# ORTHOPAEDIC AND FRACTURE

**Lower limb trauma (lec 3)**

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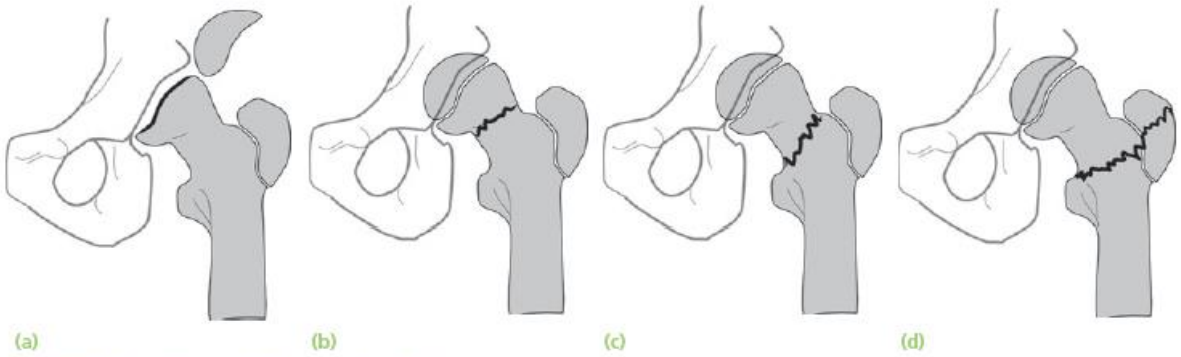
## ***PROXIMAL FEMORAL FRACTURES IN CHILDREN***

- Hip fractures rarely occur in children but when they do they are potentially very serious.
- Usually due to high velocity trauma; falling from a height or a car accident. Pathological fractures sometimes occur through a bone cyst or benign tumour.
- Risk of complications, such as avascular necrosis, premature physeal closure and coxa vara.
- Between the ages of 4 and 8 the ligamentum teres contributes very little to the blood supply of the epiphysis; hence its susceptibility to post-traumatic ischaemia**.**




29.16 Proximal femoral fractures in children These are the result of strong forces or weak bone, e.g. through cysts. There are 4 types (the Delbet classification), depending on the level of the fracture: (a) Type 1 at the physeal level; (b) Type 2 through the middle of the neck; (c) Type 3 at the base of the neck and (d) Type 4 at the intertrochanteric level.

### Treatment

Should treated urgently , and certainly within 24 hours .

*Undisplaced fractures* may be treated by immobilization in a plaster spica for 6-8 weeks.

*Displaced type IV fractures* also can be treated non operatively: closed reduction, traction and spica immobilization. Careful follow-up is essential; if position is lost, operative fixation will be needed.

*Type I, II and III fractures* are treated by closed reduction and then internal fixation with smooth pins or cannulated screws.

In small children, operative fixation is supplemented by a spica cast for 6‑12 weeks.

## ***SUBTROCHANTERIC FRACTURES***

Subtrochanteric fractures have several features

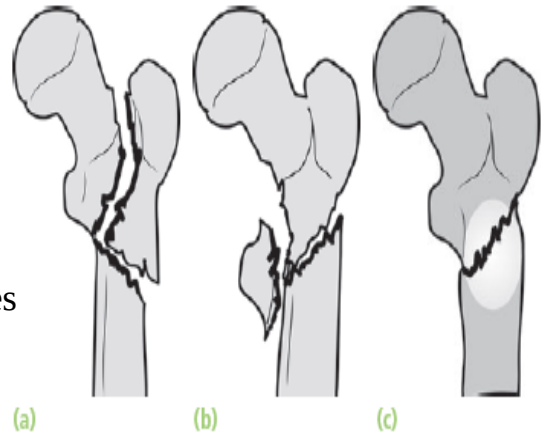
1. Blood loss is greater than with femoral neck or trochanteric fractures.
2. There may be subtle extensions of the fracture into the intertrochanteric region, which may influence the manner in which internal fixation can be performed.
3. The proximal part is abducted and externally rotated by the gluteal muscles, and flexed by the psoas.

**Clinical features**

The leg lies in neutral or external rotation and looks short; the thigh is markedly swollen. Movement is painful.

**X-ray**

- May be transverse, oblique or spiral, and is frequently comminuted.
- Three important features should be looked for, the presence of any will influence treatment:
  (1) An unusually long fracture line extending proximally towards the greater trochanter and piriform fossa;
  (2) A large, displaced fragment which includes the lesser trochanter; and
  (3) Lytic lesions in the femur.

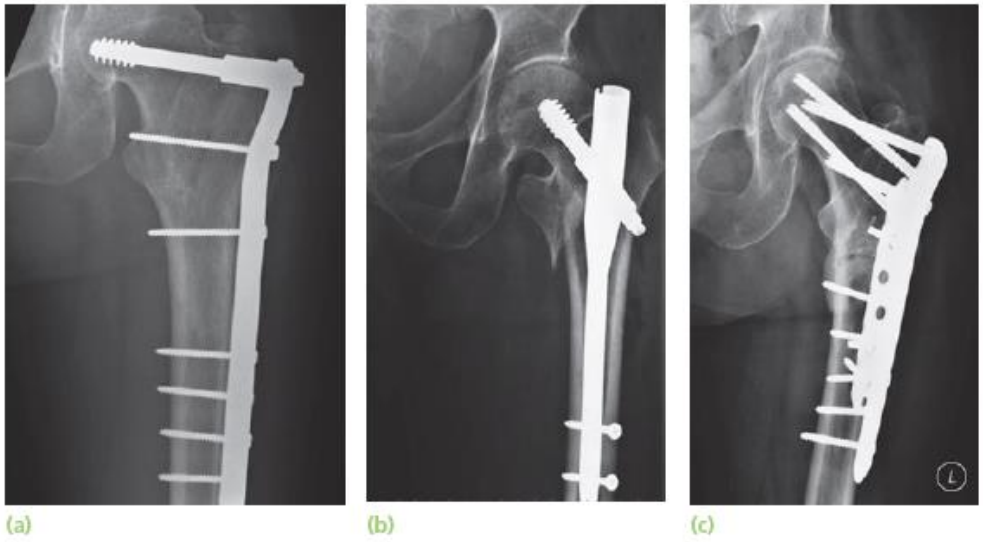


(a) (b) (c)

29.18 Subtrochanteric fractures of the femur – warning signs on the x-ray X-ray findings that should caution the surgeon: (a) comminution, with extension into the piriform fossa; (b) displacement of a medial fragment including the lesser trochanter and, (c) lytic lesions in the femur.

## Treatment

Traction may help to reduce blood loss and pain. It is an interim measure until the patient, especially if elderly and with multiple medical problems, is stabilized and prepared for surgery. Open reduction and internal fixation is the treatment of choice.



(a) (b) (c)

**29.19 Subtrochanteric fractures – internal fixation** Several methods of fixation are in use: (a) a 95° screw and plate device; (b) an intramedullary nail with proximal interlocking screw into the femoral head; and (c) a proximal femoral plate with locking screws.

### Complications

- *Malunion* :Varus and rotational malunions are fairly common. If the degree of malunion produces symptoms, it may need operative correction.
- *Non-union* This occurs in about 5 per cent of cases; it will require operative correction of any deformity, redo fixation and bone grafting.

# ***FEMORAL SHAFT FRACTURES***

### Mechanism of injury

In young adults results from a high energy injury. In elderly patients should be considered 'pathological' until proved otherwise.

### Clinical features

swelling and deformity of the limb, and any attempt to move the limb is painful. With the exception of a fracture through pathological bone

**Emergency treatment** Traction with a splint helps to control pain, reduces bleeding and makes transfer easier. Shock should be treated; and then definitive plan.

## THE ISOLATED FEMORAL SHAFT FRACTURE

*Traction, bracing and spica casts*

- **Traction**

(1) fractures in children;(2) contraindications to anaesthesia; and (3) lack of suitable skill or facilities for internal fixation.

- **Plate and screw fixation**

(1) fractures at either end of the femoral shaft, especially those with extensions into the supracondylar or pertrochanteric areas,

(2) a shaft fracture in a growing child, and

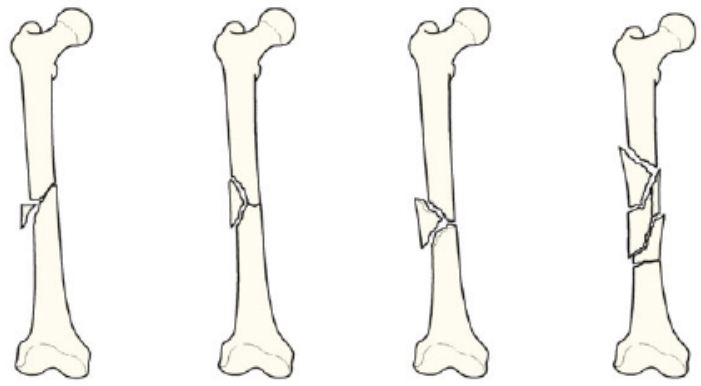
(3) a fracture with a vascular injury which requires repair

- **Intramedullary nailing**
- **External fixation**

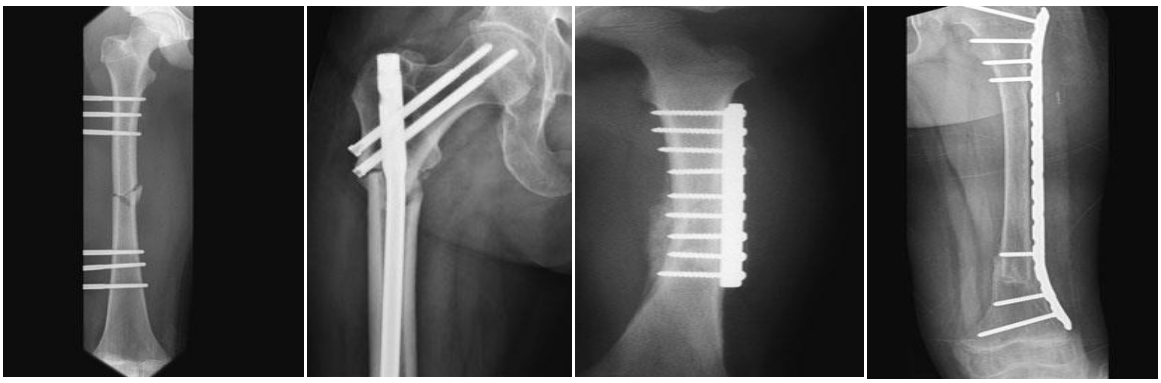
(1) treatment of severe open injuries;
(2) management of patients with multiple injuries where there is a need to reduce operating time and prevent the 'second hit'; and
(3) the need to deal with severe bone loss by the technique of bone transport. External fixation is also useful for
(4) treating femoral fractures in adolescents

### Treatment of open fractures

Open femoral fractures should be carefully assessed for (1) skin loss; (2) wound contamination; (3) muscle ischaemia; and (4) injury to vessels and nerves.



**29.20 Femoral shaft fractures – classification** Winquist's classification reflects the observation that the degrees of soft-tissue damage and fracture instability increase with increasing grades of comminution. In *Type 1* there is only a tiny cortical fragment. In *Type 2* the 'butterfly fragment' is larger but there is still at least 50 per cent cortical contact between the main fragments. In *Type 3* the butterfly fragment involves more than 50 per cent of the bone width. *Type 4* is essentially a segmental fracture.



**Complications of femoral shaft fractures**

**EARLY**

(1) *Shock* 1 or 2 litres of blood can be lost even with a closed fracture,
(2) *Fat embolism* Fracture through a large marrow- filled cavity almost inevitably results in small showers of fat emboli being swept to the lungs.
(3) *Thromboembolism* Prolonged traction in bed predisposes to thrombosis. Movement and exercise are important in preventing this, but high-risk patients should be given prophylactic anticoagulants as well.
*(4) Infection*

**LATE**

*(1) Delayed union and non-union*
*(2) Malunion*
*(3) Joint stiffness*
*(4) Refracture and implant failure*
*(5)*

# ***FEMORAL SHAFT FRACTURES IN CHILDREN***

**Mechanism**

< 2 years of age the commonest cause is child abuse; if there are several fractures in different stages of healing, this is very suspicious.

*Pathological fractures* are common in generalized disorders such as spinabifida and osteogenesis imperfecta, and with local bone lesions

## Treatment

*Traction and casts Infants* need no more than a few days in balanced traction, followed by a spica cast for another 3–4 weeks

- *2 - 10 years of age* can be treated either with balanced traction for 2–3 weeks followed by a spica cast for another 4 weeks, or by early reduction and a spica cast from the outset. Shortening of 1–2 cm and angulation of up to 20 degrees are acceptable.
- *Teenagers* require somewhat longer (4–6 weeks) in balanced traction the limit of acceptable angulation in this age group is **15** degrees in the AP x-ray and **25** degrees in the lateral
- Surgical options include fixation with flexible intramedullary nails or trochanteric entry-point rigid nails with interlocking screws

## Complications

(1) *Shortening:* anything up to 2 cm is quite acceptable in young children, bone to grow faster for up to 2 years after the injury.
(2) *Malunion* It is probably wise to observe a malunited fracture for 2 years before offering corrective osteotomy.

## ***SUPRACONDYLAR FRACTURES OF THE FEMUR***

- in young adults, usually as a result of high energy trauma, and
- in elderly, osteoporotic individuals.

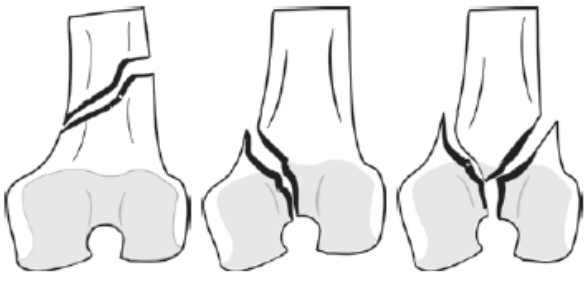
**Clinical features**

The knee is swollen because of a haemarthrosis – this can be severe enough to cause blistering later. Movement is too painful to be attempted. The tibial pulses should always be checked to ensure the popliteal artery was not injured in the fracture.

**X-RAY**

factors influence the type of internal fixation

(1) whether there is a fracture into the joint and if it is comminuted;
(2) the size of the distal segment
(3) whether the bone is osteoporotic.



**29.32 The AO classification of supracondylar fractures** (a) Type A fractures do not involve the joint surface; (b) type B fractures involve the joint surface (one condyle) but leave the supracondylar region intact; (c) type C fractures have supracondylar and condylar components.

**Treatment**

- *Non-operative by traction* If the fracture is only slightly displaced and extra-articular, or if it reduces easily with the knee in flexion,for 4–6 weeks
- *Surgery* Operative treatment with internal fixation can enable accurate fracture reduction, especially of the joint surface, and early movement.

**Several different devices are available:**

1. Locked intramedullary nails

2. *Plates that are applied to the lateral surface of the femur*:

traditional angled blade-plates or 95 degree condylar screw-plates.

3. *Simple lag screws*

**Complications**

EARLY *Arterial damage* , LATE *Joint stiffness, Malunion ,Non-union*

# ***FRACTURE-SEPARATION OF DISTAL FEMORAL EPIPHYSIS***

**Salter–Harris fracture of epiphysis**

Type 1 **–** separation of the epiphysis

Type 2 – fracture through the physis and metaphysis

Type 3 **–** an intra-articular fracture of the epiphysis

Type 4 **–** splitting of the physis and epiphysis **–**

Type 5 **–** crushing of the physis.

**Clinical features**

The knee is swollen and perhaps deformed. The pulses in the foot should be palpated because, with forward displacement of the epiphysis, the popliteal artery may be obstructed by the lower femur.

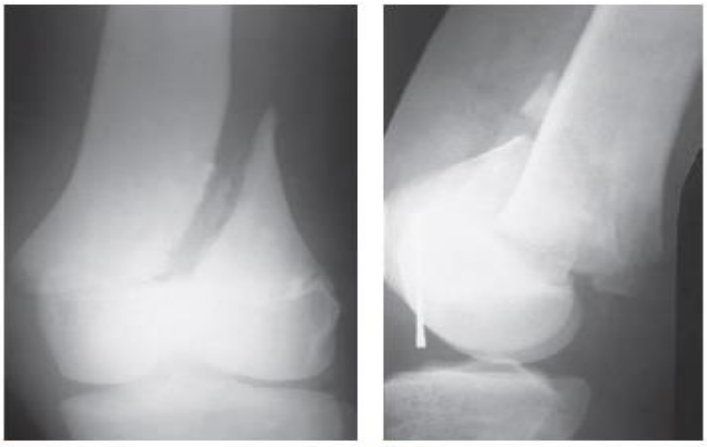
**Treatment**

The fracture can usually be perfectly reduced manually, but further x-ray checks will be needed over the next few weeks to ensure that reduction is maintained. Occasionally open reduction is needed; a flap of periosteum may be trapped in the fracture line. Salter– Harris types 3 and 4 should be accurately reduced and fixed.

**Complications**

EARLY *Vascular injury* .

LATE *Physeal arrest*



(a) (b)

29.35 Fracture-separation of the epiphysis These