CASE THREE

SHORT CASE NUMBER: 3_9_3
CATEGORY: CHILDREN & YOUNG PEOPLE
DISCIPLINE: PAEDIATRICS_SURGERY
SETTING: HOSPITAL
TOPIC: COMMON PAEDIATRIC ORTHOPAEDIC PROBLEMS

Case

During a routine baby check on Annie Whyte, aged 3 days, you note she has a positive Barlow test and equivocal Ortolani test. Annie was born by Caesarean section for breech presentation. Her birth weight was 4.2 kg.

Questions

1. What factors in Annie's history are known risks for developmental dysplasia of the hip? (CDH)
2. Outline the diagnosis of CDH in the newborn and compare this to diagnosis in the older infant.
3. In point form, outline the differences between bow legs and knock knees in terms of age affected and treatment required.
4. Outline how to diagnose adolescent idiopathic scoliosis?
5. In a table, summarise the key features of the following osteochondroses: Scheuermann condition, slipped capital femoral epiphysis, chondromalacia patellae, Osgood-Schlatter condition and Sever condition.
6. List the key features of these 4 common paediatric fractures: clavicle fractures, forearm fractures, supracondylar fracture of the humerus and toddler fracture of the tibia.

Suggested reading:

- Cundy P. (2012). Orthopaedic Problems. In: M. South & Isaacs D (Eds.). *Practical Paediatrics* (7th Ed). (pp 252-263). Edinburgh: Churchill Livingston/Elsevier.
- Up-to-date - Clinical features; evaluation; and diagnosis of adolescent idiopathic scoliosis

ANSWERS

1. What factors in Annie's history are known risks for developmental dysplasia of the hip? (DDH)

This condition was previously called congenital dislocation of the hip (CDH); however, developmental dysplasia of the hip (DDH) is now the preferred term as it implies that some of these hip problems may develop after birth. DDH is the most common musculoskeletal abnormality in neonates. The incidence of this condition in Australia and North America is 7 per 1000 live births. In some regions of Europe it is more common.

The risk factors in Annie's case include breech (X10), female gender (X4) and large baby > 4Kg (X2). Other risk factors include, oligohydramnios (X4), first born (X2) and family history.

2. Outline the diagnosis of DDH in the newborn and compare this to diagnosis in the older infant.

Newborn
The Barlow and Ortolani tests are used for diagnosis. Every baby should be examined for hip dislocation during the first day of life and again at discharge from the maternity ward, and at ages 6 weeks, 3 months, 6 months and 1 year. The baby must be relaxed for the examination to be meaningful. If the baby is crying, a bottle or pacifier is offered or the baby is examined later when relaxed. With the legs extended, any asymmetry of the legs or adductor creases is noted. The examiner then holds the leg to be examined (using the opposite hand to the side of the hip to be examined). With the knee flexed, the thumb is placed over the lesser trochanter and the middle finger over the greater trochanter. The pelvis is steadied by the other hand and the flexed thigh is abducted and adducted and any clunk or jerk is noted.

It is very important to note that frequently a fine click can be felt in the hip joint without any laxity or abnormal movement. Sometimes the click comes from the knee joint. This is very common and is of no significance. Also, it is common in the first 2 or 3 days of life for the hip to be felt to subluxate smoothly without any clunk. This is especially felt in premature babies and requires repeated examination; frequently the hip becomes normal without treatment but it must be carefully followed.

Radiography has no place in the diagnosis of developmental dysplasia of the hip in the neonatal period. Ultrasound examination of the hips gives the clinician useful information as to the relationship of the femoral head to the acetabulum and the existence of any acetabular dysplasia during the first 6 months of life. Ultrasound has a high false-positive rate in babies under 6 weeks of age and scans should only be performed under 6 weeks either to check whether a hip is 'in joint' while in a splint or to check a 'doubtful' hip when the Barlow or Ortolani tests are equivocal.

Older Infant > 3-4 months
The Barlow and Ortolani tests become more difficult to elicit after 3 months of age. In the abnormal hip, a new sign of limited abduction appears due to tightness of the adductor tendons. This sign is not diagnostic but an X-ray is indicated when there is asymmetry in the range of the abduction of the hips or when the range of abduction of both hips is inappropriate for the age of the child. In the first year of life the range of abduction in flexion is usually 60-90°; this arc normally lessens with age.
Over the age of 4 months the degree of ossification of the upper femur and acetabulum enables X-rays to be of value.

The physical signs of late presenting dislocation include:

- higher greater trochanter
- wide perineum
- asymmetric gluteal buttock crease
- short leg
- abnormal gait.

3. **In point form, outline the differences between bow legs and knock knees in terms of age affected and treatment required.**

Age affected:
Bow legs are common under 2 years of age and knock knees are common between 2 and 7 years of age.
Treatment required:
Both conditions are most commonly normal developmental processes with bow legs resolving between 2 and 3 years of age and knock knees by age 7. No treatment is required apart from parental assurance. There is a rare form of knock knees that presents in obese children over the age of 12 years and which does require treatment.

4. **Outline how to diagnose adolescent idiopathic scoliosis?**

Approximately 90% of cases occur in girls and the scoliosis progresses during the rapid growth spurt years.
For diagnosis, the child must remove all clothing above the waist and stand with the back facing the examiner. In all but very minor curves the deformity will be readily apparent. Signs to look for are:

- uneven shoulders
- waist (flank) asymmetry
- a unilateral rib prominence when the child bends forward

If the curve disappears completely when the child bends forward, it can be labelled 'postural'. Should a rib hump become visible (due to rotation of the vertebrae and consequent rib deformity) the curve is labelled 'structural'.

5. **In a table, summarise the key features of the following osteochondroses: Scheuermann's condition, slipped capital femoral epiphysis, chondromalacia patellae, Osgood-Schlatter's condition and Sever condition.**

	Scheuermann condition	Slipped capital femoral epiphysis	Chrondromalacia patellae	Osgood-Schlatters' condition	Sever condition
Age (years)	12-16	10-15	10-20 (♀>♂)	10-14	10-12
Site	Epiphyseal plates of vertebral bodies (thoracic > lumber)	Hip, 40% bilateral	Patella	Tibial tuberosity	Heel, at the attachment of the Achilles tendon
Symptoms/ signs	Back pain, thoracic kyphosis	Hip or referred knee pain, limp. Limited internal rotation of the hip	Pain around patella after exercise, worse on walking downstairs. Occasionally tender inferior pole of patella, effusion.	Pain and swelling of tibial tubercle.	Painful heel
Diagnosis	Clinical and X-Ray	Clinical and X-ray	Clinical	Clinical	Clinical
Treatment	Mostly conservative,	Surgery with screw fixation to prevent	Reassurance, massage, anti-	Reassurance, quadriceps	Reassurance, calf

	some brace, and rarely surgery	further slip	inflammatory gels, quadriceps stretches. Resolves in ~ 18 months	stretches and massage. Resolves 12-18 months.	stretches. Resolves within 12 months

6. List the key features of these 4 common paediatric fractures: clavicle fractures, forearm fractures, supracondylar fracture of the humerus and toddler fracture of the tibia.

Fractures in Children

Children's bones can break in several ways, namely:

- bend
- buckle
- greenstick
- complete, with/without displacement and overlap

Practical points
Rules of 2 for fractures

- 2 views (anteroposterior and lateral X-ray)
- 2 joints (X-ray the joint above and joint below to exclude dislocation)
- 2 joints (immobilize the joint above and below the fracture in a cast)
- 2 times (ensure the fracture has not shifted after 1 week)
- 2 sides (you can X-ray the contralateral side for comparison if needed)

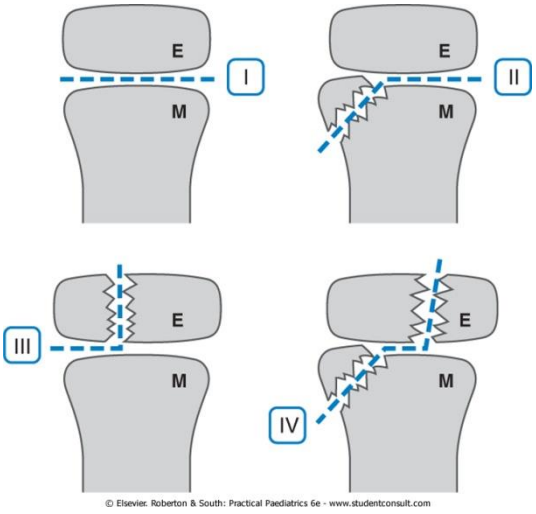
Clavicle fractures

- These are the most common fractures seen in children.
- The fracture is usually midshaft and of greenstick type. Complete fractures with overlap of the ends are seen in older children and unite well.
- It is important to warn the parents at the beginning that they must expect to see a large lump develop: this is healing callus, which will remodel over 6-12 months without any cosmetic or functional deficit.
- Treatment is with a triangular sling inside the clothes to support the elbow, regular analgesia and rest. The clavicle will start to join within a week and the sling can usually be discarded by 4 weeks.

Forearm fractures

- Most forearm fractures are of the buckle or greenstick variety and if there is minimal tilt or deformity they can be treated in an above elbow cast for 5 weeks.
- It is important to do a check radiograph after 7-10 days to ensure that the fracture has not tilted more. If it has tilted to an unacceptable position, the fracture can still undergo a closed reduction before firm union occurs.
- Fractures with visible deformity or significant tilt/displacement require closed reduction and a similar time of cast immobilization
- Ensure that you complete and document a neurovascular examination of the limb initially. Provide the parents with written instructions for neurovascular observations at home and provide them with emergency contact details if excessive swelling or symptoms develop. Look for the five Ps:
    - excessive *Pain*
    - *Paraesthesia* (compression of the sensory nerves)
    - *Paleness* of the fingers

    - *Plum*-coloured (venous congestion)
    - *Pulseless.*
- Approximately 30% of children's fractures involve the growth plate (physis). If the physis suffers permanent damage, the bone can end up: short or angulated
- The Salter-Harris classification is used for growth plate fractures (below). Type I is often seen in the distal fibula as the childhood equivalent of the adult ankle sprain. Type II is the commonest variety and frequent in the distal radius. Types III and IV have a much higher risk of growth disturbance and usually require accurate reduction and internal fixation to minimize the risk of growth arrest.



Supracondylar fracture of the humerus

- This fracture is often seen in children of 4-10 years after a fall from a height, such as from monkey bars, or when running. The mechanism is usually hyperextension of the elbow joint with the olecranon acting as a fulcrum lever to cause the fracture
- Neuropraxia of the radial, median, ulnar nerve is common. Occasionally displaced fractures cause damage to the brachial artery. Again, neurovascular assessment is mandatory. Minimally tilted fractures can be treated in a collar and cuff under the clothes for the first 2 weeks, then outside the clothes for a further 2 weeks. Warn the parents to expect elbow stiffness, especially loss of elbow extension for several months.
- Displaced fractures require accurate reduction to avoid later deformity. Often the fracture will be held with K wires, which are removed at 4 weeks

Toddler fracture of the tibia

- This distal shaft fracture may not be visible on initial radiographs and often perplexes clinicians faced with a toddler who refuses to walk for days after a seemingly minor trauma.
- The fracture can be diagnosed clinically by twisting the good leg first and then noting the cry or facial expression when twisting the affected side. Warn the parents what you are going to do first!
- Treat the fracture in an above knee cast and allow weight bearing as the child dictates. Most will walk after 1 week in the cast and the cast can be removed at 3 weeks. Warn the parents to expect a limp for 1-2 months: the limp will resolve spontaneously.