Proximal femoral fractures
Per- and intertrochanteric hip fractures
Alan Norrish
Learning outcomes

At the end of this lecture you will be able to:

• Discuss the importance of blood supply for hip fractures
• Explain the importance of positioning, reduction, and perioperative sterility
• Describe the implant choice and the procedure step-by-step
• Suggest how complications can be avoided

At the end of this lecture you will be able to:
• Discuss the importance of blood supply of hip fractures.
• Explain the importance of good positioning, reduction and sterility.
• Describe the implant choice and the procedure step-by-step.
• Suggest how complications can be avoided.
Aim of treatment

- Stable fixation that always allows immediate weight bearing
- Minimize potential for implant failure
- Maximize potential for return to prefracture mobility
Hip fractures

- High energy (rare)
  - Young patients, polytrauma

- Low energy (very common)
  - 15% of women and 5% of men
  - Osteoporosis most common cause
  - Costs billions every year
  - Mortality:
    - 10% at 1 month
    - 30% at 1 year
Osteoporosis

- Reduced bone mineral density
- Common with aging
- Can lead to “fragility fractures”

Healthy bone

Osteoporotic bone
Blood supply

- Blood supply to the femoral head
  - Comes up from the circumflex artery
Blood supply

- Femoral head blood supply
  - Preserved in intertrochantric fractures
Blood supply

- Intact blood supply
  - Fracture can be fixed
Blood supply

- Transcervical fractures
  - Blood supply is at risk
  - Necrosis of the femoral head

- Surgical treatment
  - Head replacement, hemiarthroplasty
Classification is very important

31- A B C

Intertrochanteric hip fractures
- Fixation with eg, DHS

Neck and head fractures
- Different treatments eg, hemiarthroplasty

Mainly talk about a end b fractures.
This lecture is about the 31-A fractures.
The different 31-A subtypes require a different implant for fixation. Mainly talk about a end b fractures.
Classification

31- A 1

- Trochanteric, simple
- Stable type
  - Dynamic hip screw
Classification

31-A

1 2

• Trochanteric, comminuted
• Unstable
  • Dynamic hip screw or
  • Proximal femoral nail A
Classification

31-A

1

2

3

• Reverse oblique
• Unstable/stable
  • Proximal femoral nail antirotation
Dynamic hip screw

- Design
- Technique step-by-step

1. Reduction
2. Guide wire insertion
3. Lag screw insertion
4. Plate fixation
The DHS implant consists of a lag screw and a plate with a barrel in which the lag screw can glide. The plate is fixed with standard 4.5 mm screws.
Technique: Step 1—reduction

- Use of traction table, closed reduction
- Ensure sterility when draping and using C-arm

In many cases the traction table is used. The reduction is done on this table and before the patient is draped. Important also is to guarantee smooth access of the image intensifier in both planes; AP and lateral.
Technique: Step 2—guide wire insertion

1. Insertion of anteversion wire
   - Use long K-wire

The anteversion of the femoral neck is determined with a long K-wire inserted with the blunt end first. An alternative is to use a long, non-threaded K-wire.
**Technique: Step 2—guide wire insertion**

1. Insertion of anteversion wire
   - Use long K-wire

2. Insertion of guide wire
   - 135° guide
   - Guide wire
   - C-arm

The guide wire is inserted parallel to the anteversion wire by using the 135° guide fixed on the T-handle.
Technique: Step 3—screw insertion

1. Measuring for screw length
   • Use depth gauge

The length of the screw must be measured/determined with the guide wire. Note that the screw must be 10 mm shorter than the length of the guide wire. The surgeon will deduct 10 mm of the measured length to determine the screw length.
**Technique: Step 3—screw insertion**

1. **Measuring for screw length**
   - Use depth gauge

2. **Reaming**
   - Set reamer
   - Use triple reamer

Set the triple reamer to 10 mm shorter than the measured length and drill the hole over the guide wire.

Tapping is only required in young patients with dense bone.
Technique: Step 3—screw insertion

1. Measuring for screw length
   • Use depth gauge
2. Reaming
   • Set reamer
   • Use triple reamer
3. Tapping
   • In young patients only
Technique: Step 3—screw insertion

1. Measuring for screw length
   • Use depth gauge
2. Reaming
   • Set reamer
   • Use triple reamer
3. Tapping
4. Screw insertion
   • Insertion wrench
   • Coupling screw
   • Centering sleeve

Assemble the plate:
   • The coupling screw is inserted into the wrench.
   • The plate is slid over the wrench.
   • The DHS screw is attached to the coupling wrench.
   • The sleeve is assembled over the wrench.
Technique: Step 4—plate fixation

1. Plate fixation
   • Impact plate
   • Use instruments for conventional plate fixation

Impact plate in order to have best contact with femur.
The plate is fixed with conventional 4.5 mm screws:
• Drill bit 3.2 mm with sleeve
• Measuring
• Tap (when no self-tapping screws are used)
• Insertion of screw
Proximal femoral nail anteriotation

- Design
- Technique step-by-step
Design of PFNA

- Hole in nail for lag screw
- Lag screw/blade
- Locking bolt
- Intramedullary nail
Technique: Step 1—reduction

- Use of traction table, closed reduction
- Ensure sterility when draping and using C-arm

The same procedure as for DHS is followed.
1. Insertion point is determined
   • Use a guide wire

The entry point is in line with the central axis of the femoral neck. The guide wire is inserted through the tip of the greater trochanter in the femoral canal. The insertion is done under x-ray control in AP and lateral view.
Technique: Step 3—nail insertion

1. Reaming
   • Use sleeve to protect soft tissues
   • Use cannulated drill bit 17 mm

Open the medullary cavity with the cannulated 17.0 mm drill bit drilling down to its stop.
Technique: Step 3—nail insertion

1. Reaming

2. Nail insertion
   - Insertion handle
   - Connection screw
   - Socket wrench with T-handle

Assemble the PFNA onto the insertion handle.

Before the nail is handed over to the surgeon, the scrub nurse fixes the aiming arm on the handle and checks with a K-wire (through the locking holes towards the nail) the good functionality of the instruments.
Technique: Step 4—blade insertion

1. Insertion of guide wire

Beware of sterility when changing C-arm from AP to lateral view

The guide wire is inserted:
1. The protection sleeve is assembled (four parts) and entered in the aiming arm. It is clicked into place and advanced to the lateral cortex by turning the buttress nut.
2. The trocar is removed.
3. The guide wire is inserted in the center of the femoral head. The position is checked in both planes.
Technique: Step 4—blade insertion

1. Insertion of guide wire
2. Insertion of blade

The blade is inserted:
1. The length of the blade is determined with the direct measuring device.
2. The lateral cortex is opened with the 11mm drill bit (with stop). The 11mm reamer can be used as alternative. In this case the length of the fixation sleeve must be set to the measured length of the helical blade. Reaming is not required in patients with severe osteoporosis.
Technique: Step 4—blade insertion

1. Insertion of guide wire
2. Insertion of blade
**Technique: Step 5—distal locking**

1. Insertion of locking bolt
   - Drill
   - Measure
   - Insert bolt

✓ Correct position is checked in both planes

The nail is locked distally:
1. The triple guide is inserted.
2. The trocar is removed.
3. The locking hole is drilled and measured (on drill guide).
4. The inner sleeve is removed.
5. The locking bolt is inserted through the outer sleeve.
Long versus short PFNA

Advantages

- More stable
  - For reverse oblique fractures
  - For subtrochanteric fractures
- Less in periprosthetic fractures
- In some countries eg, the UK short PFNA is no longer recommended
Complications

• Wrong position of lag screw
  • Head cut out

To avoid cut out:
  • Screw must be close to joint
  • In middle of head
  • In AP and lateral view
Complications

- Wrong position of lag screw
  - Head cut out
- **Wrong selection of implant**
  - Implant failure
    - Eg, DHS in very unstable fractures can lead to malunion
Intertrochanteric fracture with subtrochanteric extension

- Treatment: DHS
  - Is this the best implant choice?
  - What may happen?
Intertrochanteric fracture with subtrochanteric extension

- Consequences:
  - Fixation failed
  - Screw cut out
  - Leg shortened
  - Leg malrotated
Complications

- Wrong position of lag screw
  - Head cut out
- Wrong selection of implant
  - Implant failure
- Periprosthetic fracture
  - More common in:
    - Short IM nails than in DHS
    - Nails where distal screw is near tip of the nail
Complications

- Wrong position of lag screw
  - Head cut out
- Wrong selection of implant
  - Implant failure
- Periprosthetic fracture
  - Infection
  - Sterility
**Special considerations for sterility**

Beware of:
- Surgeon’s back
  - Ensure gown is done up tightly as surgeon faces away during the whole procedure
- Transparent isolation drape
  - Ensure skin is dry or drape peels off
  - Positioning the drape requires the hand to move over the head—not a recommended position, great care must be taken
- C-arm
  - Protect drape when turning from AP to lateral view
Maintaining asepsis within sterile field

- Surgeon’s back
  - Surgeon faces away during whole procedure

Surgeon’s back:
- Ensure gown is done up tightly as surgeon faces away during whole procedure

Transparent isolation drape:
- Ensure skin is dry or drape peels off
- Positioning the drape requires the hand to move over the head—not a recommended position, great care must be taken

C-arm:
- Protect drape when turning from AP to lateral view
Maintaining asepsis within sterile field

- **Surgeon’s back**
  - Surgeon faces away during whole procedure
- **Isolation drape**
  - Ensure skin is dry
  - Ensure watching hands when applying drape over head

**Surgeon’s back:**
- Ensure gown is done up tightly as surgeon faces away during whole procedure

**Transparent isolation drape:**
- Ensure skin is dry or drape peels off
- Positioning the drape requires the hand to move over the head—not a recommended position, great care must be taken

**C-arm:**
- Protect drape when turning from AP to lateral view
Maintaining asepsis within sterile field

- Surgeon’s back
  - Surgeon faces away during whole procedure
- Isolation drape
  - Ensure skin is dry
  - Ensure watching hands when applying drape over head
- C-arm
  - Protect drape when taking lateral view

Surgeon’s back:
  - Ensure gown is done up tightly as surgeon faces away during whole procedure

Transparent isolation drape:
  - Ensure skin is dry or drape peels off
  - Positioning the drape requires the hand to move over the head—not a recommended position, great care must be taken

C-arm:
  - Protect drape when turning from AP to lateral view
Support surgeon

• Know the procedure step-by-step:
  • Dynamic hip screw
  • Proximal femoral nail antirotation

• Control completeness of instruments:
  • Maintain order on table
  • Be proactive in

Support surgeon to follow the correct procedure
Questions

Optional:

*Insert questions to check learning.*
The blood supply of proximal femoral fractures is...

1. Not disturbed much in intertrochanteric fractures
2. Disturbed in transcervical fractures
3. Always result in femoral head necrosis

Optional:
*Insert questions to check learning.*
The blood supply of proximal femoral fractures is...

1. Not disturbed much in intertrochanteric fractures
2. Never disturbed in transcervical fractures
3. Always result in femoral head necrosis

Optional:
Insert questions to check learning.
How do you set the DHS reamer?

1. Set reamer according to correct measurement
2. Set reamer 10 mm less than measurement
3. Set reamer 10 mm more than measurement

Optional:
Insert questions to check learning.
How do you set the DHS reamer?

1. Set reamer according to correct measurement
2. Set reamer 10 mm less than measurement ✔
3. Set reamer 10 mm more than measurement

Optional:
*Insert questions to check learning.*
What are, in your opinion, important nursing considerations during an osteosynthesis with DHS or PFNA?

1. Maintaining sterility
2. Knowing the procedure step-by-step
3. Guaranteeing a smooth change from AP to lateral view with the image intensifier

Optional:
Insert questions to check learning.
What are, in your opinion, important nursing considerations during an osteosynthesis with DHS or PFNA?

1. Maintaining sterility

2. Knowing the procedure step-by-step

3. Guaranteeing a smooth change from AP to lateral view with the image intensifier

Optional:

*Insert questions to check learning.*
Summary

- Intertrochanteric fractures:
  - Good blood supply allows fixation rather than replacement
- The right implant must be selected for each fracture type:
  - DHS, PFNA, long PFNA
- Complete instruments need to be laid out:
  - To facilitate a step-by-step approach to each procedure
- Preoperative planning:
  - Reduces complication rate

- For intertrochanteric fractures, good blood supply allows fixation rather than replacement.
- The procedure starts with positioning and a closed reduction (maintain sterile field).
- The right implant must be selected for each fracture type (DHS, PFNA, long PFNA).
- Good instruments can be laid out to facilitate a step-by-step approach to each procedure.
- Preoperative planning reduces complications