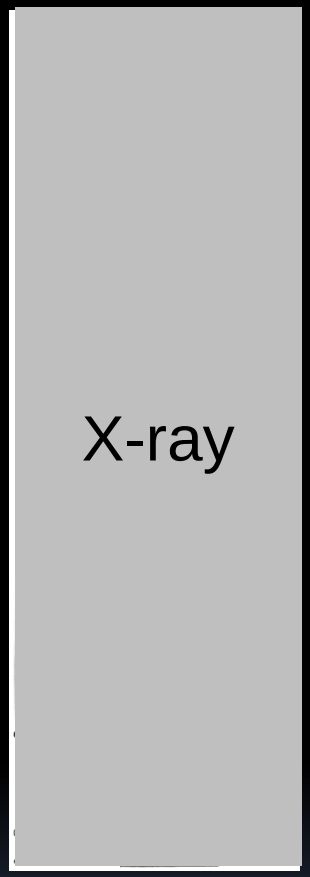




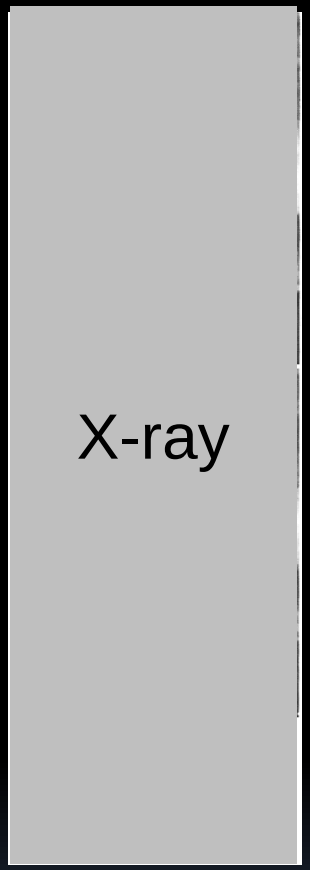
AP VIEW



OBTURATOR OBLIQUE VIEW



ILIAC OBLIQUE VIEW



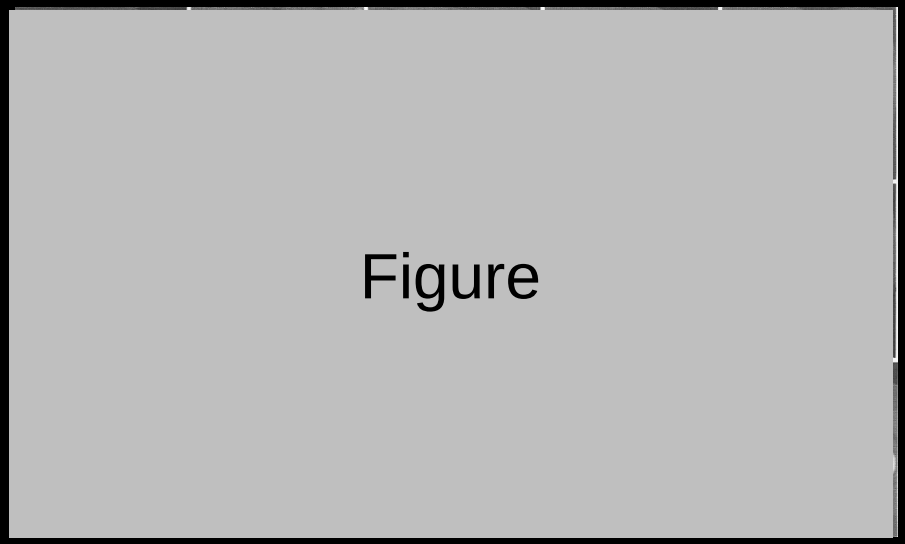
	Antero-posterior view	Obturator-oblique view	Iliac-oblique view
Landmarks of anterior column	• Ilio-pectineal line • Anterior wall • Teardrop and ± relationships with ilio-ischial line	• Ilio-pectineal line • Anterior part of obturator ring	• Anterior wall of the acetabulum • Anterior border of iliac wing and crest • Iliac wing
Landmarks of posterior column	• Posterior wall of acetabulum • Ilio-ischial line	• Posterior wall of acetabulum • Posterior part of obturator ring	• Ilio-ischial line •Quadrilateral surface of ischium • Posterior border of innominate bone

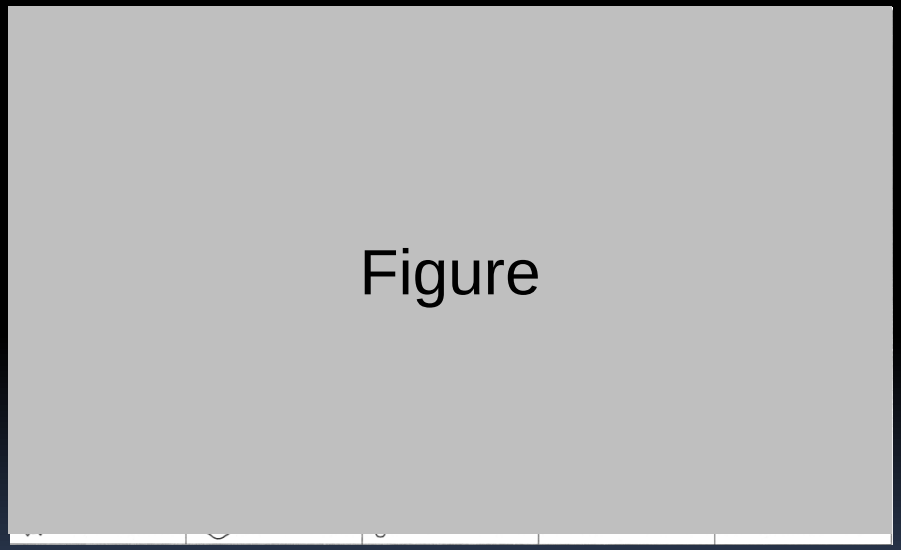
RADIOLOGY OF THE NORMAL ACETABULUM- 2

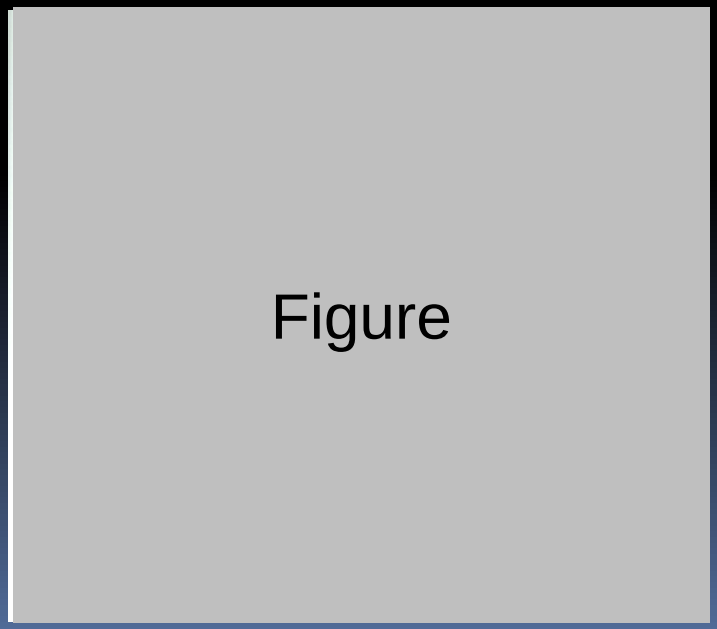
Theoretically, fracture lines can not “escape” the CT scan if sections are 1-3mm.

CT Scanning allows for better evaluation of:

- Head/Neck fractures
- Impaction
- Wall Size
- Intra-articular debris
- Fracture pattern
- Fracture displacement
- Sacral fractures
- SI involvement
- Comminution
- Approach







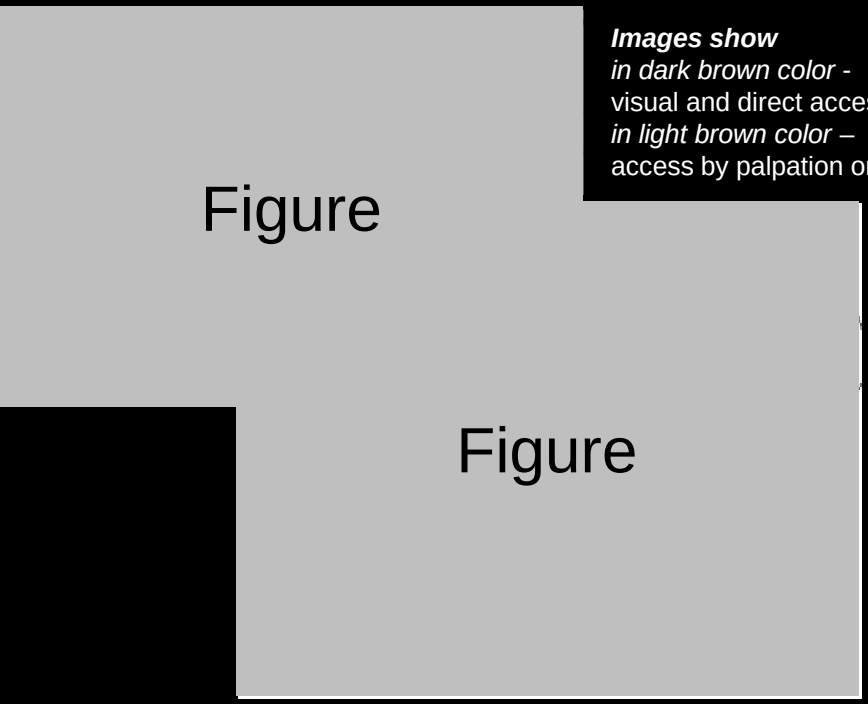
The figures above show a 15 section scan of the normal innominate bone. The inner numbers refer to:

1) Posterior wall of the acetabulum
2) Anterior wall of the acetabulum
3) Subchondral bone of the anatomical roof
4) Posterior column
5) Pelvic brim (ilio-pectineal line)

SURGICAL APPROACHES

Kocher- Langenbeck

Images show
in dark brown color - visual and direct access
in light brown color – access by palpation only

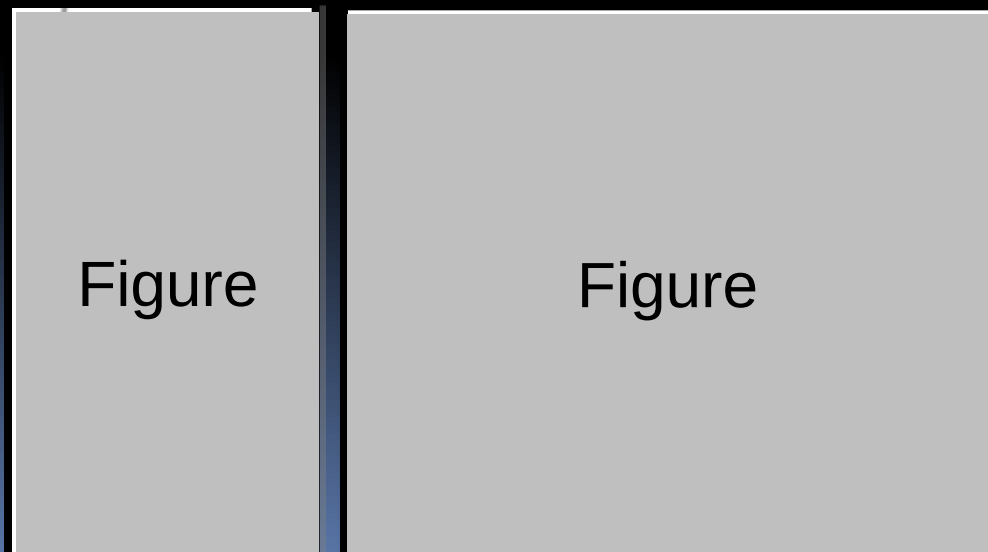


The **Kocher-Langenbeck approach** is a nonextensile approach to the posterior acetabular column.
It allows direct visualization of the acetabular articular surface, femoral head, posterior wall, posterior column, ischium, and greater and lesser sciatic notches

Indications
•ORIF of fractures of the posterior wall/ column
•Transverse fractures
•Combined fracture patterns in which the posterior column or wall needs to be reduced under direct vision

Ilioinguinal approach

The **Ilioinguinal approach** provides **access to** the inner and anterior aspect of the innominate bone from the sacroiliac joint to the pubic symphysis.
Three intervals are utilized:
Lateral window - access to iliac fossa/ anterior SI joint
Middle window - ASIS to iliopectineal eminence, including quadrilateral plate
Medial window - quadrilateral plate to retropubic space
Corona mortis- retropubic anastomosis between the obturator a. and external iliac a. or inferior epigastric a.
Iliopectineal fascia separates medial and middle window or tunica musculorum (iliopsoas and femoral n.) from tunica vasculorum (femoral a. and v.)
Articular reductions are indirect. The joint can not be directly visualized with this approach. Reductions are based on restoration of extraarticular anatomy.
Indications
ORIF of the anterior wall/column, anterior column + posterior hemitransverse, some both column, some “T” types



SURGICAL APPROACHES

Figure

Figure

Extended Iliofemoral

The **Extended Iliofemoral approach** exposes the **entire lateral innominate bone** by posterior reflection of the abductors and short external rotators. It can be extended anteriorly into the lateral window of the ilioinguinal incision. The extended iliofemoral approach allows **simultaneous visualization of both posterior and anterior columns**. This approach involves significant stripping of the bone, is associated with **heterotopic bone** formation, and an extended recovery period. Prolonged abductor weakness is to be expected.

Indications

- Transverse fractures with significant posterior wall involvement
- Transtectal associated transverse + posterior wall fractures, or T-shaped fractures, particularly with posterior wall comminution
- T-shaped fractures with widely displaced vertical limbs or pubic symphysis dislocation
- Both-column fractures with posterior wall or posterior column comminution, sacroiliac joint involvement, or very high posterior column involvement
- When ORIF of associated or transverse fractures is delayed by three or more weeks.

This image shows
in dark brown: Direct access
in light brown: Limited visual and digital or clamp access

POSTERIOR WALL FRACTURES

- A separation of posterior articular surface
- Posterior column remains attached
- Associated with posterior femoral head dislocation
- Subtypes
  - Fracture confined below the roof
  - Posterosuperior fracture involving roof
  - Posteroinferior fracture involving subcotyloid groove
  - Fractures associated with marginal impaction
  - Fractures with multiple fragments

Figure

Figure

AP Radiograph

- Disruption of posterior wall of acetabulum
- Femoral head dislocation
- "Gull sign" is pathognomonic

AP VIEW

X-ray

OBTURATOR OBLIQUE VIEW

X-ray

ILIAC OBLIQUE VIEW

X-ray

Judet Radiographs

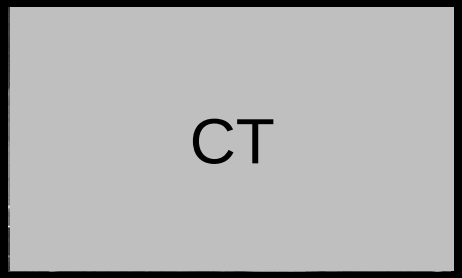
- Obturator oblique
  - Posterior wall fracture displacement - iliopectineal line intact
- Iliac oblique
  - Intact ilioischial line and anterior wall
  - Posterior wall superimposed on iliac wing, difficult to see

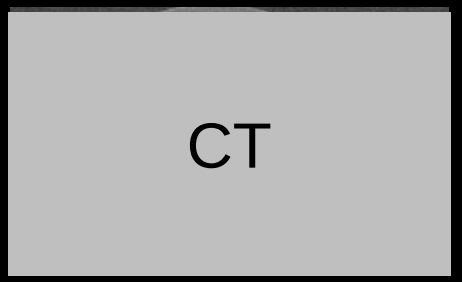
X-ray

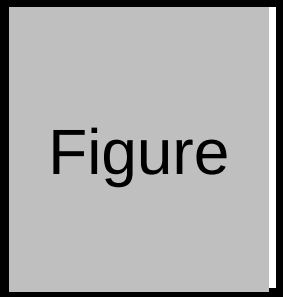
POSTERIOR WALL FRACTURES - 2

Surgical Indications

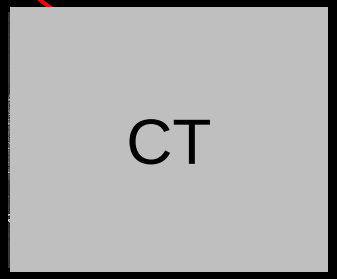
1. Displaced posterior wall fracture
2. Incongruent hip joint
3. Unstable hip joint
4. Progressive loss of reduction
5. Larger posterior wall fragment > 40% (CT)
6. Wall fragment size 20-40% with unstable hip exam

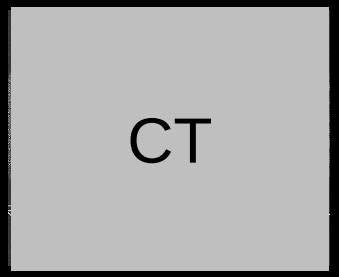






Note associated femoral head fracture
And intra-articular loose body





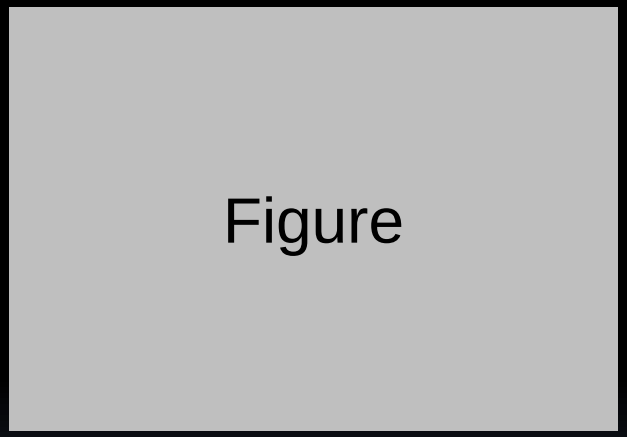
1. **Disimpact and fix impacted fragments**
2. **Fix fragments with lag screws +/- washer (large fragments)**
3. **Spring plates for small or fragmented pieces**
4. **Apply buttress plate (an underbent plate)**

CT allows comprehensive study of the bone fragment as it helps to assess:

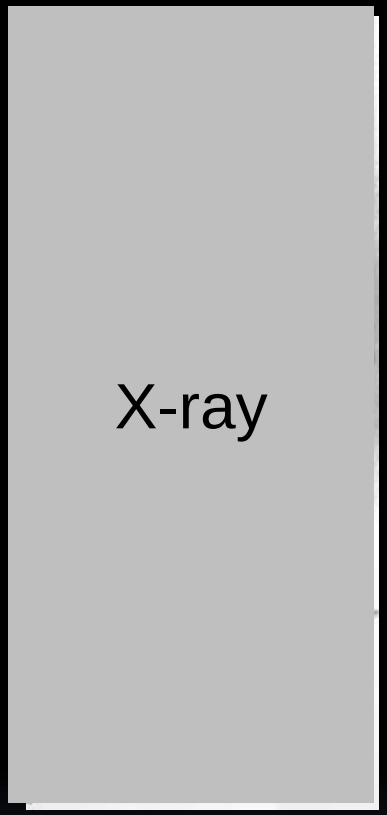
1. Fragment size
2. Degree of posterior displacement
3. Origin and direction of fracture line
4. Amount of articular surface affected
5. Position of femoral head
6. Presence of marginal impaction
7. Presence of intra-articular loose bodies
8. Ligamentum teres avulsion fracture

POSTERIOR COLUMN FRACTURES

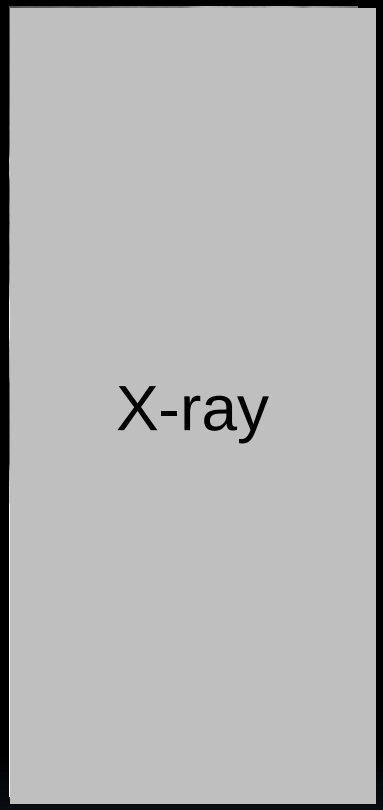
- Disruption of ischium
- Fracture line originates at greater sciatic notch travels across retroacetabular surface, exits at obturator foramen
- inferior-pubic ramus fractured
- Medial displacement of femoral head



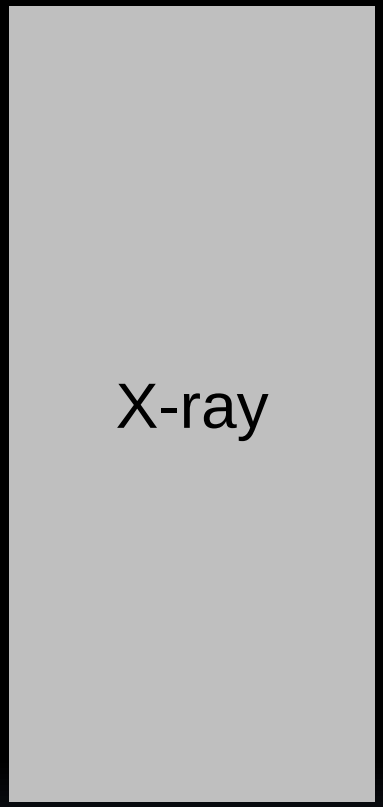
AP VIEW



OBTURATOR OBLIQUE VIEW



ILIAC OBLIQUE VIEW



AP Radiograph

- Ilioischial line disrupted
- Posterior column & femoral head displaced medially
- Roof of acetab intact and of normal density
- Iliopectineal line intact
- Teardrop is intact

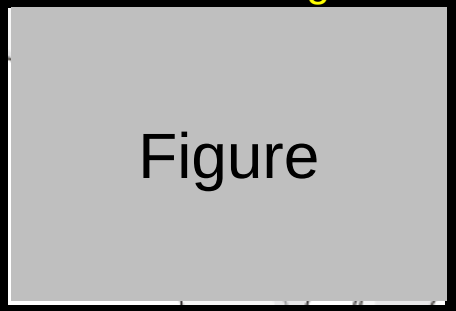
Judet Radiographs

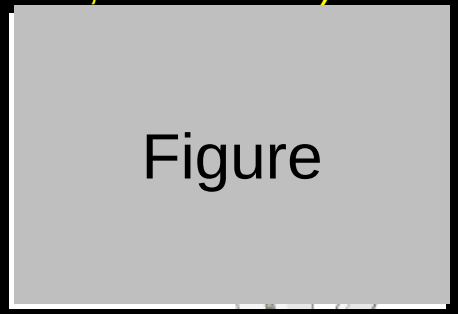
- Obturator oblique
  - Intact anterior column
  - Ilioischial line is discontinuous
- Iliac oblique
  - Highlights posterior column fracture
  - Anterior wall intact
  - Shows level of fracture exit relative to sciatic notch

POSTERIOR COLUMN FRACTURES - 2

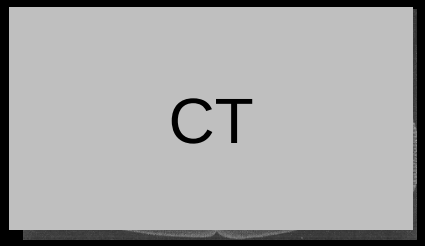
Surgical Indications

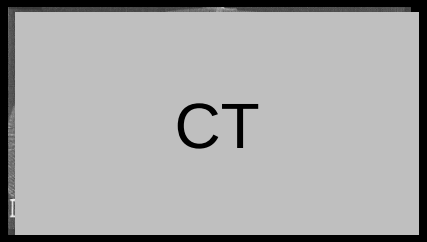
1. Displaced posterior column fracture (≥2 mm)
2. Incongruent hip joint
3. Unstable hip joint
4. Progressive loss of reduction
5. Roof Arc angle ≤70° (Vrahas, JBJS 1999)

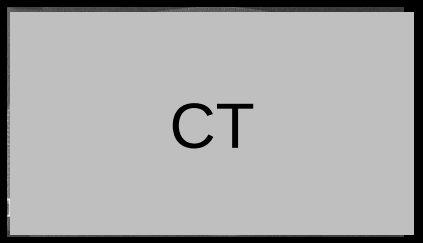




1. **Reduce fracture using Weber clamp or pelvic reduction clamp**
2. **Lag screws and then apply short plate along medial edge of post column**
3. **Apply 2nd plate spanning post column, securing ischium to ilium OR Posterior Column Screw**







CT shows (R) side

1. fracture appears on section involving roof of greater sciatic notch
    1. fracture line orientation begins fwd and inward 50’
    2. Post column frag internally rotated (red arrow)
2. fracture continues to inferior-pubic ramus, which is broken in its mid part
3. **Orientation of fracture is coronal**

NOTE CONTRALATERAL (L) SIDE HAS “T” TYPE fracture

ANTERIOR WALL FRACTURES

- Disruption of a portion of the anterior roof of the acetabulum
- Fragment often trapezoidal involving upper surface of superior ramus
- Much of anterior column is undisturbed
- inferior-pubic ramus not fractured
- Ilioischial line may be disturbed in 2 points

Figure

Figure

AP VIEW

X-ray

OBTURATOR OBLIQUE VIEW

X-ray

ILIAC OBLIQUE VIEW

X-ray

AP Radiograph

- Iliopectineal line broken at 2 points
- Anterior wall of acetabulum disrupted
- Femoral head dislocated anteriorly and externally rotated
- Ilioischial line intact, while teardrop displaced inwards

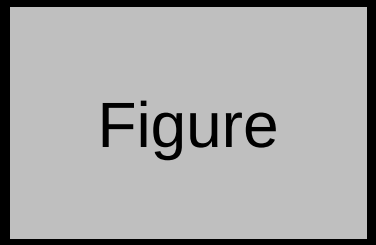
Judet Radiographs

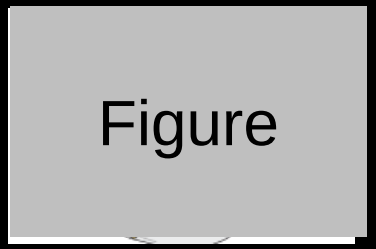
- Obturator oblique
  - Fracture of anterior wall confirmed, trapezoidal in shape
- Iliac oblique
  - Integrity of posterior column confirmed
  - AIIS intact
  - Iliac wing intact from AIIS to iliac crest

ANTERIOR WALL FRACTURES - 2

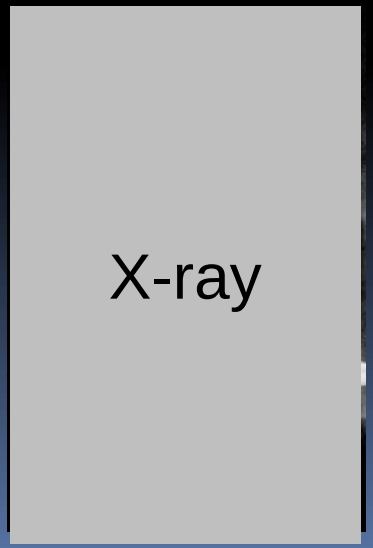
Surgical Indications

1. Displaced anterior wall fracture (large or high fragment)
2. Incongruent hip joint
3. Unstable hip joint
4. Progressive loss of reduction

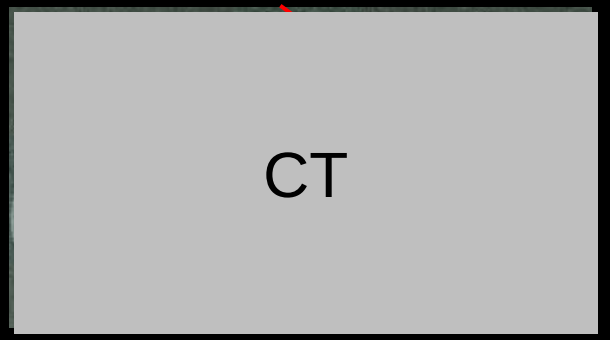


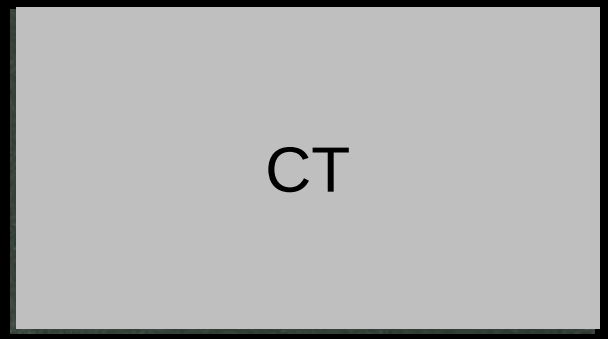


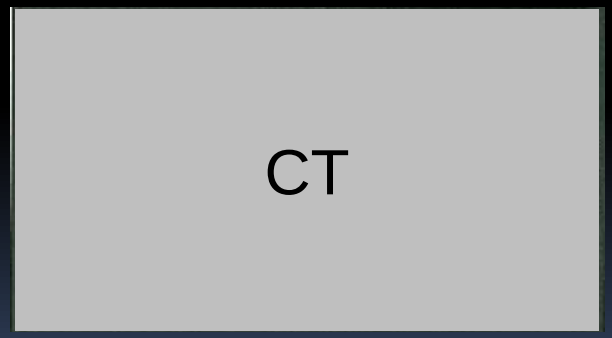
1. **Apply interfrag lag screws to reduce fragments, beware of intraarticular penetration**
2. **Apply neutralization plate bridging iliac fossa anterior to SI to superior pubic ramus**



fracture line detaching ant wall & quadrilateral plate directed anterior





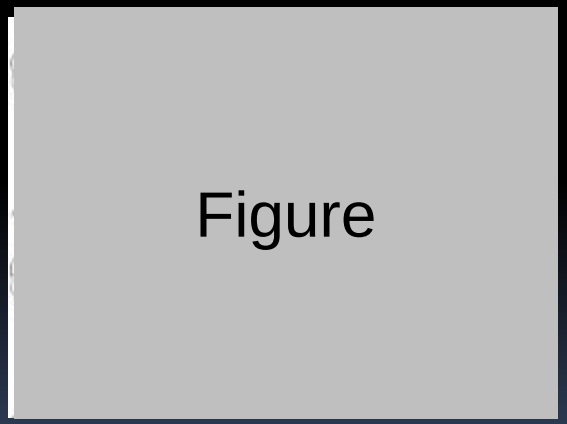


CT confirms that iliac wing, post column, inferior-pubic ramus and pubic angle are intact. The only disturbed part is the middle portion of the anterior column which is the ant wall.

ANTERIOR COLUMN FRACTURES

Subtypes based on location of fracture exit through the innominate bone

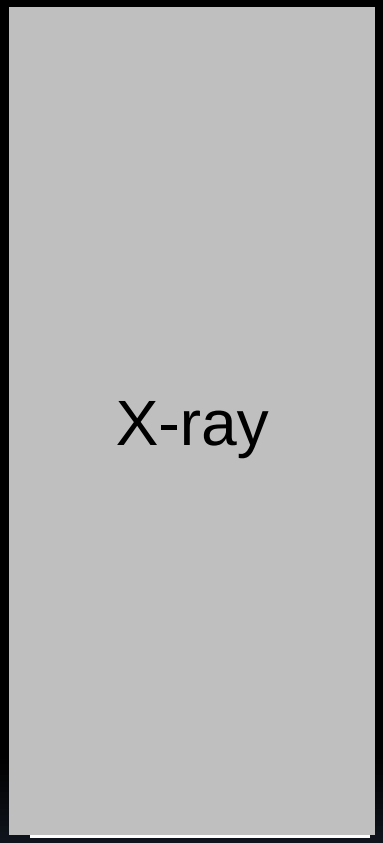
- Very low
  - Majority of articular surface intact
- Low (psoas gutter, below AIIS)
  - Femoral head subluxated anterior w/ fragment
- Intermediate (anterior interspinous notch)
  - Femoral head subluxated anterior w/ fragment
- High (Iliac crest)
  - Often secondary fracture line in iliac fragment



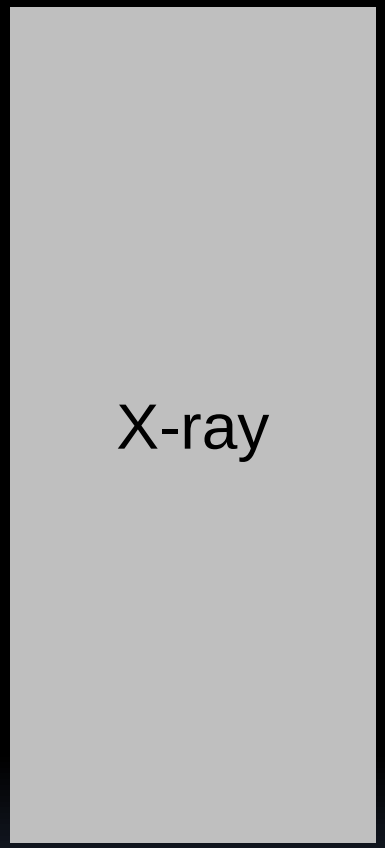
AP Radiograph

- Disruption of iliopectineal line
- Fracture of the inferior-pubic ramus
- Intact ilioischial line

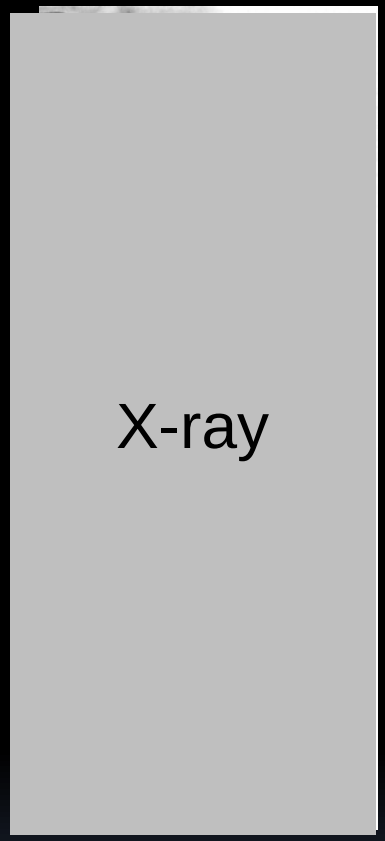
AP VIEW



OBTURATOR OBLIQUE VIEW



ILIAC OBLIQUE VIEW



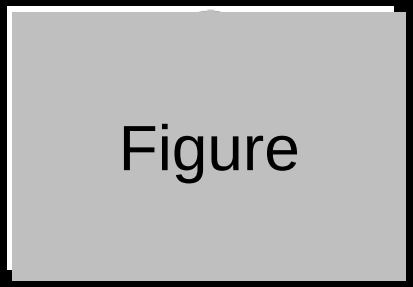
Judet Radiographs

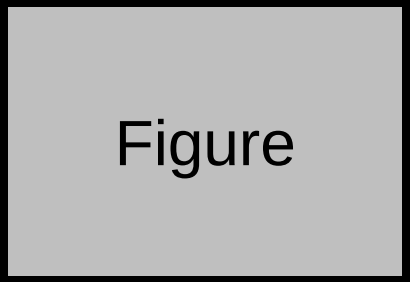
- Obturator oblique
  - Best illustrates disruption of iliopectineal line
  - Demonstrates anterior column displacement by femoral head
  - Posterior wall intact
- Iliac oblique
  - May demonstrate an associated quadrilateral plate fracture
  - Shows iliac wing component displacement

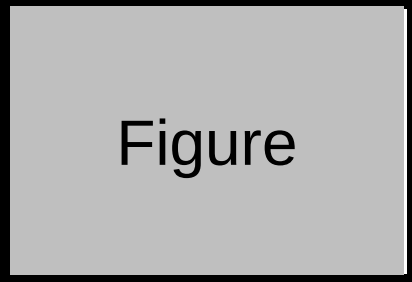
ANTERIOR COLUMN FRACTURES - 2

Surgical Indications

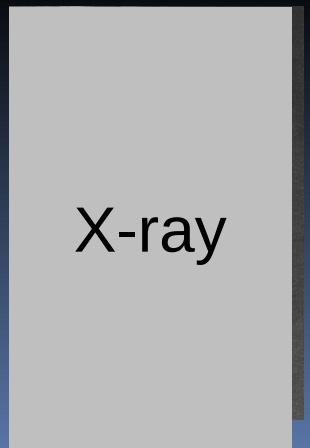
1. Displaced anterior column fracture
2. Incongruent or unstable hip joint
3. Progressive loss of reduction
4. Prophylactic stabilization of minimally displaced anterior column fracture in elderly or non-compliant patient
5. Roof Arc angle of ≤ 20° (Vrahas, JBJS 1999)

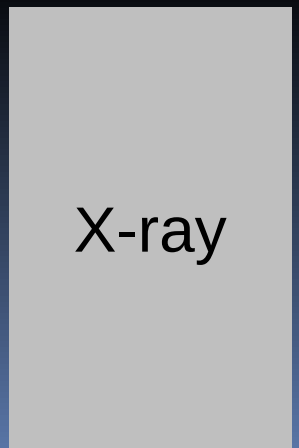


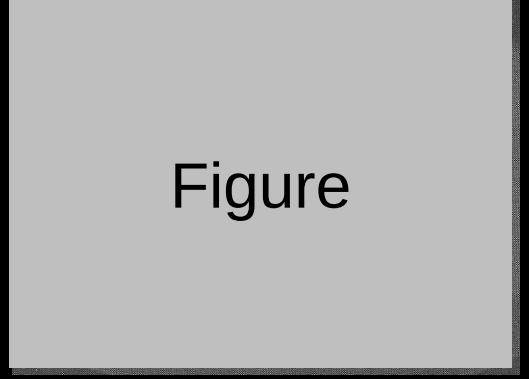


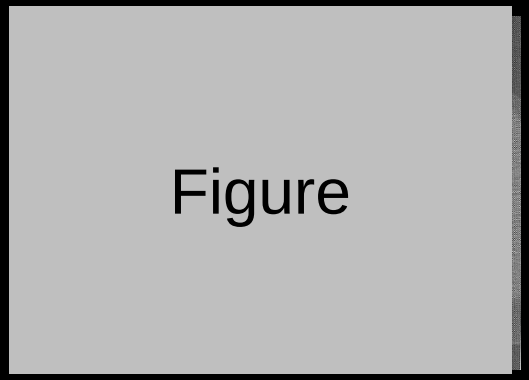


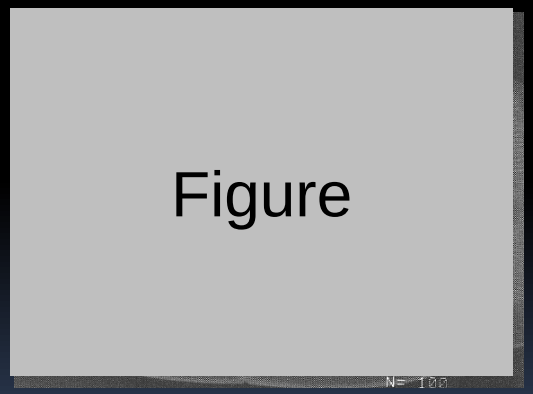
1. **Reduce fracture at exit point from innominate bone**
2. **Lag screw or plate iliac wing.**
3. **Reduce fracture closer to the acetabulum and apply pelvic brim neutralization plate bridging iliac fossa anterior to SI to superior pubic ramus or insert anterior column screw**











CT confirms that posterior column is connected to intact part of iliac wing. The level of detachment of the anterior column is defined.

PURE TRANSVERSE FRACTURES

- Fractured anterior and posterior columns
- Subclassified based on level of fracture through acetabular dome
- Often associated with a posterior wall
- Subtypes
  - Transtectal – fracture through roof of acetabulum
  - Juxtatectal – fracture through highest point of cotyloid fossa
  - Infratectal – through the cotyloid fossa

Figure

AP Radiograph

- Iliopectineal line disrupted
- Ilioischial line disrupted
- Anterior wall disrupted
- Posterior wall disrupted

AP VIEW

X-ray

OBTURATOR OBLIQUE VIEW

X-ray

ILIAC OBLIQUE VIEW

X-ray

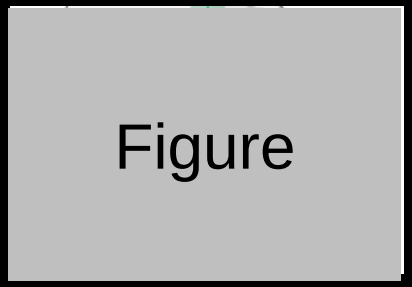
Judet Radiographs

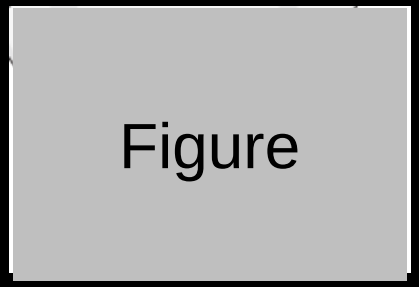
- Obturator oblique
  - Best demonstrates fracture orientation
  - Confirms uninjured obturator ring
- Iliac oblique
  - Demonstrates fracture of quadrilateral surface
  - Posterior surface usually greatest displacement
  - Iliac wing not fractured

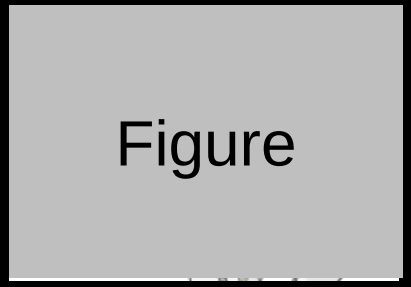
PURE TRANSVERSE FRACTURES -2

Surgical Indications

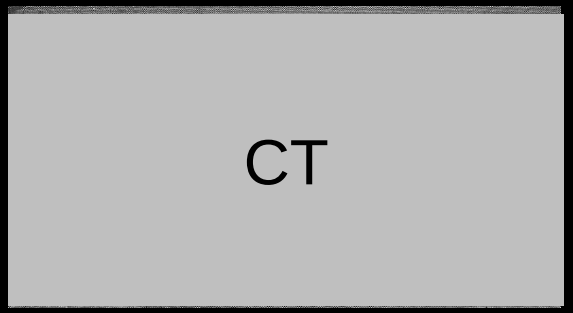
1. Displaced (≥ 2mm) transverse fracture, roof arc angles <45° on AP
2. Incongruent hip joint
3. Unstable hip joint
4. Progressive loss of reduction
5. Prophylactic stabilization of minimally displaced fractures in elderly or non-compliant patients

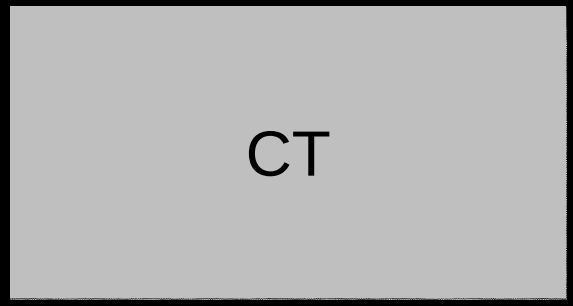


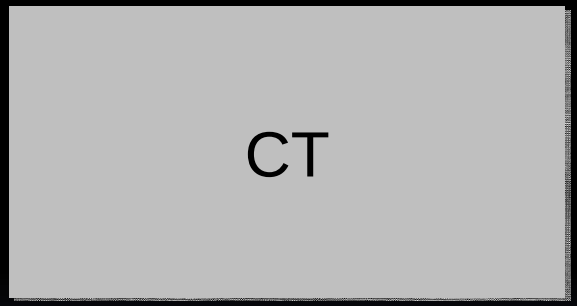


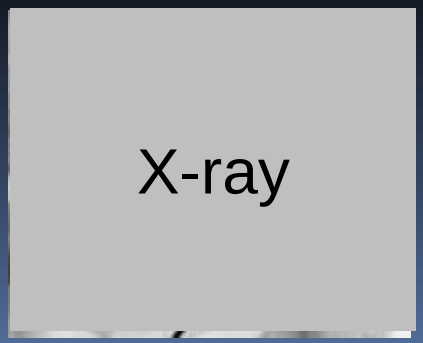


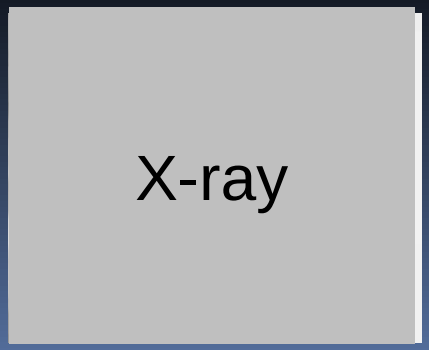
1. **Approach the more displaced side first (anterior vs. posterior) - <u>most common posterior approach</u>**
2. **Reduce fracture using Webber or pelvic reduction clamp**
3. **Place plate just anterior to sciatic notch**
4. **Apply 'anterior column' screw, directed anteriorly at oblique angle above greater sciatic notch toward superior pubic ramus and/or apply another plate from ischium to anterior column**

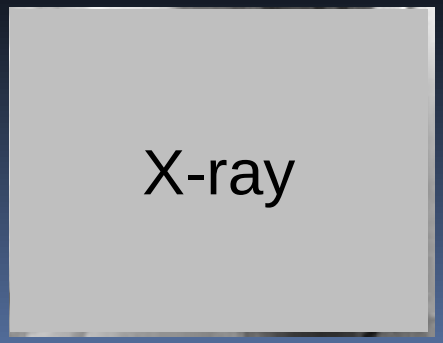












In CT: fracture appears as a sagittal line. The fracture line is in the AP direction, and begins proximal medial and ends distal lateral. The iliac wing and obturator ring are intact.

T-TYPE FRACTURES

- A transverse fracture of acetabulum with an associated vertical component
- Transverse component of "T" type is similar to pure transverse fracture
- T-shaped fractures with a posterior wall component are a variant of the transverse and posterior wall type
- Roof segment remains attached to iliac wing
- Orientation of the stem of fracture is variable
  - Anterior, Vertical, or Posterior
- Central displacement of femoral head with anterior and posterior column rotating, around head "saloon door"

AP VIEW	OBTURATOR OBLIQUE VIEW	ILIAC OBLIQUE VIEW
X-ray	X-ray	X-ray

Figure

Figure

AP Radiographs

- All vertical landmarks are fractured
- Always an intact segment of roof attached to iliac wing
- inferior-pubic ramus fracture noted

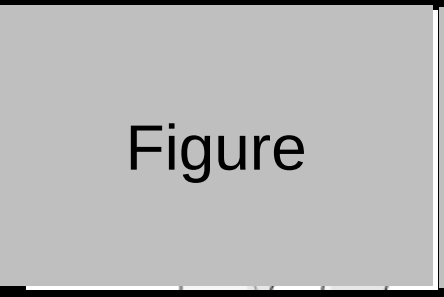
Judet Radiographs

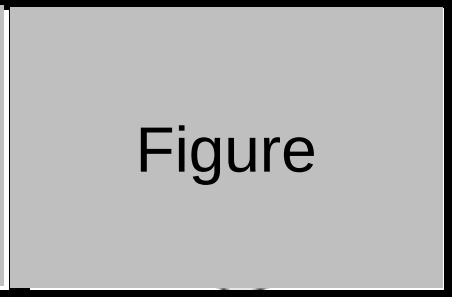
- Obturator oblique
  - Fracture of inferior-pubic ramus confirmed
  - Iliopectineal line disrupted
- Iliac oblique
  - Confirms fracture of posterior column (ilioischial line)
  - fracture line separating 2 columns
  - May demonstrate fracture through quadrilateral surface

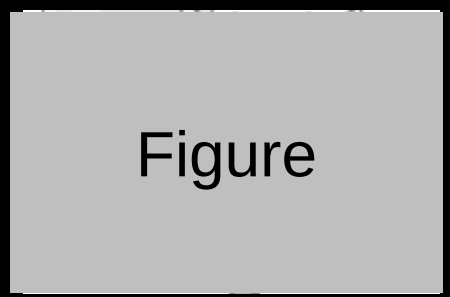
T-TYPE FRACTURES - 2

Surgical Indications

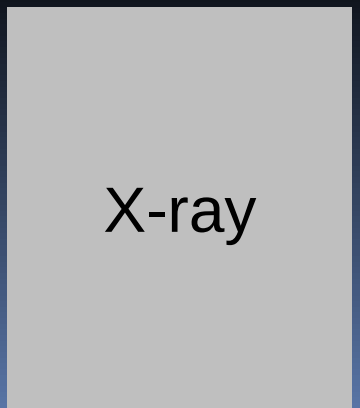
1. Unstable hip
2. Loss of congruence
3. All displaced fractures
4. Incongruence or diastasis of articular surface ≥ 2mm
5. Interposition of soft tissue
6. Hip displacement

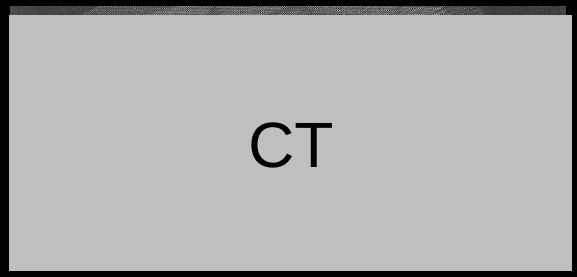


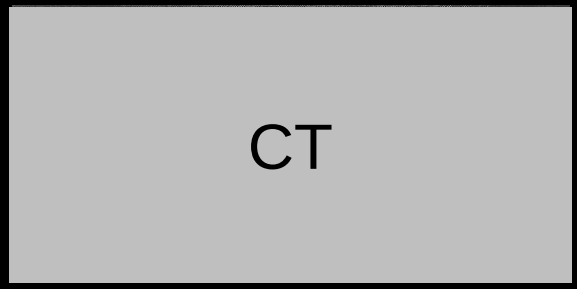


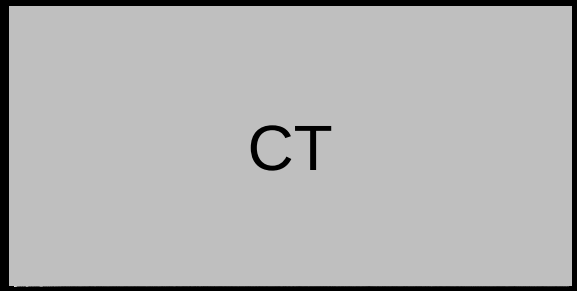


1. **Approaches - combined Stappa/ilioinguinal and Kocher Langenbeck or extended iliofemoral/Big "T"**
2. **Approach more displaced fracture first (<u>most common anteriorly</u>)**
3. **Reduce, lag, and plate fractures**









CT sections through the iliac wing show intact bone. Transverse component is, as always, AP oriented. Vertical component divides only the ischio-pubic component. It divides the cotyloid fossa. The ischio-pubic notch is divided in vertical or anterior shaped frx, but is spared in most post T-shaped fracture.

ASSOCIATED POST COLUMN AND POST WALL FRACTURES

- Posterior wall fracture
  - Same as in elementary patterns
- Posterior column fracture
  - Fracture begins in cavity created by posterior wall fracture
  - Fracture pattern as in elementary patterns
- Central displacement or dislocation of femoral head

Figure

AP VIEW	OBTURATOR OBLIQUE VIEW	ILIAC OBLIQUE VIEW
X-ray	X-ray	X-ray

AP Radiograph

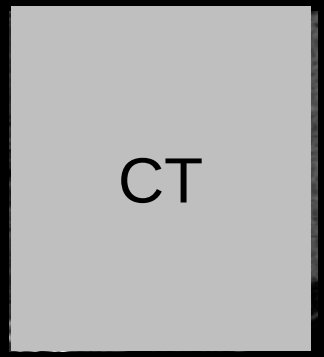
- Disrupted ilioischial line
- Disrupted posterior wall
- Posterior dislocation of femoral head
- Intact iliopectineal line, anterior wall

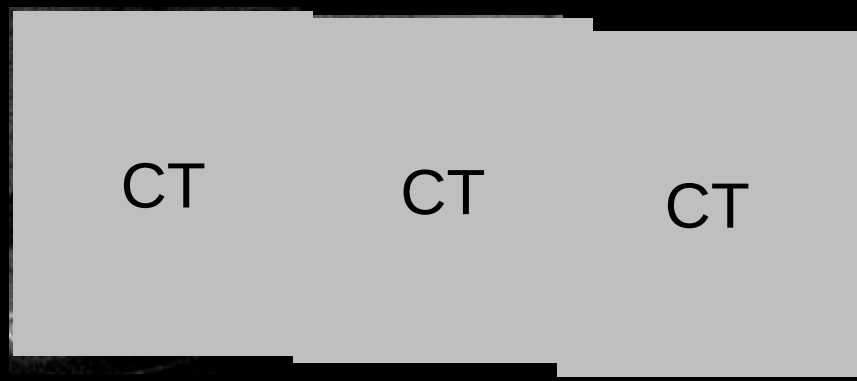
Judet Radiographs

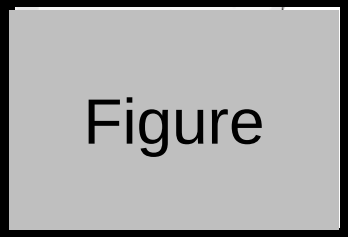
- Obturator oblique
  - Intact iliopectineal line
  - Posterior wall fracture visualized
  - Direction of the line detaching the posterior column can be seen which may split the ischium or involve the obturator foramen.
- Iliac oblique
  - Demonstrates posterior column fracture displacement (ilioischial line)
  - Demonstrates level of fracture through greater sciatic notch

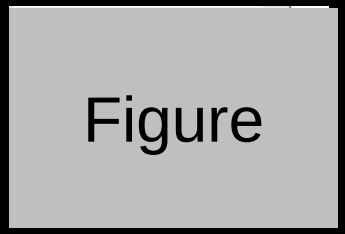
ASSOCIATED POST COLUMN AND POST WALL FRACTURES - 2

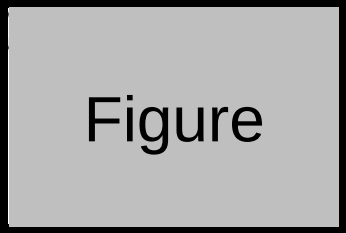
Surgical Indications - as with posterior column and wall separately

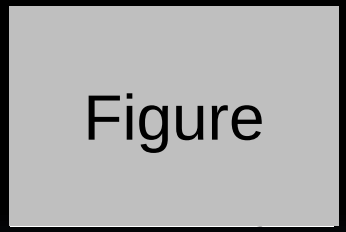












CT shows the post wall (red arrow) fragment (sagittal), as well as associated marginal impaction (yellow arrow). Often the femoral head will follow the wall fragment. In contrast, note that the (coronal) fracture line at the level of the roof defines disruption to the posterior column (green arrow).

1. **Begin w/ post column reduction using Webber clamp or pelvic reduction clamp**
2. **Fix fracture using medially placed recon plate and/or lag screws**
3. **Reduce and fix posterior wall as if isolated with lag screws and buttress plate**

ASSOCIATED TRANSVERSE AND POST WALL FRACTURES

- 2nd most common associated fracture pattern after both-column
- Highest incidence of complications: pre-op sciatic palsies and secondary osteonecrosis of femoral head
- Transverse component as in elementary patterns, Posterior wall component variable
- Obturator foramen intact

Figure

Figure

AP Radiograph

- Ilioischial and iliopectineal lines disrupted
- Posterior hip dislocation common
- Obturator ring intact
- Inferior-pubic fragment displaced medially

AP VIEW

X-ray

OBTURATOR OBLIQUE VIEW

X-ray

ILIAC OBLIQUE VIEW

X-ray

Judet Radiographs

Obturator oblique

- Obliquity of transverse fracture seen
- Integrity of obturator ring confirmed
- Size and extent of posterior wall fracture delineated

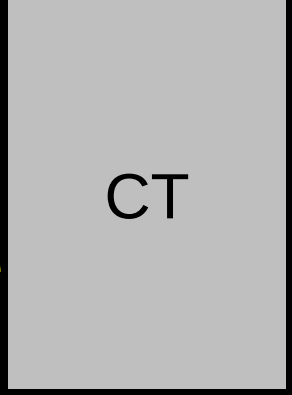
Iliac oblique

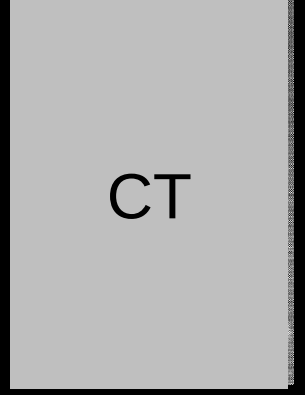
- Integrity of iliac wing confirmed
- Fracture through posterior column demonstrated

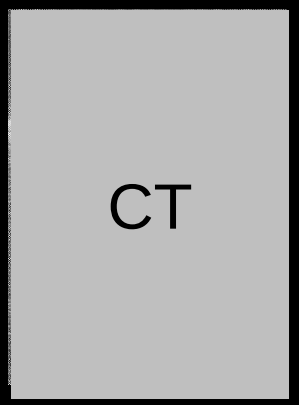
ASSOCIATED TRANSVERSE AND POST WALL FRACTURES - 2

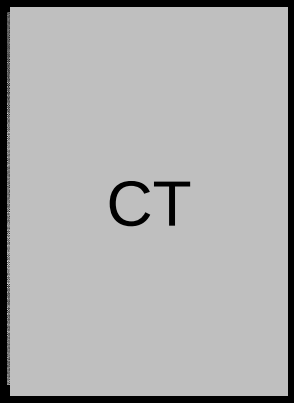
Surgical Indications

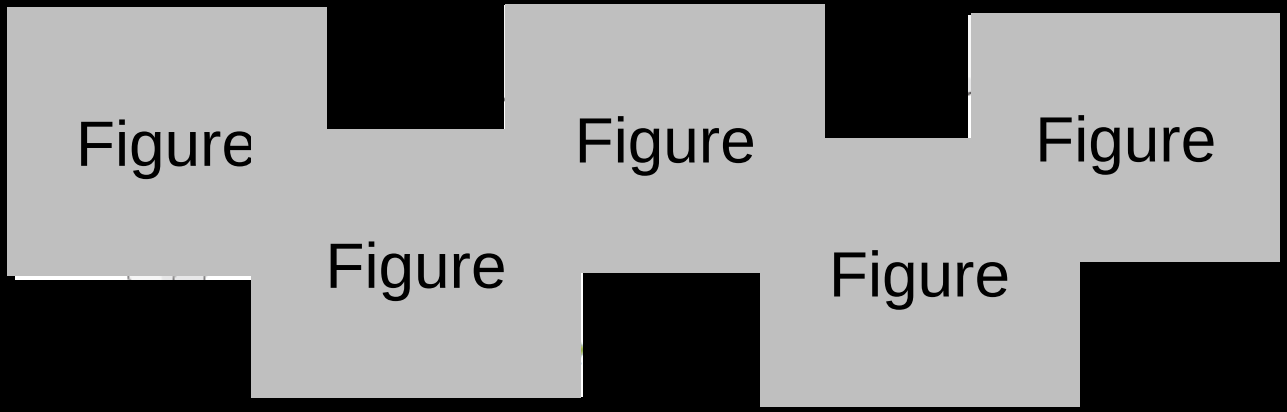
1. Loss of congruence
2. All displaced fractures especially with transtectal or juxtatectal fracture line
3. Incongruence or diastasis of articular surface
4. Interposition of soft tissue
5. Hip displacement
6. Instability of the hip (depending on size of fragment of the posterior wall)



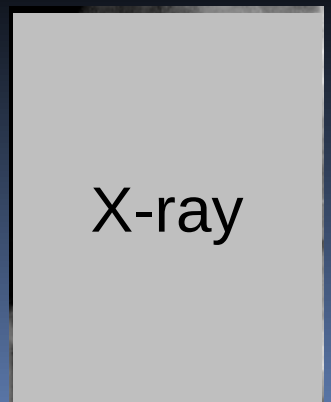


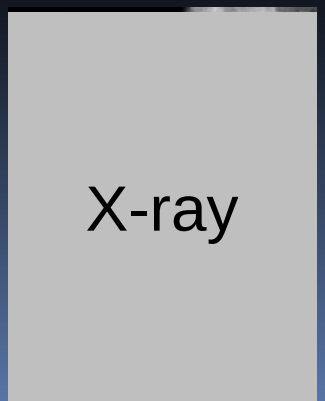


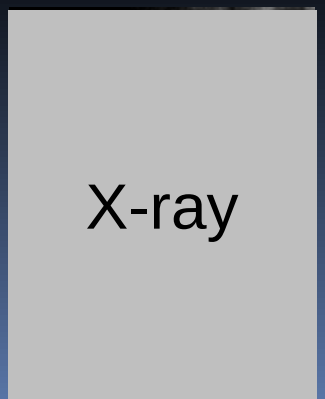




1) **Reduce and fix transverse fracture through posterior approach**
2) **Reduce and fix the posterior wall fracture as if isolated**
3) **Place anterior column screw**







CT demonstrates direction of femoral head dislocation. The transverse fracture is in the AP direction (red arrow). The posterior wall fracture (yellow arrow) can be seen as a punch out of the transverse fracture line. Both the post wall fragments and marginal impaction can be appreciated.

ASSOCIATED ANTERIOR COLUMN AND POST HEMITRANSVERSE FXS

- Anterior column fracture
- Posterior column fracture line mimics the posterior half of a transverse type fracture
- A roof fragment remains attached to iliac wing
- Displacement of anterior column fracture often severe
- Differentiation from T-type and Both Column fractures:

T- type- anterior limb is low type anterior column fracture and mimics transverse acetabular fracture

Both column- no part of articular surface is attached to axial skeleton (spur sign on obturator oblique)

Figure

Figure

AP VIEW

X-ray

OBTURATOR OBLIQUE VIEW

X-ray

ILIAC OBLIQUE VIEW

X-ray

AP Radiographs

- Anterior lesion is as elementary anterior column/anterior wall fracture other than low type
- Femoral head follows anterior component
- Disrupts ilioischial and iliopectineal lines

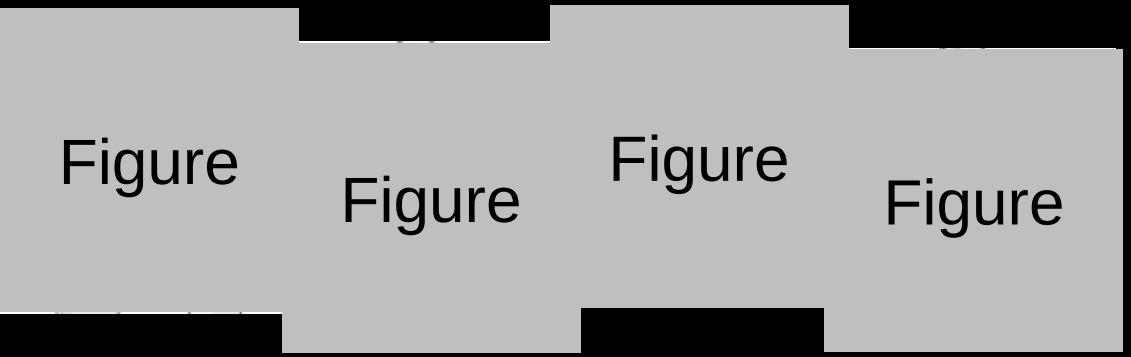
Judet Radiographs

- Obturator oblique
  - Iliopectineal line disrupted in one or more locations
  - Point of rupture of posterior column well visualized
- Iliac oblique
  - Ilioischial line disrupted in one location
  - Highlights iliac wing fracture

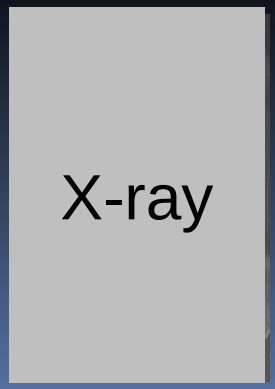
ASSOCIATED ANT COLUMN AND POST HEMITRANSVERSE FRACTURES - 2

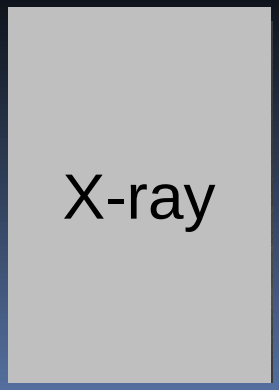
Surgical Indications

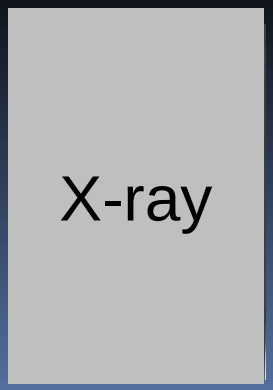
1. Unstable hip
2. Loss of congruence or diastasis of articular surface
3. All displaced fractures especially with weight-bearing dome involvement
4. Interposition of soft tissue
5. Hip displacement

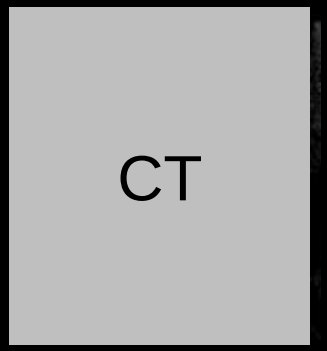


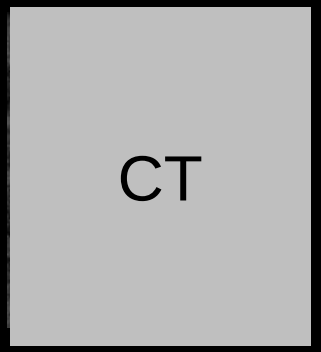
1. **Approach- Stoppa** (Cole, CORR 1999) **or Ilioinguinal, always reduce anterior column 1st, begin peripherally at crest (for column involvement)**
2. **Augment using a buttress plate along pelvic brim**
3. **Posterior column screw OR posterior approach**

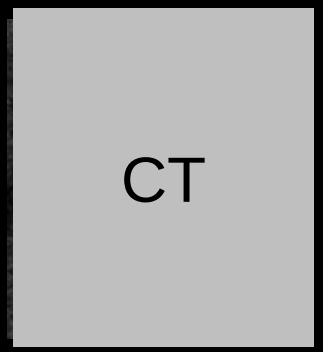


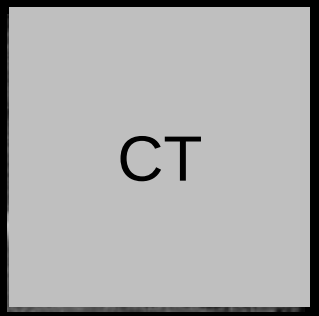












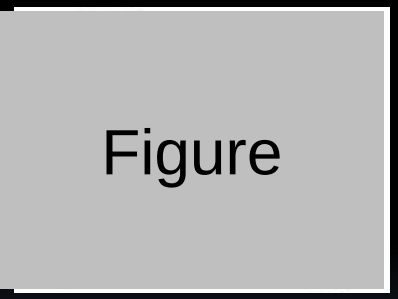
CT demonstrates the two components. The anterior column fracture appears as a coronal fracture line (yellow arrow). The anterior fragment is frequently comminuted at the level of the obturator canal. The post hemitransverse (red arrow) component CT sections most frequently has the typical sagittal (AP) direction.

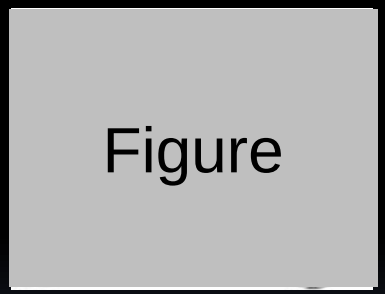
ASSOCIATED BOTH-COLUMN FRACTURES

Acetabular fracture where no portion of the articular surface remains attached to the axial skeleton

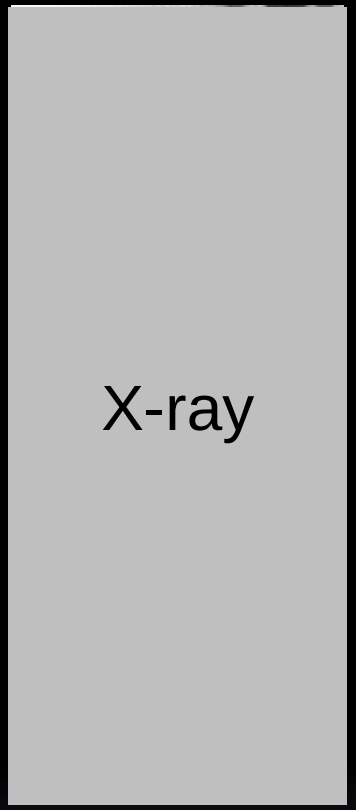
Because the fractured acetabulum is medially displaced, the "Spur sign" on obturator oblique view represents the intact iliac wing that is attached to axial skeleton

Secondary congruence may occur with medial displacement of the hip joint. Congruence refers to the maintenance of the joint surface & the normal spatial (i.e. spherical) relationship between the femoral head and acetabulum. This relationship is likely maintained by labral or capsular integrity.

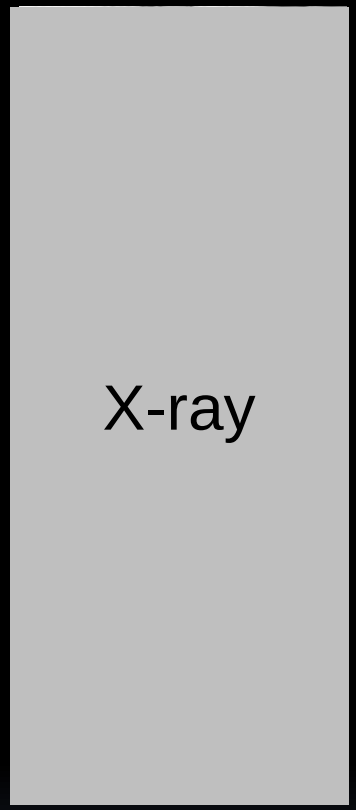




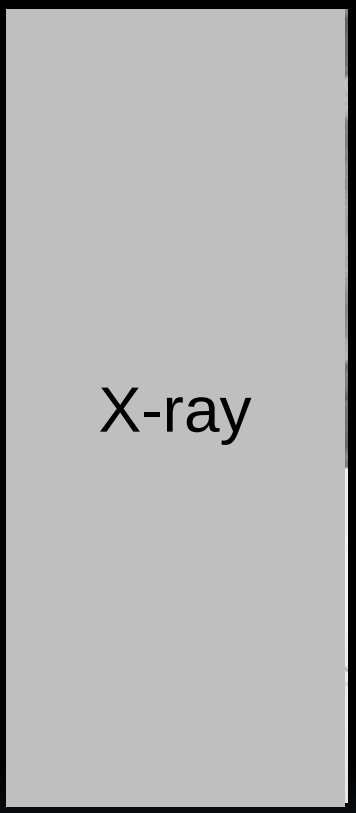
AP VIEW



OBTURATOR OBLIQUE VIEW



ILIAC OBLIQUE VIEW



AP Radiographs

- All 6 acetabular landmarks disrupted
- Central displacement of femoral head
- Inward displacement of posterior column
- Tilted and displaced acetabular roof
- Iliac wing fracture
- Fracture of inferior-pubic ramus

Judet Radiographs

- Obturator oblique
  - Iliopectineal line disrupted
  - Anterior wall of acetabulum broken
  - Acetabular roof tilted
  - Posterior wall of acetabulum may be fractured
  - Fracture of inferior-pubic ramus
  - Spur sign is pathognomonic
- Iliac oblique
  - Anterior column fractured
  - Iliac wing fractures may be seen
  - Displacement of posterior column delineated
  - Fracture line separating columns seen on quadrilateral surface

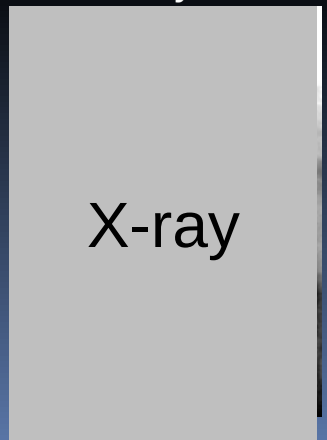
ASSOCIATED BOTH-COLUMN FRACTURES - 2

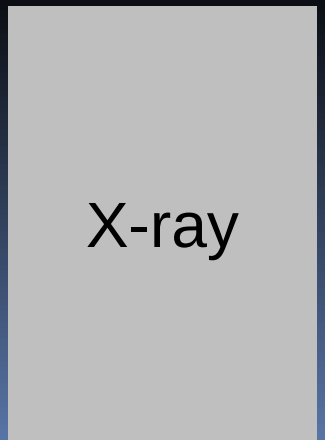
Surgical Indications

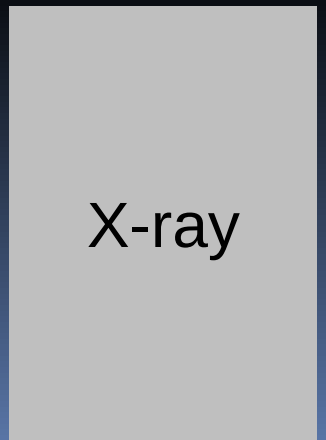
1. Unstable hip
2. Incongruence or diastasis of articular surface
3. All displaced fractures especially with transtectal or juxtatectal fracture line
4. Interposition of soft tissue
6. Hip displacement

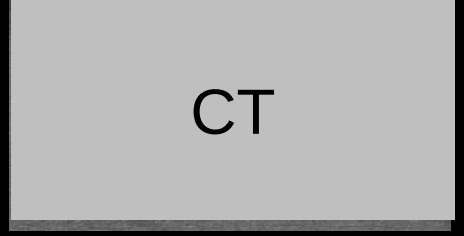
In elderly person, w/ secondary congruence, surgery may be avoided.

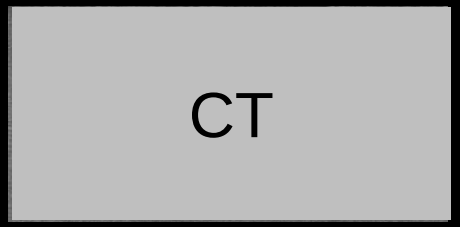
1. **Approach depends on displacement. May need combined anterior and posterior approaches or an extended approach.**
2. **Posterior approach is always needed if there is a posterior wall fracture.**
3. **Reduce iliac wing and fix using screws or plates applied along inner table**
4. **Reduce free triangular (keystone) fragment if present**
5. **Reduce posterior column and apply reconstruction plate(s), stabilize w/ lag screw(s)**
6. **Place additional screws through pubic body and ramus as necessary**

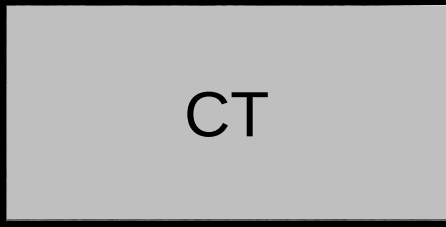


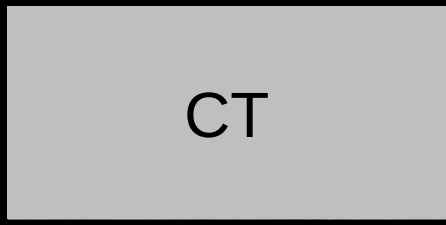












In reading this particular fracture pattern, the CT demonstrates a coronal fracture line dividing the iliac wing. A cortical piece of bone from the inner aspect of the wing is isolated (F). Due to the special configuration of this fracture , the iliac wing (IW) is still visible in front of the stable attached iliac wing fragment (spur sign(S)). The two columns (AC, PC) are medial to IW and S. The roof is divided by a coronal fracture line. The two columns rotate around the head. The cotyloid fossa is attached to the post column.