

Intracapsular Femoral Neck Fractures

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Case 1: Intracapsular Femoral Neck Fracture—Closed Reduction

1. Male, 52 years old, falls from height, closed and isolated injury of the left hip:
 - Displaced intracapsular femoral neck fracture of the left femur (Fig. 14.1)
2. Preoperative plan:
 - Traction table with indirect reduction
 - Reduction technique: Whitman maneuver
 - Reduction control with C-arm
 - Fixation with three 7.3 mm cannulated screws
3. Patient setup in the theatre (Fig. 14.2):
 - Patient is positioned supine in the traction table.
 - Care should be taken to level the pelvis.
 - A small bolster is positioned on the left side of the patient to curve the upper body to the contralateral side.
 - The well right side leg is abducted.
4. Reduction maneuver (Fig. 14.2):
 - Longitudinal traction
 - Slight abduction
 - Internal rotation
5. C-arm positioning (Fig. 14.3):
 - C-arm for the AP view is positioned between the legs of the patient and centered in the femoral neck (a).
 - For the lateral view, the C-arm is rotated around the hip to get a perfect lateral view of the femoral neck (b).
6. Reduction control
 - For the reduction control, we use three different methods to assess the quality of the reduction:
 - (a) Garden index—angle between the primary compressed trabecula and the medial cortex of the femur should be 160° in the AP view and 180° in the lateral view (Fig. 14.4).
 - (b) Lowell lines—the lines of the femoral neck contour should be smooth without a break or sharp angles (Fig. 14.5).
 - (c) Reduction of the medial cortex—the medial cortex of the femoral neck should be anatomically reduced. It is not acceptable when the lateral fragment is cranial to the medial fragment (Fig. 14.6).
7. Skin incision:

The skin incision is done in line with the midline of the femoral shaft on the lateral view starting at the level of the lesser trochanter (LT) for about 4 cm distally (blue dotted line) (Fig. 14.7).
8. Implant insertion:

We start with the two superior guide wires, one anterior and one posterior (Fig. 14.8).

After that, we insert the third guide wire close to the calcar on the AP view and between the two superior on the lateral view (Fig. 14.9).

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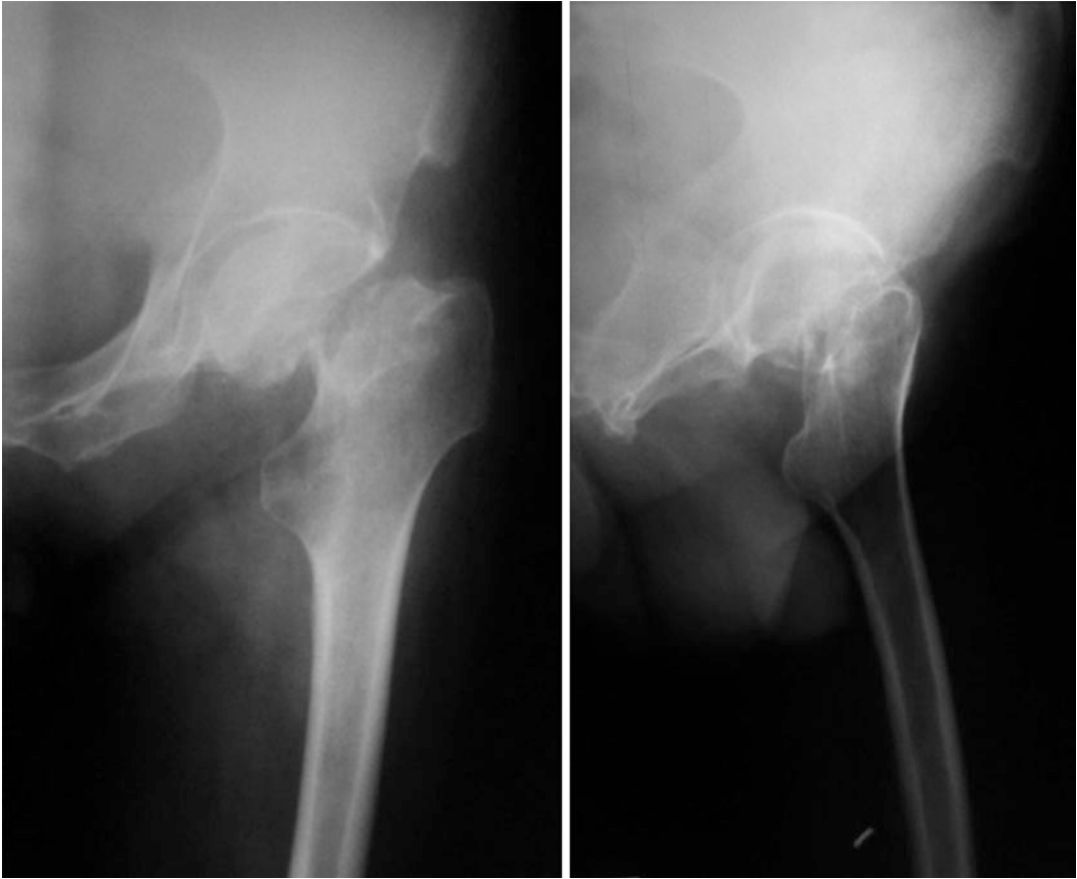


Fig. 14.1 Displaced femoral neck fracture in a 52-year-old male patient



Fig. 14.2 Position of the patient in the traction table, showing the position of the well leg and the reduction of the fractured left side

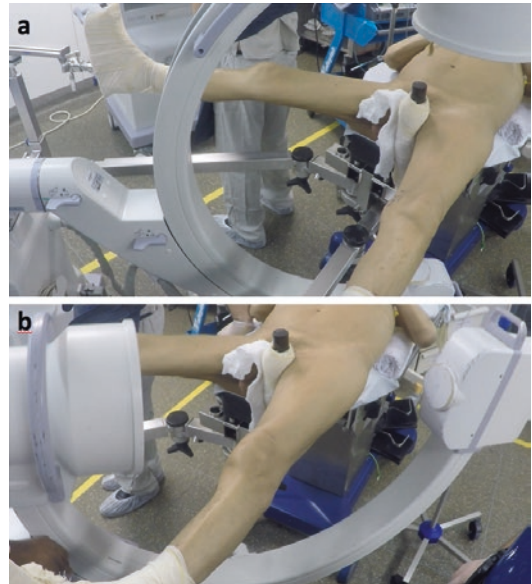


Fig. 14.3 Position of the C-arm in the AP view (a) and in the lateral view (b)

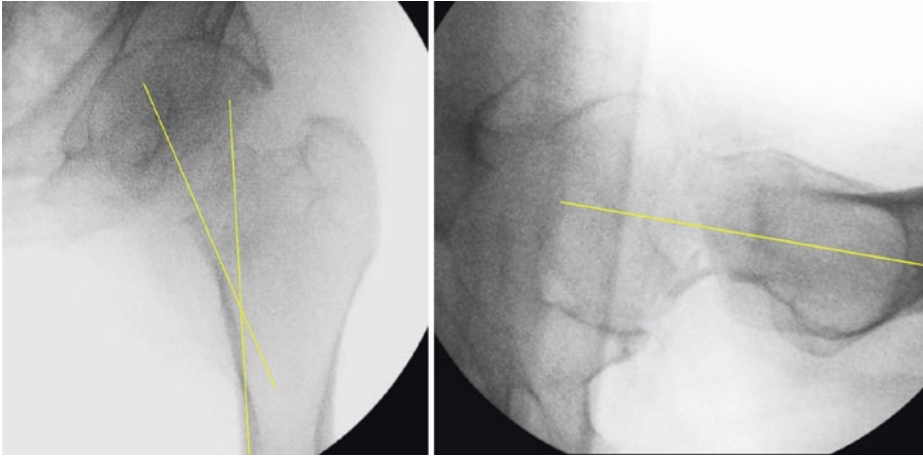


Fig. 14.4 C-arm control image showing the Garden index

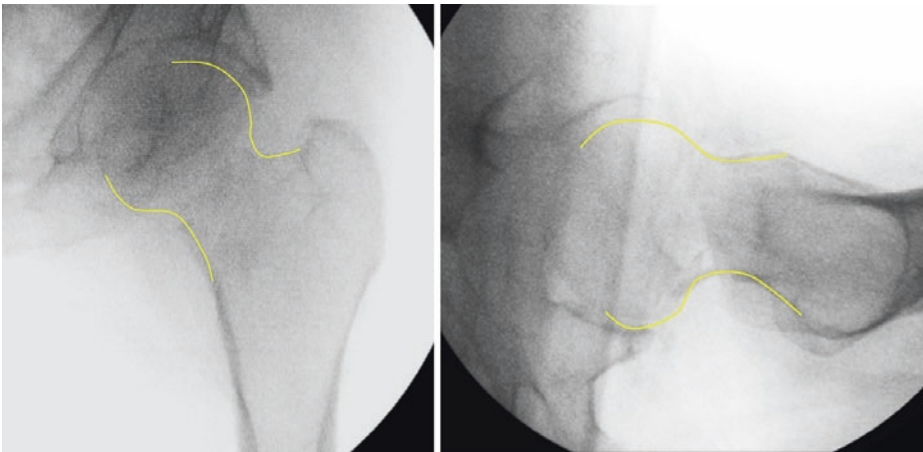


Fig. 14.5 C-arm control image showing the Lowell lines in the AP and lateral view

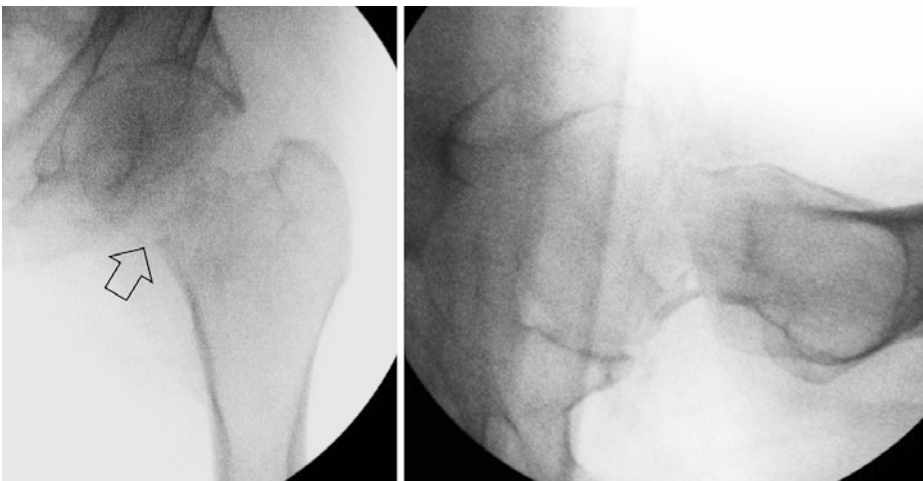


Fig. 14.6 C-arm control image showing the reduction of the medial cortex

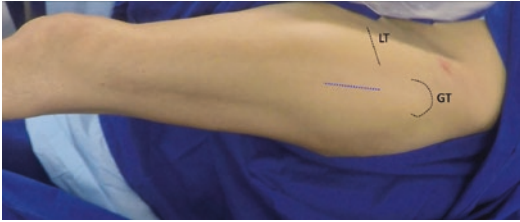


Fig. 14.7 Lateral side of the left thigh showing the level of the lesser trochanter (LT), the greater trochanter (GT), and the incision line (dotted line)

Guide wires are sequentially exchanged by cannulated screws as follows: first the inferior screw close to the calcar, then the superior anterior screw and final screw to be inserted is the posterior screw.

9. Final X-ray (Fig. 14.10)

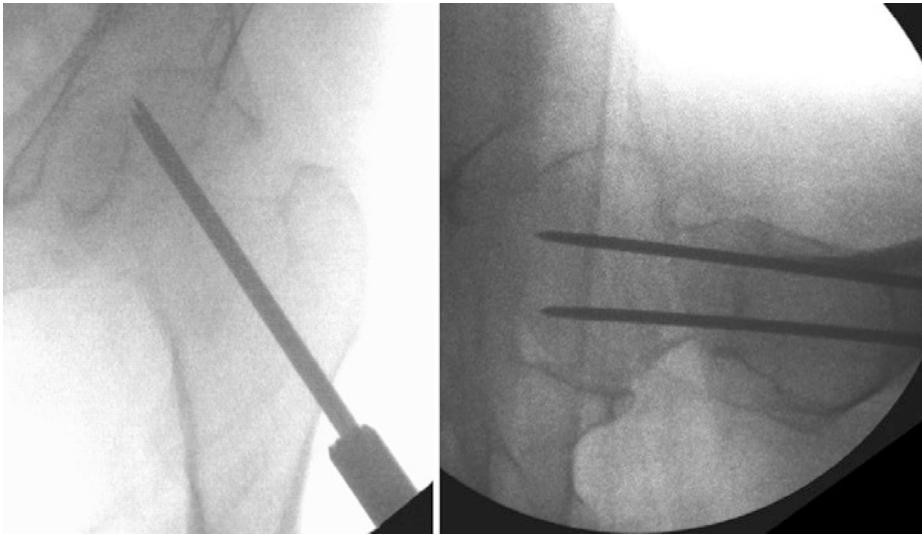


Fig. 14.8 C-arm image of the insertion of the two superior guide wires

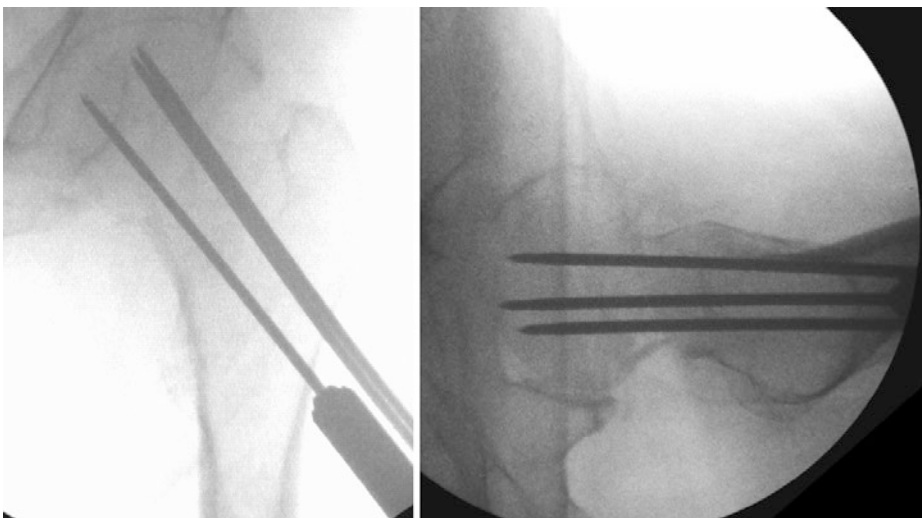


Fig. 14.9 C-arm image of the insertion of the distal guide wire close to the calcar

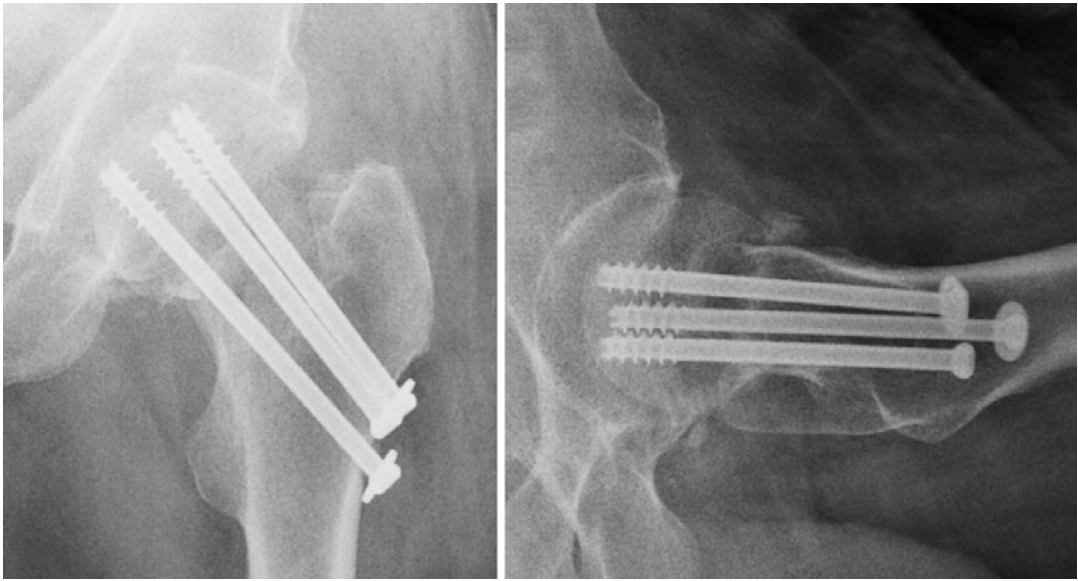


Fig. 14.10 AP and lateral X-ray of the fixation of the femoral neck fracture with three cannulated screws

Summary and Tips and Tricks

The treatment option in a displaced intracapsular femoral neck fracture in a young patient is reduction and fixation.

Closed reduction is better for the patient and for the vitality of the femoral head, but a careful pre-op evaluation is needed to assess the ability to achieve the perfect reduction with close maneuver.

Whenever we perceive that the closed reduction is possible, we prefer to use the traction table. It allows the Whitman maneuver (longitudinal traction, slight abduction, and internal rotation) and facilitates to get the AP and lateral view with the C-arm. The reduction position is also guaranteed throughout the procedure.

The reduction maneuver should be done only once to avoid fragmentation of the femoral neck. If a good reduction is not achieved, an open reduction should be performed.

The most important phase is the reduction control. Reduction should be anatomic. There is no single method enough to assess the quality of the reduction, and thus we use three different methods to assure that the reduction is good.

The superior screws should not address the superolateral part of the femoral head to avoid AVN. The inferior screw should be as close as possible to the calcar and never enter below the level of the lesser trochanter to prevent the subtrochanteric fracture. The anterior screw should be close to the anterior cortex and the posterior screw to the posterior cortex.

The first screw to be inserted and tightened is the inferior one to compress the calcar. The last one to be tightened is the posterior screw.

Case 2: Intracapsular Femoral Neck Fracture—Open Reduction

1. Male, 46 years old, motorcycle accident, closed and isolated injury of the right hip:
 - Displaced intracapsular fracture of the femoral neck (Fig. 14.11)
 - History of previous fracture of the same femoral shaft, healed and without implant
2. Preoperative plan:
 - Radiolucent table
 - Leadbetter reduction maneuver (once)
 - If successful fixation with cannulated screws (see Case 1)
 - If unsuccessful open reduction using Hueter anterior approach

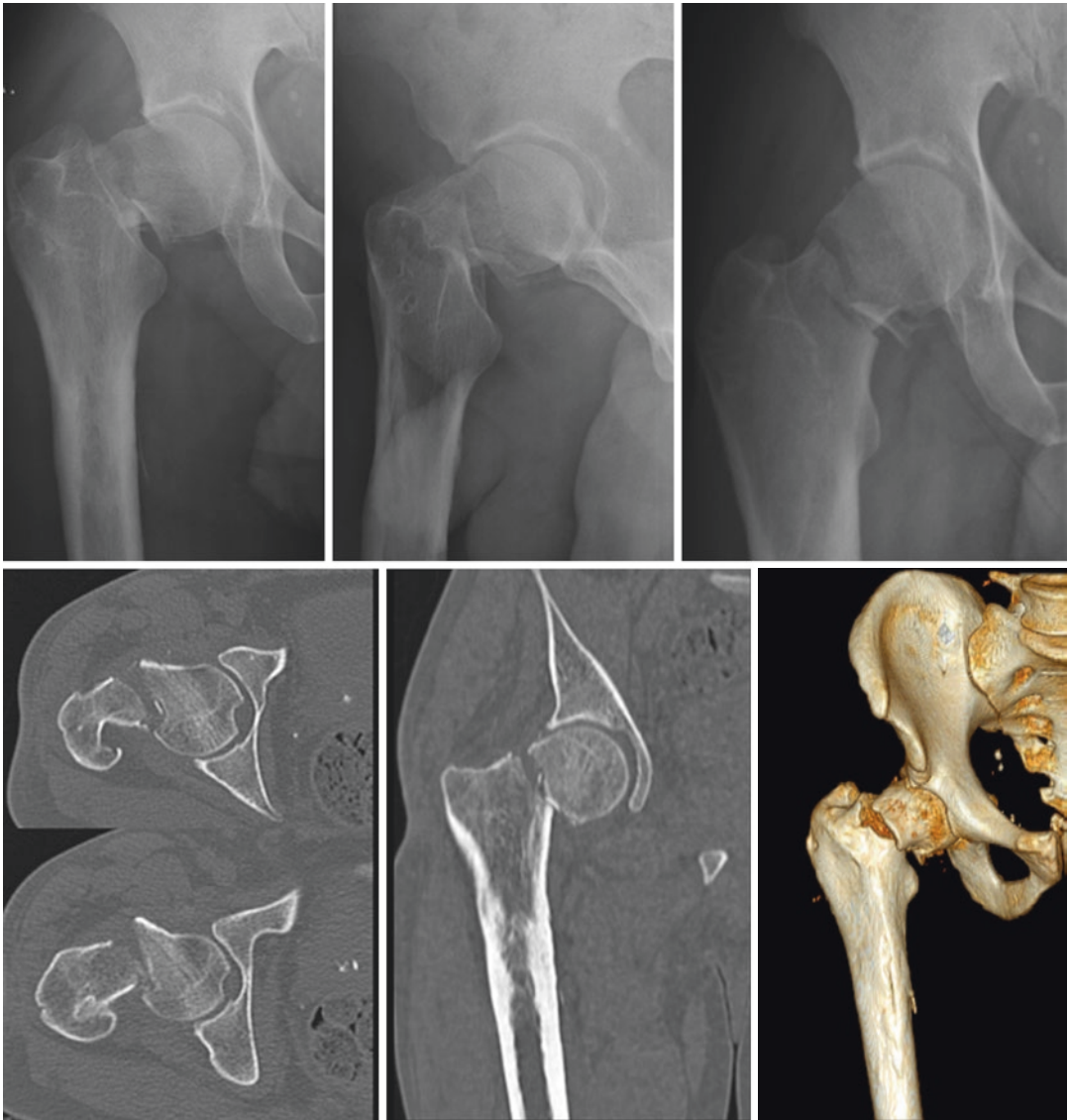


Fig. 14.11 X-ray and CT scan of the intracapsular femoral neck fracture in a 46-year-old male patient after a motorcycle accident

- Use of bone hook and Cobb elevator to help the reduction
 - Fixation with a 1/3 tubular plate on the medial edge of the femoral neck
 - Plus, three cannulated screw inserted through a lateral approach
3. Patient setup in the theatre (Fig. 14.12):
- Supine in a radiolucent table over a rectangular bolster
 - Well leg placed in a holder in flexed and abducted position
 - Fracture leg free over the table

4. C-arm positioning (Fig. 14.13):

C-arm is positioned in the opposite side of the surgeon. AP is centered in the femoral neck, and for the lateral view the cross-table technique is used.

5. Reduction maneuver (Fig. 14.14):

Leadbetter maneuver tried once: flex the hip to 90° with slight adduction and apply traction in line with the femur. While maintaining the traction, apply internal rotation to 45°. Then the leg is slowly brought into abduction and full extension while maintaining traction and internal rotation.

6. Reduction control after the Leadbetter maneuver was not acceptable. Decided to move for open reduction (Fig. 14.15).

7. Hueter anterior approach (Fig. 14.16):

- Bone reference: anterosuperior iliac spine (ASIS).
- Reduction: anterior incision (yellow dotted line) made between the sartorius and the tensor fasciae latae.
- Fixation: lateral incision (red dotted line) made in line with the femoral shaft, 4 cm below the greater trochanter.

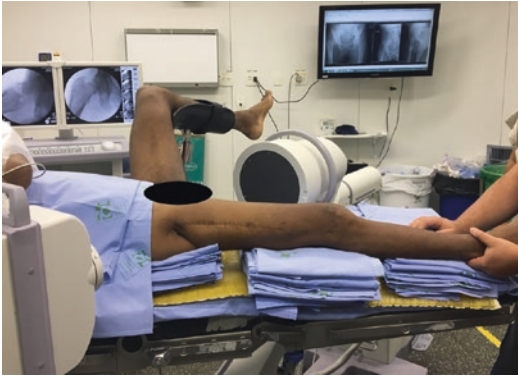


Fig. 14.12 Position of the patient in the radiolucent table showing how to position the well left leg and the right fractured limb



Fig. 14.14 Leadbetter maneuver to reduce the femoral neck fracture

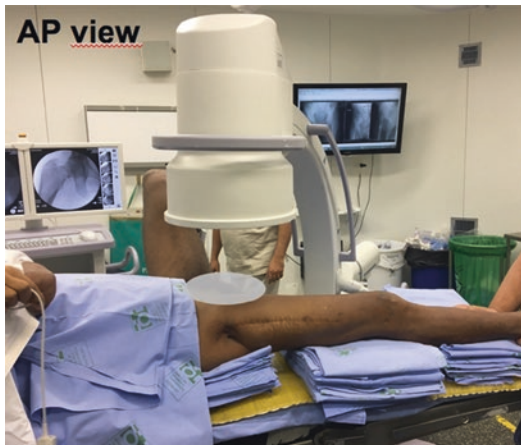


Fig. 14.13 How to position the C-arm to get the AP and lateral cross-table images

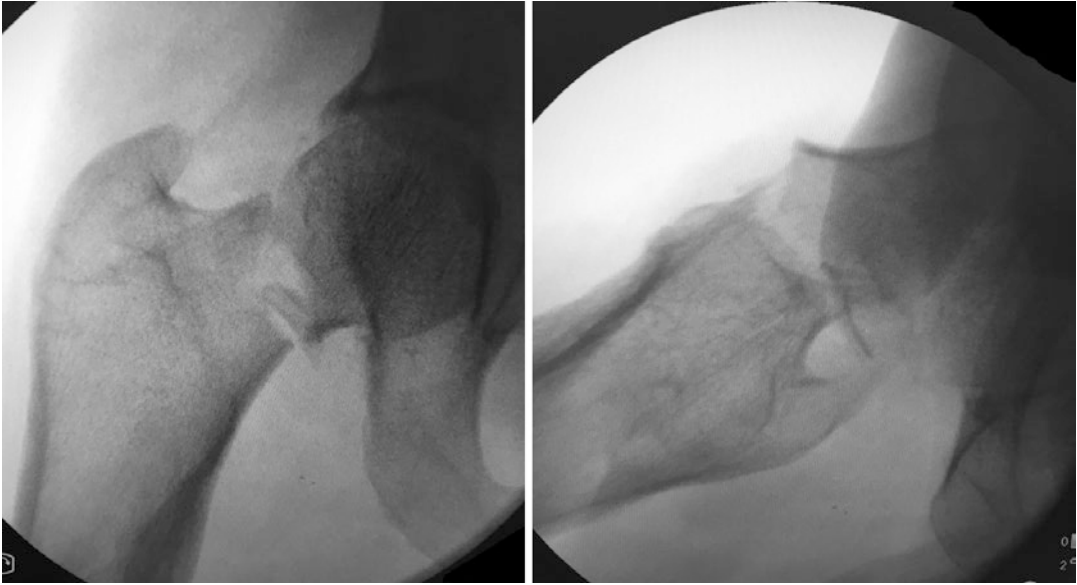


Fig. 14.15 C-arm image showing a nonacceptable reduction

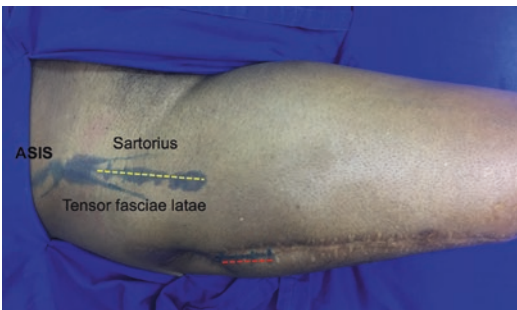


Fig. 14.16 Anterior image of the right thigh showing the anatomical landmarks for the Hueter approach. *ASIS* anterosuperior iliac spine. Red dotted line, incision for the cannulated screws; yellow dotted line, Hueter incision for anterior approach to the femoral neck

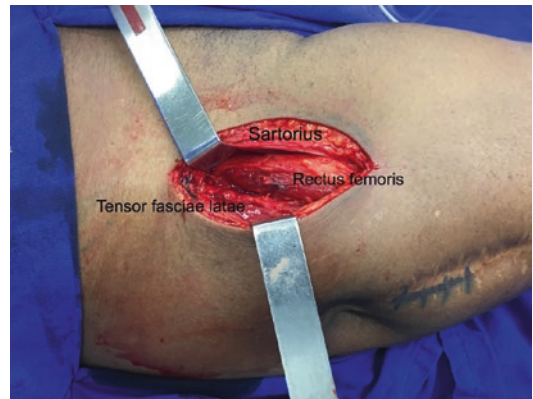


Fig. 14.17 Hueter anterior approach

- Approach goes between the sartorius and tensor fasciae latae (Fig. 14.17).
 - Anterior capsule exposure, “L”-shaped arthrotomy, and exposure of the fracture (video below—double click) (Fig. 14.18).
8. Reduction technique:
- Open direct reduction using bone hook and Cobb elevator (Fig. 14.19)
9. Provisional fixation with three K-wires (same that will be used for the cannulated screw fixation) (Fig. 14.20).



Fig. 14.18 Anterior capsule of the right hip

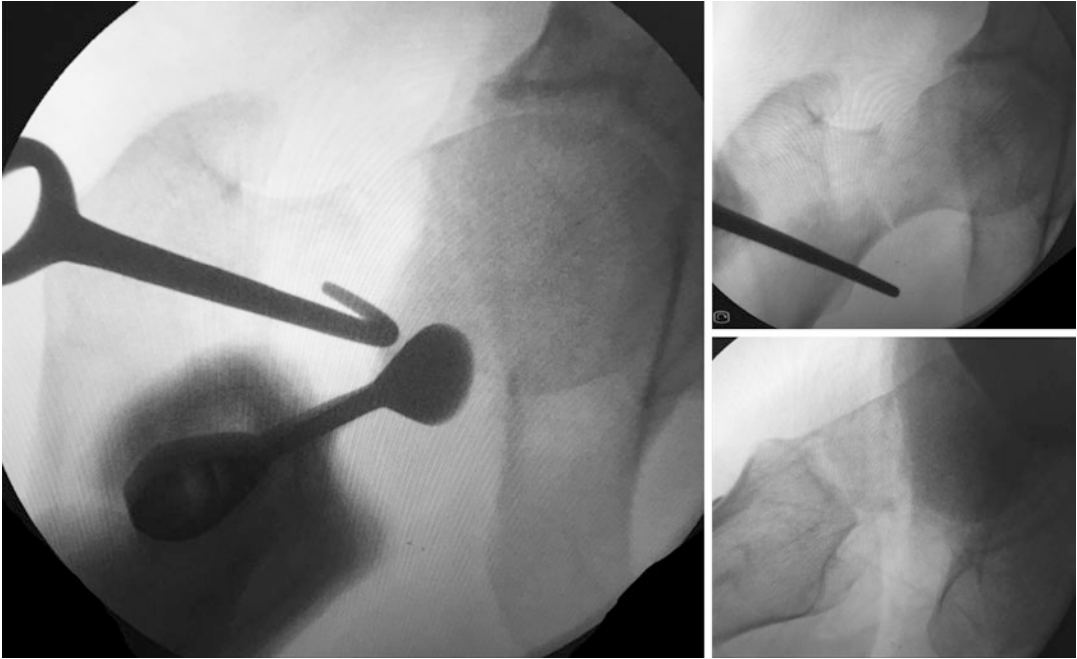


Fig. 14.19 C-arm image showing the reduction maneuver with the help of a bone hook and Cobb elevator



Fig. 14.20 C-arm image showing the provisional fixation of the femoral neck with K-wires

10. Positioning of the leg in flexion and external rotation to insert the 1/3 tubular as a buttress plate on the medial side of the femoral neck (Fig. 14.21).
11. 1/3 Tubular plate as a buttress plate in the medial side of the femoral neck (Fig. 14.22).
12. Three cannulated screws are inserted over the guide wires (Fig. 14.23).
13. Final X-ray (Fig. 14.24).

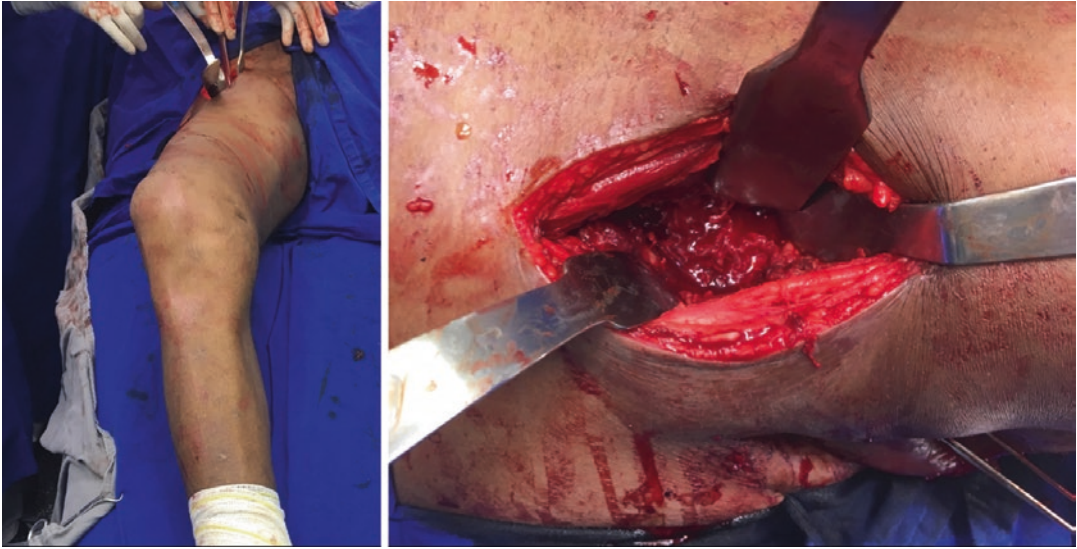


Fig. 14.21 Position of the leg to expose the medial side of the femoral neck

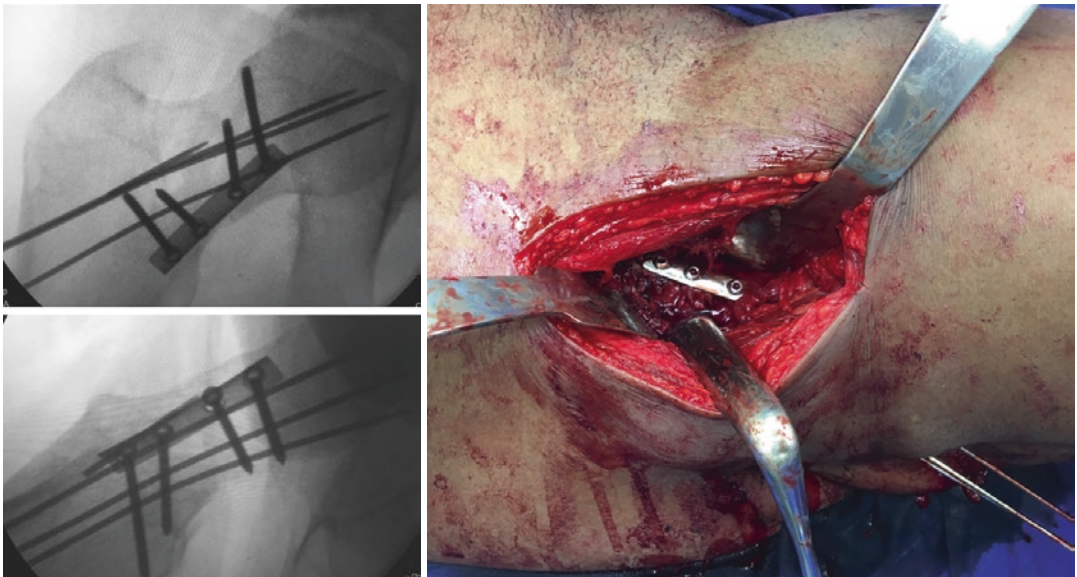


Fig. 14.22 Fixation of the femoral neck with a 1/3 tubular plate as a buttress plate

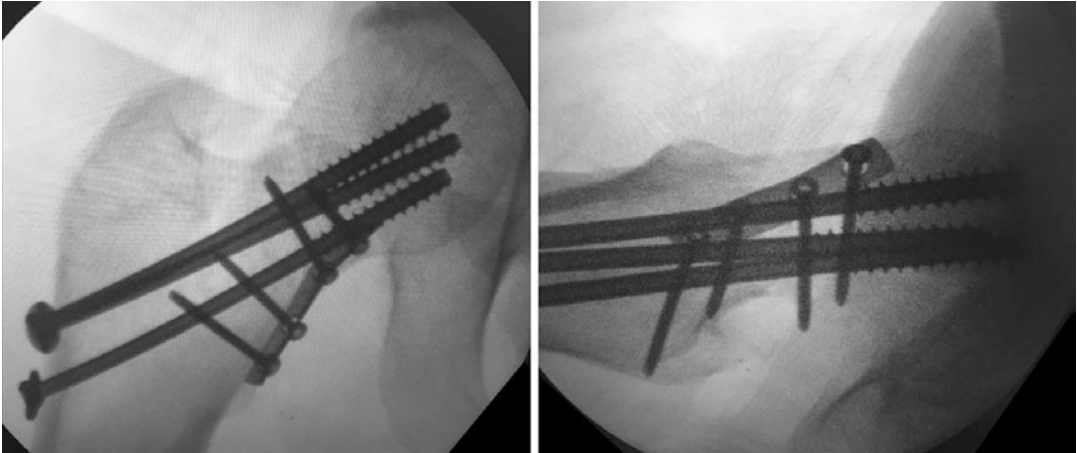


Fig. 14.23 C-arm image showing the fixation of the femoral neck with three cannulated screws

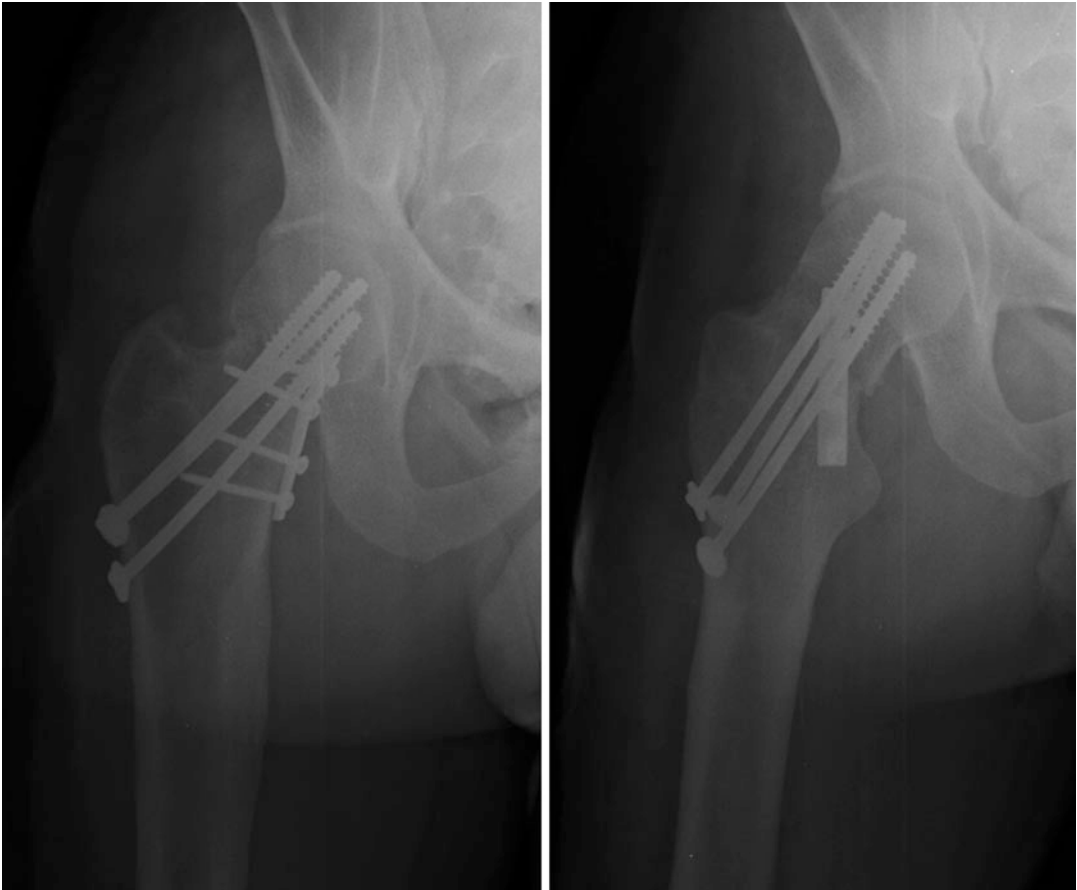


Fig. 14.24 X-ray of the fixation of the femoral neck fracture with cannulated screws and medial buttress plate

Summary and Tips and Tricks

When in the preoperative planning, it's expected that the close reduction would be difficult to be obtained THEN the patient is positioned in a radiolucent table with the well leg flexed and abducted to allow the cross-table lateral view.

Instead of the expected difficulty, to achieve a good reduction, a closed reduction with the Leadbetter maneuver is tried once.

The open reduction is done through the Hueter anterior approach. The approach goes between the sartorius and the tensor fasciae latae.

In the deeper dissection, both the rectus femoris and the gluteus medius have to be separated.

The anterior capsule is exposed and opened with a horizontally inverted "L"-shaped incision. It's a good way to preserve the vascular supply to the femoral head and have a good access to the neck for the reduction and the fixation with a buttress plate on the medial side of the neck.

Once the anatomical reduction is achieved, it's important to maintain it with three K-wires.

To fix the medial aspect of the femoral neck with the 1/3 tubular plate, the hip should be flexed and externally rotated.

The 1/3 tubular plate is placed in the medial aspect of the femoral neck. Care should be taken when fixing the plate in order not to create difficulty during the insertion of the cannulated screws.

After the fixation with the plate, the femoral neck is fixed with three cannulated screws (see case before for details).

Suggested Reading

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