Bone & Joint Open

Supplementary Material

10.1302/2633-1462.56.BJO-2023-0177.R1

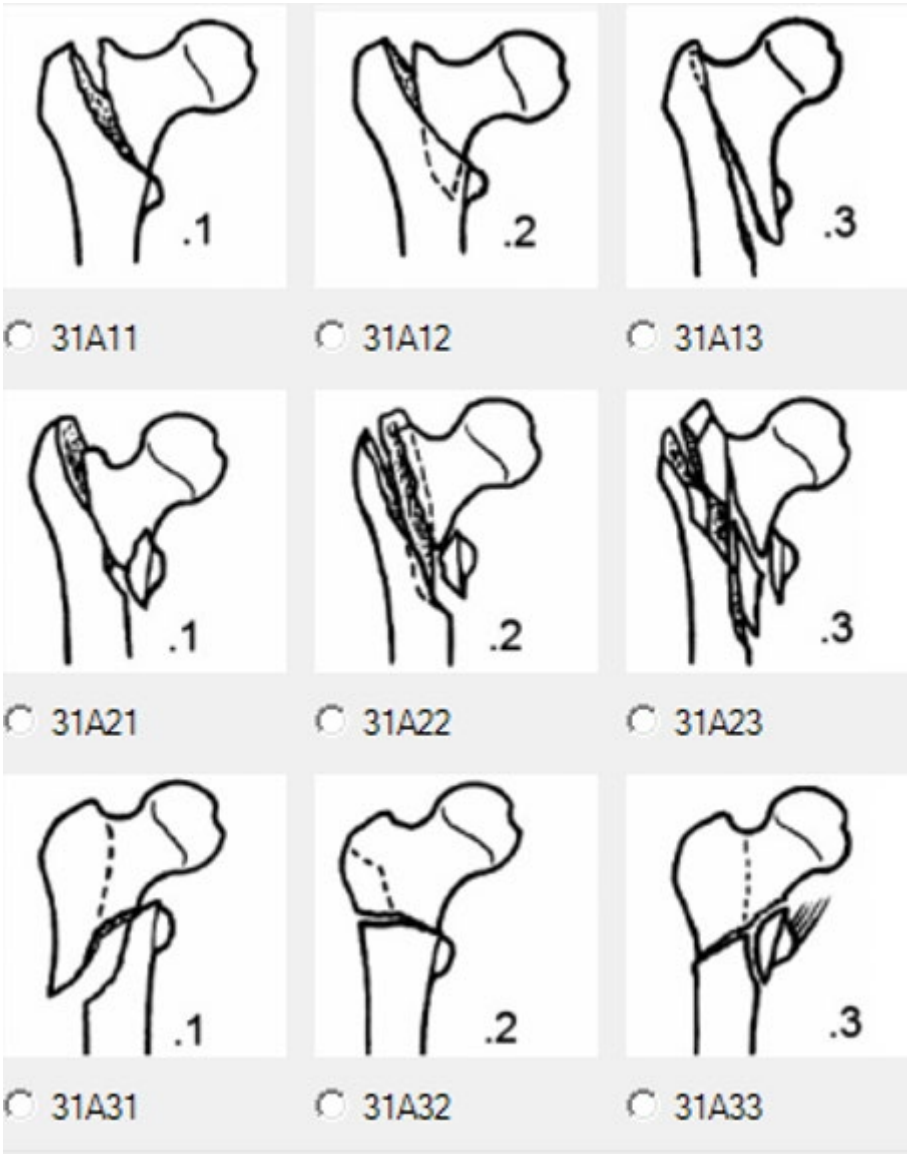
General information:

1. You cannot return on any step to change your previous answers.
2. Do not assess the CT image of the fracture before completing the questions based on observations made on radiograph.

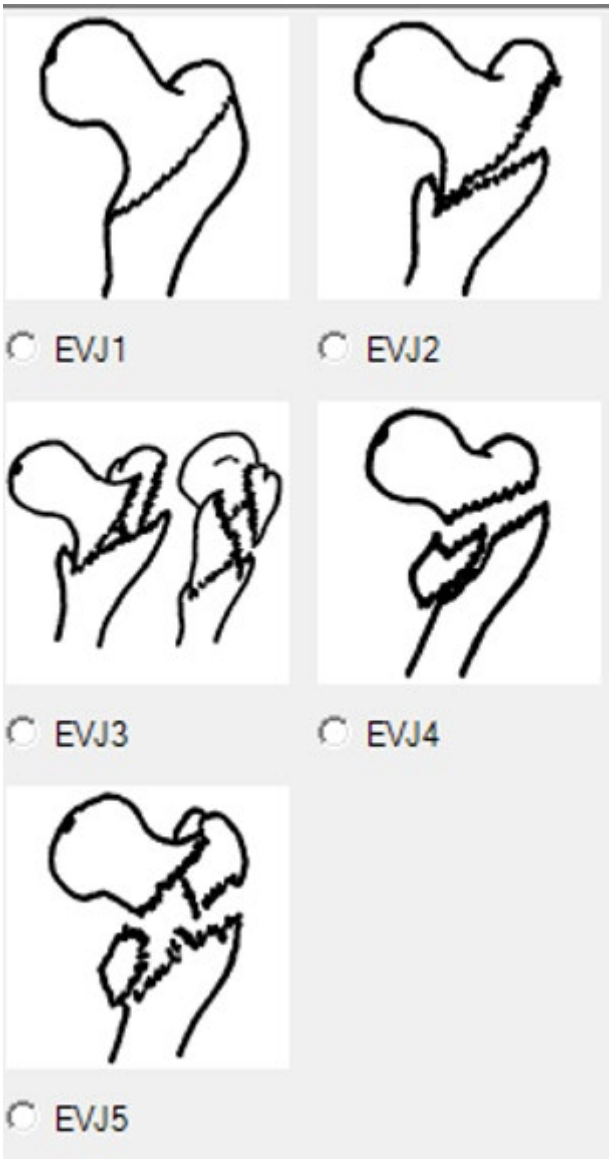
Answered by: ☐ Observer 1 (O1) ☐ Observer 2 (O2) ☐ Expert group

Classify the trochanteric fracture with the following three classification systems. Assess the anteroposterior (AP) and lateral radiograph of the fracture:

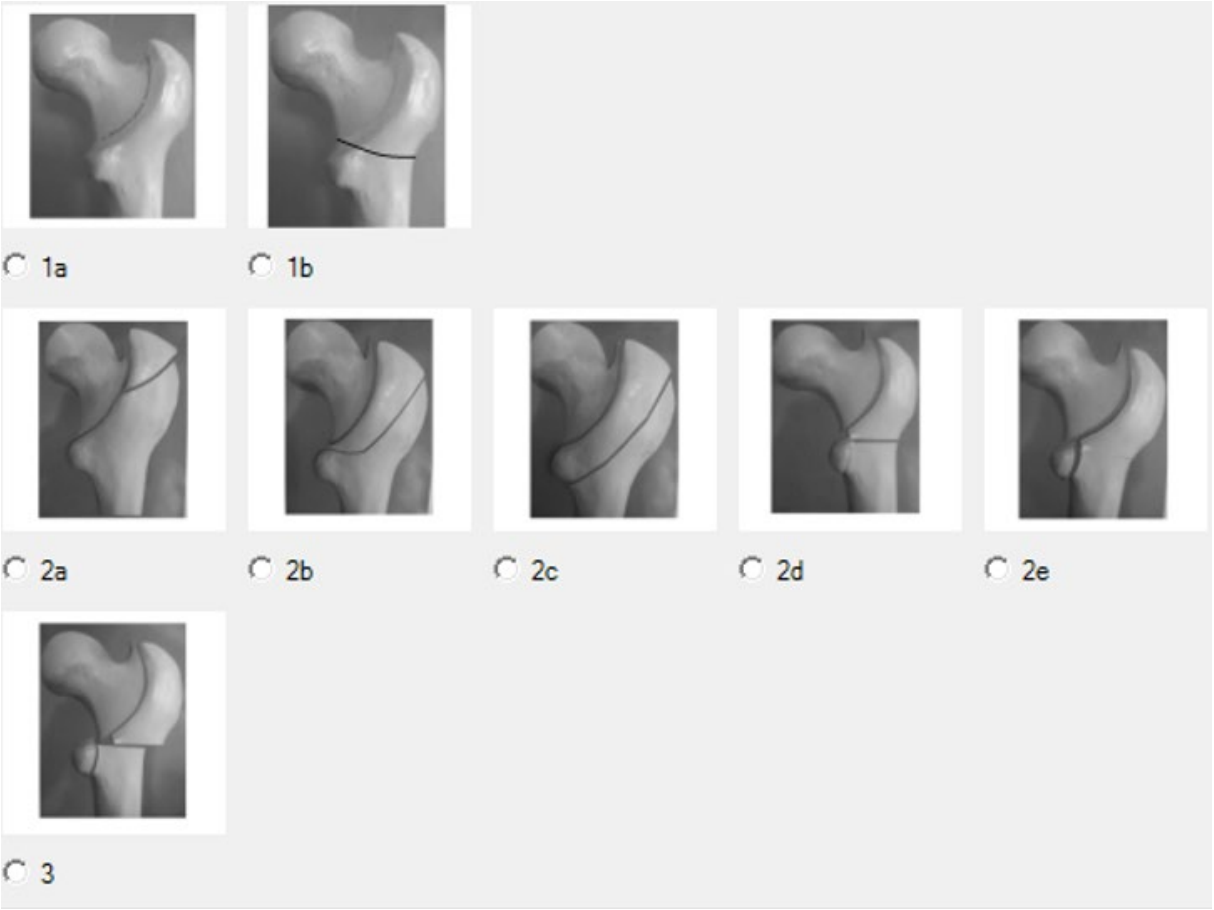
1. AO/OTA classification



2. Evan Jensen Classification



3. Modified Nakano Classification



Questions addressing specific fracture morphology based on AP and lateral radiograph of fractured hip:

Fracture through lateral cortex (intertrochanteric fracture line)?

☐ Yes

☐ No

Thin lateral wall (< 20.5 mm)?

☐ Yes

☐ No

Big posterolateral trochanter major fragment?

☐ Yes

☐ No

Comminution of trochanter major?

☐ Yes

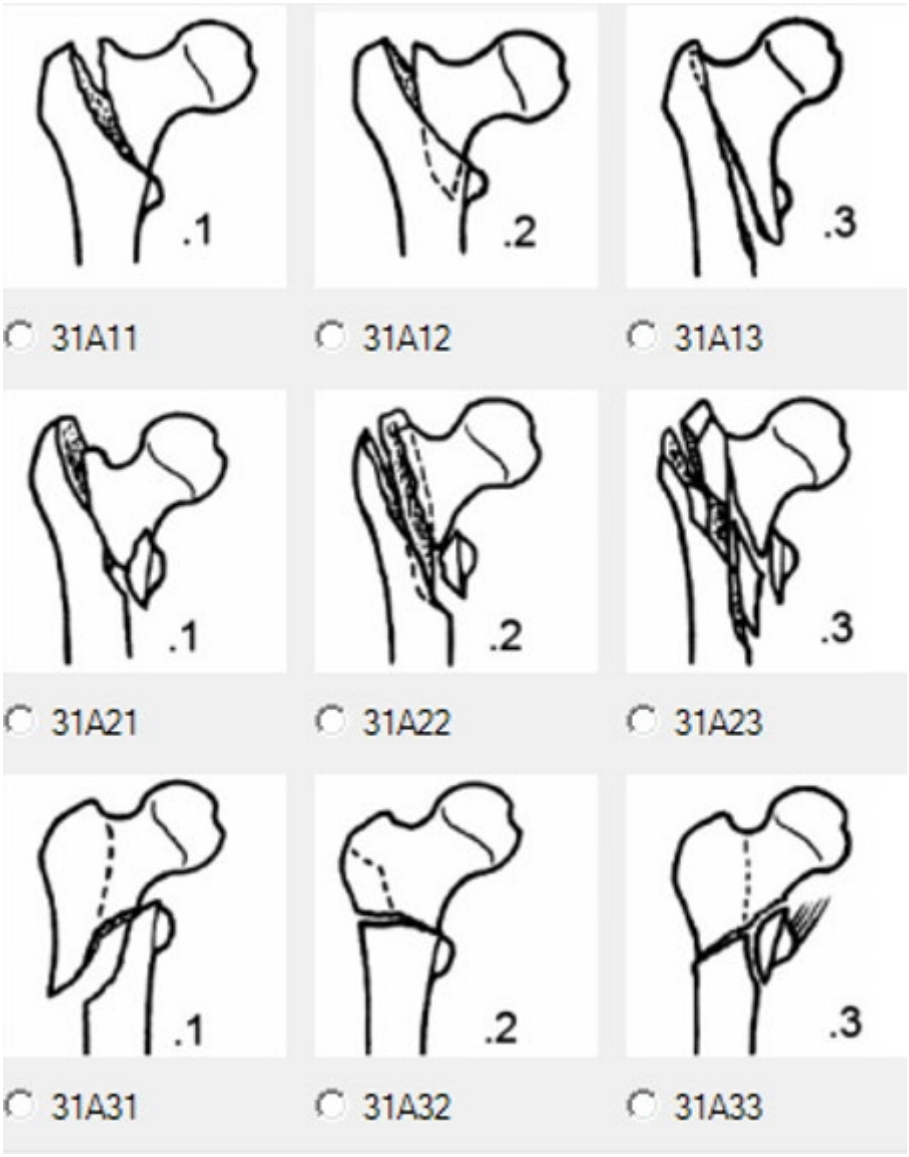
☐ No

Trochanter minor:

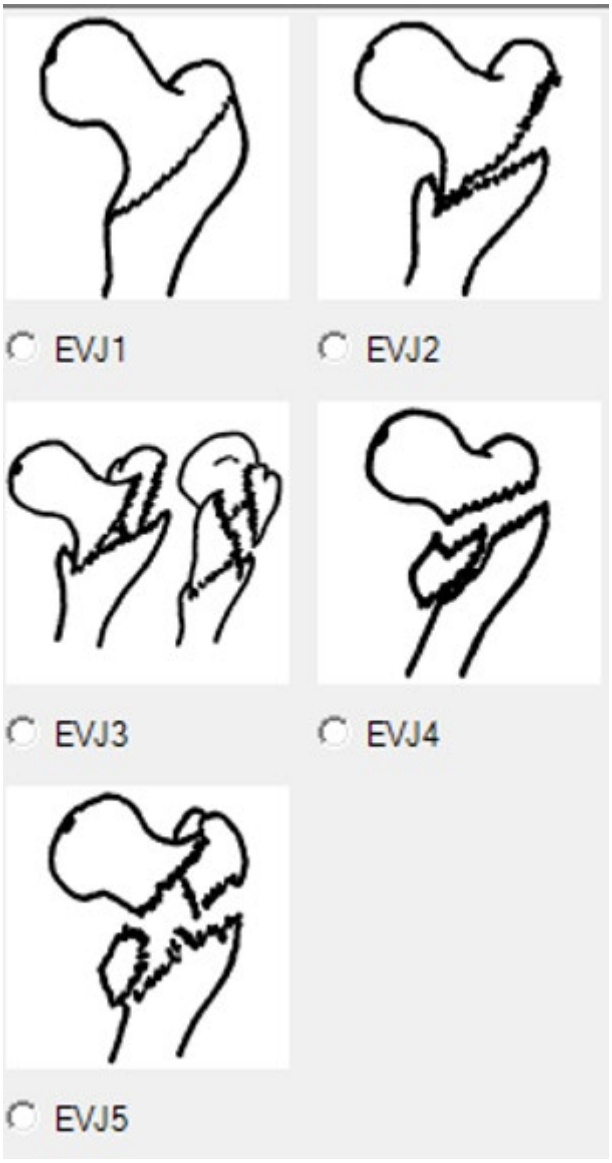
☐ No fracture
☐ Undisplaced (< 5 mm) small fragment of trochanter minor (insertion of iliopsoas)
☐ Displaced (> 5 mm) small fragment of trochanter minor (insertion of iliopsoas)
☐ Undisplaced (< 5 mm) large fragment of trochanter minor extending proximal or distal of minor
☐ Displaced (> 5 mm) large fragment of trochanter minor extending proximal or distal of minor

The observer/expert group will now assess the CT (coronal, sagittal, axial, and 3D reconstruction) image of the same fracture and register their assessment based on them:

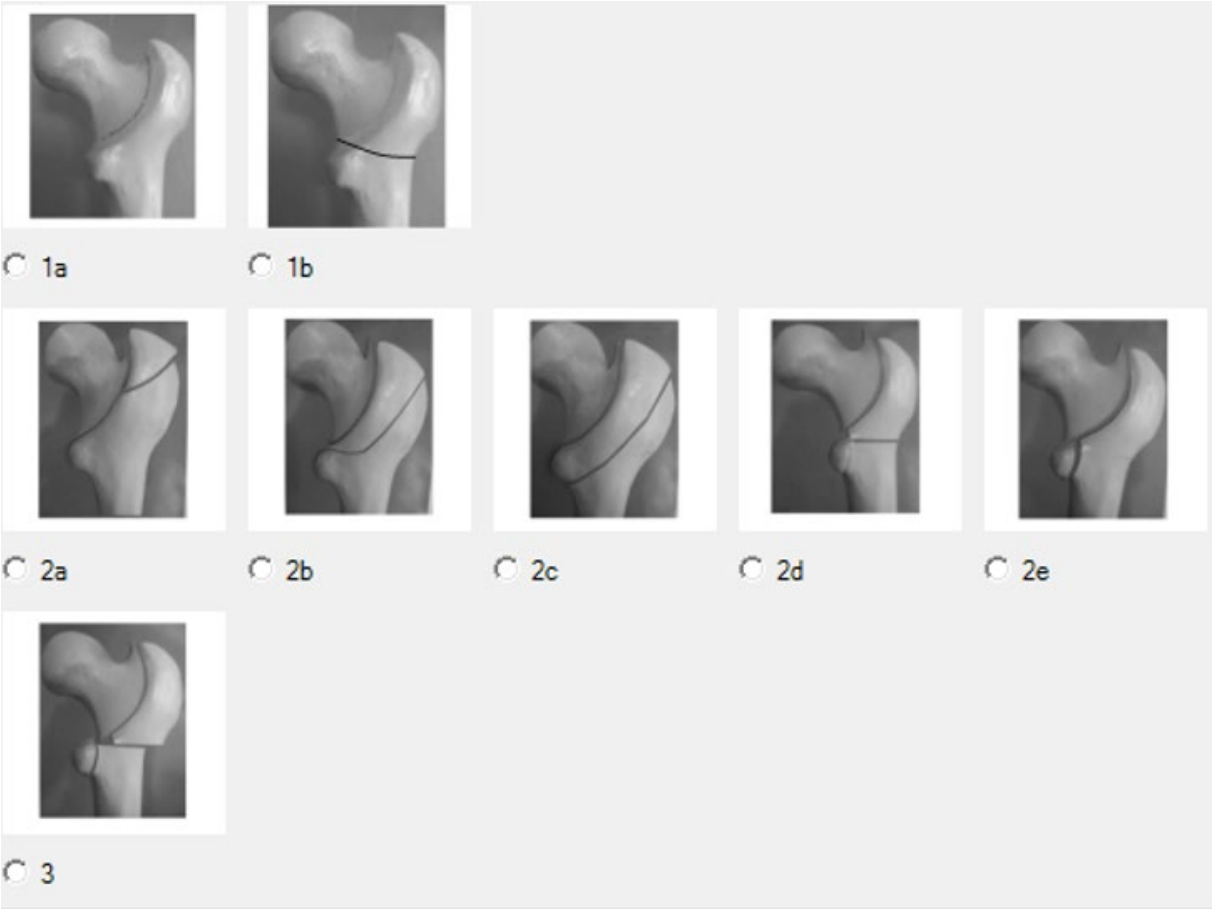
1. AO/OTA classification



2. Evan Jensen Classification



3. Modified Nakano Classification



Questions addressing fracture morphology based on CT (coronal, sagittal, axial, and 3D reconstruction) image of fractured hip:

Fracture through lateral cortex (intertrochanteric fracture line)?

☐ Yes

☐ No

Thin lateral wall (< 20.5 mm)?

☐ Yes

☐ No

Big posterolateral trochanter major fragment?

☐ Yes

☐ No

Comminution of trochanter major?

☐ Yes

☐ No

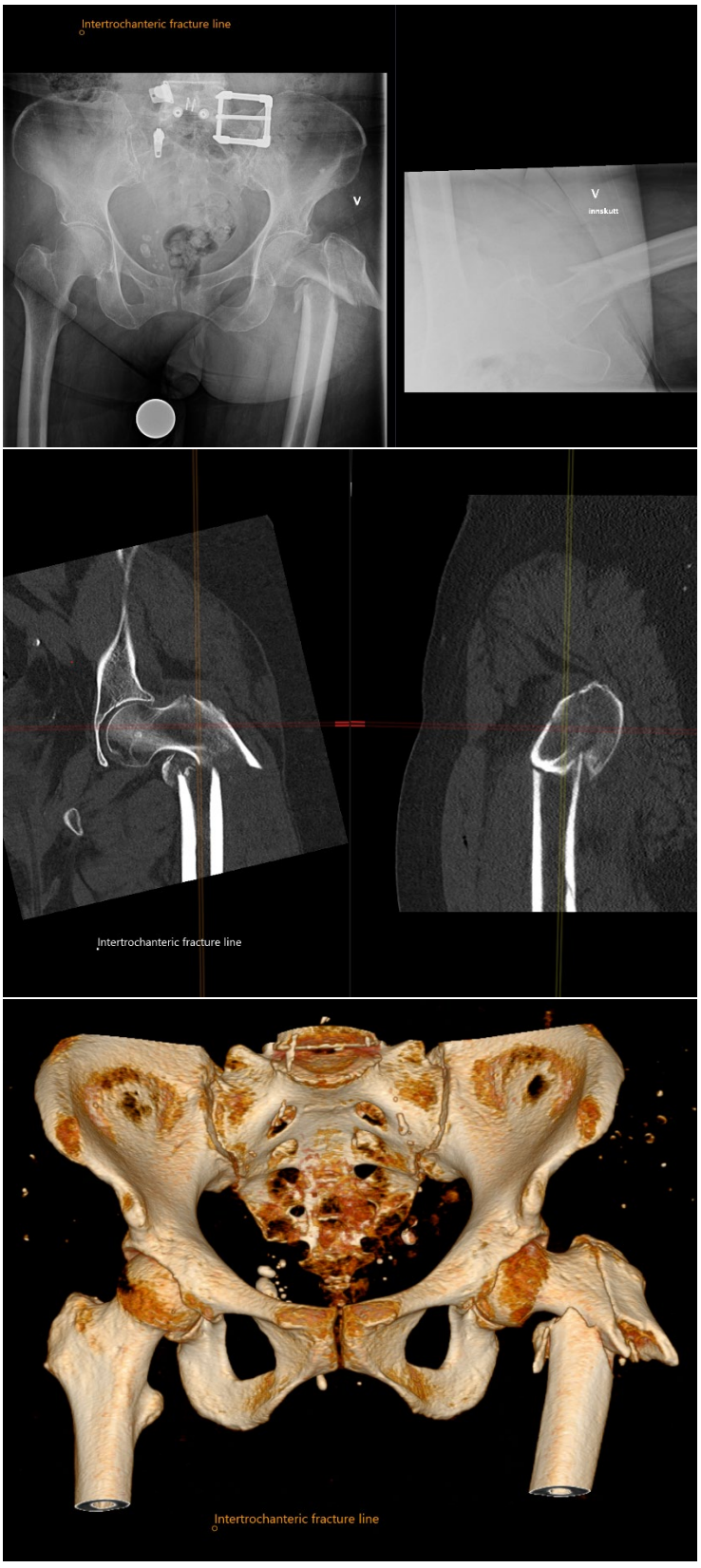
Trochanter minor:

☐ No fracture
☐ Undisplaced (< 5 mm) small fragment of trochanter minor (insertion of iliopsoas)
☐ Displaced (> 5 mm) small fragment of trochanter minor (insertion of iliopsoas)
☐ Undisplaced (< 5 mm) large fragment of trochanter minor extending proximal or distal of minor
☐ Displaced (> 5 mm) large fragment of trochanter minor extending proximal or distal of minor

The expert groups definitions

Fracture through lateral cortex (intertrochanteric fracture line)?

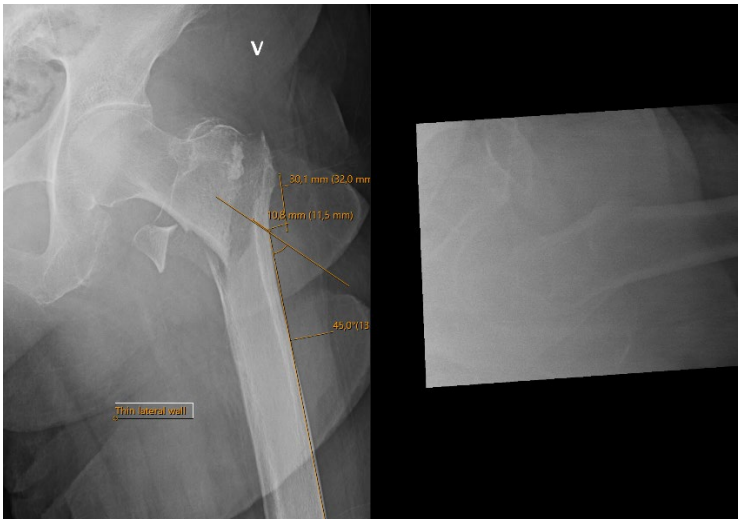
- Defined as a fracture through the lateral cortex of proximal femur, distal to trochanter major

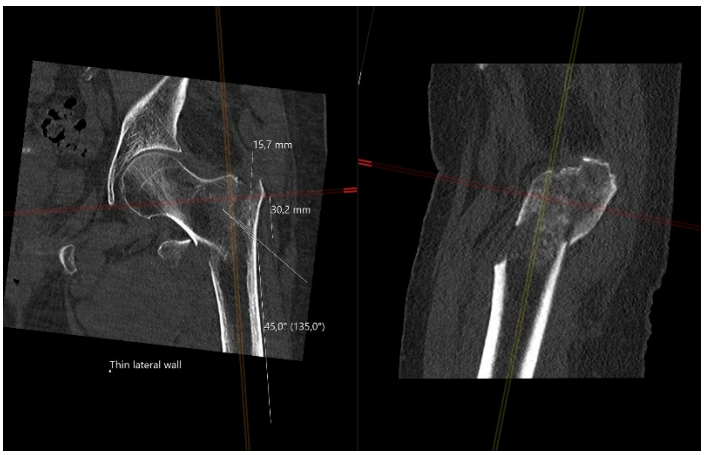


Thin lateral wall (< 20.5 mm)?

> "Lateral wall height or thickness is defined as the distance in mm from a reference point 3 cm below the innominate tubercle of the greater trochanter angled 135° upward to the fracture line on the AP x-ray. The thickness (d) must

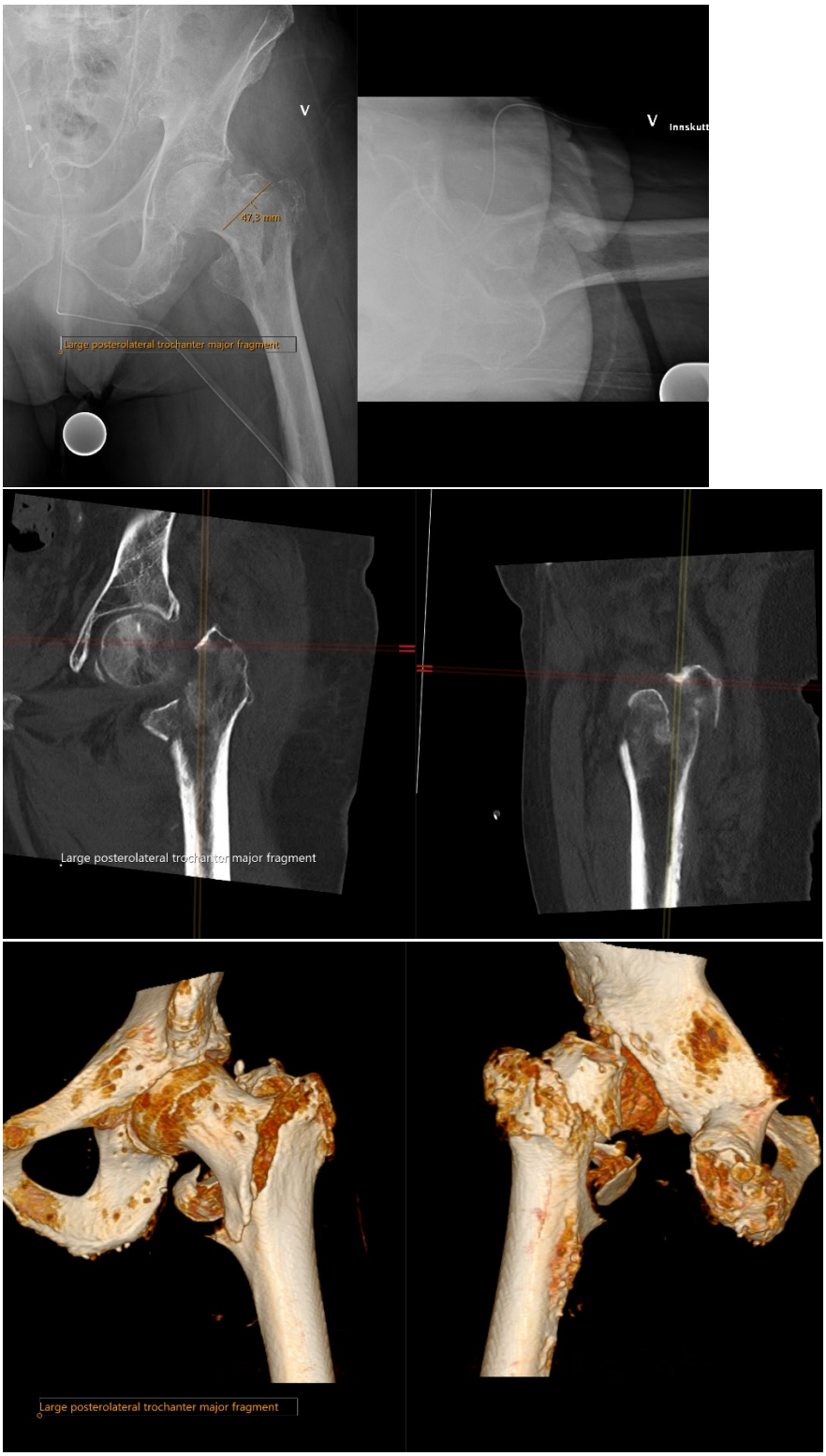
be less than 20.5 mm for the fracture to be considered an A2 fracture (Hsu et al 2013)" – AO Surgery reference





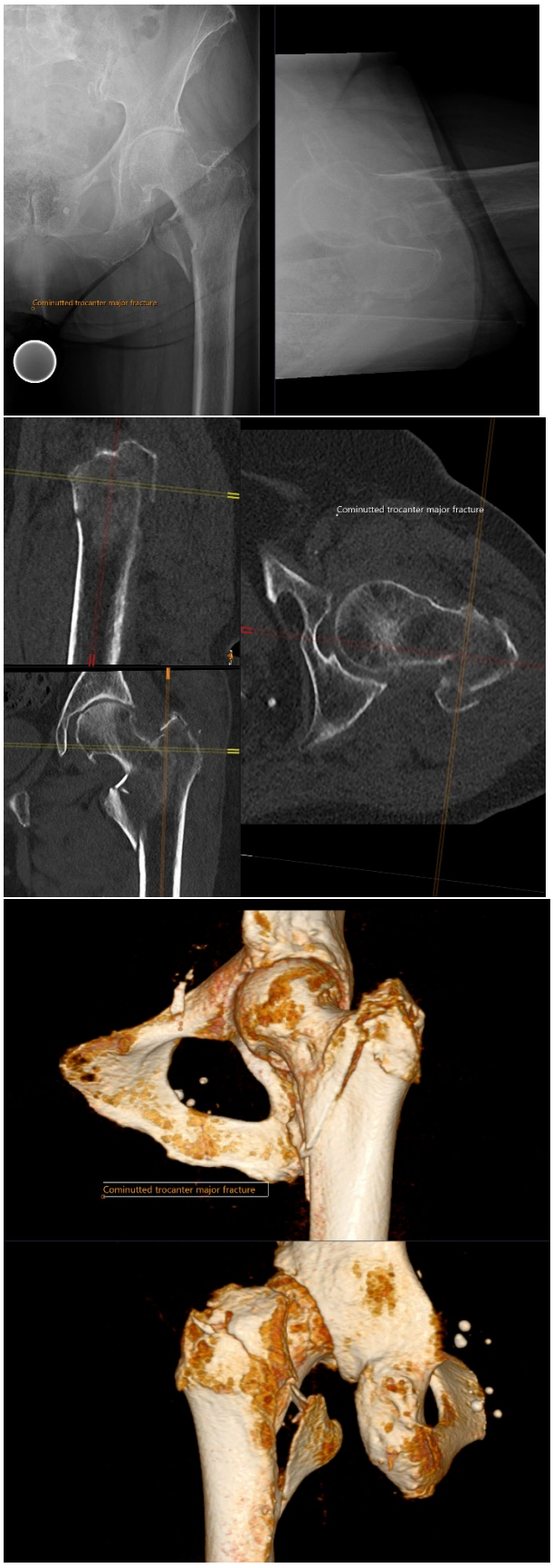
Big posterolateral trochanter major fragment?

- Defined as a large posterior fragment of trochanter major measuring ≥ 4 cm in diameter



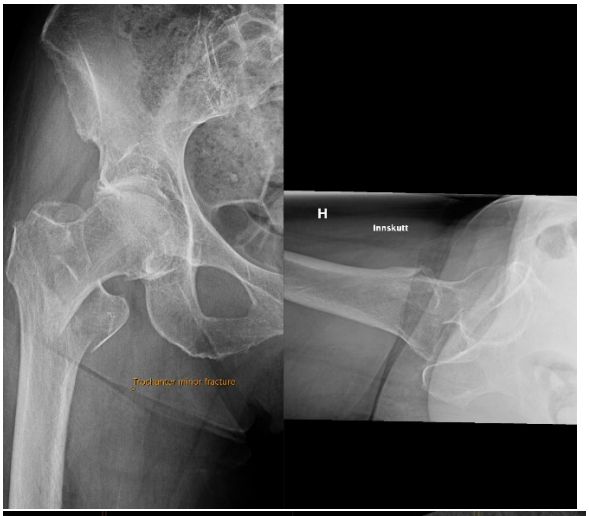
Comminution of trochanter major?

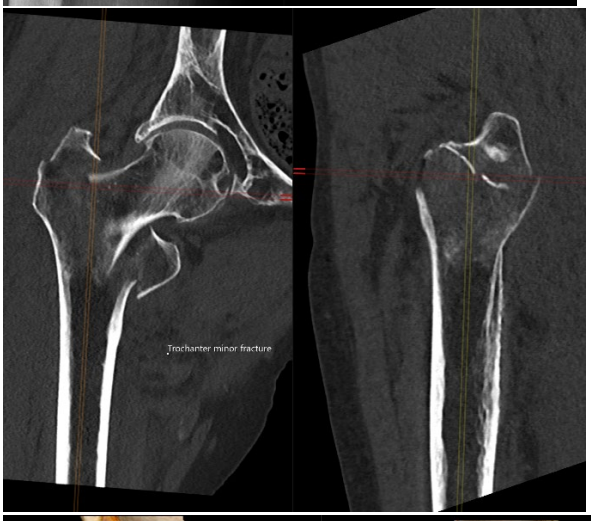
- Defined as > 2 fracture lines through trochanter major



Trochanter minor:

- Unstable is defined as a large fragment (> 50%) of trochanter minor, through the entire cortex with either proximal or distal extension





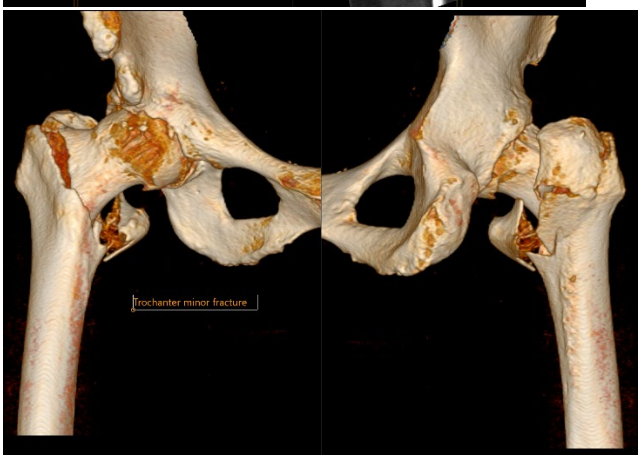


Table i. Inter-rater agreement for three-month classifications for radiograph and CT.

Variable		Radiograph (n = 94)			CT (n = 92)			
	Observed agreement	κ (95% CI)	AC1 (95% CI)	Observed agreement	κ (95% CI)	p-value	AC1 (95% CI)	p-value
Stability								
AO/OTA	69%	0.38 (0.22, 0.56)	0.40 (0.21, 0.58)	74%	0.44 (0.24, 0.62)	0.430	0.51 (0.33, 0.68)	0.190
Modified Evans Jensen	77%	0.47 (0.27, 0.64)	0.57 (0.39, 0.73)	82%	0.48 (0.28, 0.69)	0.930	0.70 (0.55, 0.83)	0.066
Modified Nakano	79%	0.52 (0.33, 0.70)	0.61 (0.44, 0.77)	78%	0.46 (0.24, 0.66)	0.574	0.63 (0.46, 0.78)	0.712
Morphologies								
Intertrochanteric fracture line	68%	0.30 (0.10, 0.49)	0.42 (0.25, 0.60)	74%	0.45 (0.25, 0.63)	0.309	0.50 (0.32, 0.68)	0.333
Thin lateral wall	69%	0.38 (0.20, 0.57)	0.38 (0.20, 0.57)	62%	0.23 (0.03, 0.40)	0.040	0.25 (0.04, 0.45)	0.077
Large posterolateral trochanter major fragment	64%	0.28 (0.08, 0.46)	0.28 (0.08, 0.47)	76%	0.47 (0.27, 0.65)	0.069	0.56 (0.40, 0.72)	0.005
Comminuted trochanter major fracture	70%	0.39 (0.20, 0.58)	0.43 (0.24, 0.62)	62%	0.24 (0.04, 0.45)	0.222	0.24 (0.05, 0.45)	0.137
Large trochanter minor fragment	84%	0.58 (0.37, 0.75)	0.75 (0.61, 0.86)	82%	0.55 (0.36, 0.72)	0.743	0.69 (0.53, 0.82)	0.402

Agreement coefficients with 95% percentile bootstrap confidence interval (B = 1,000).
p-values for difference between agreement for CT vs radiograph obtained from bootstrap samples (B = 10,000)
*Defined as a displaced or undisplaced large trochanter minor fragment extending proximal or distal of minor
κ, Cohen's kappa coefficient; AC1, Gwet's agreement coefficient; AO/OTA, AO/Orthopaedic Trauma Association; CI, confidence interval.