HAEMATOGENOUS BONE AND JOINT SEPSIS

Dr Paul Rollinson
Orthopaedic Department,
Ngwelezana Hospital

Overview

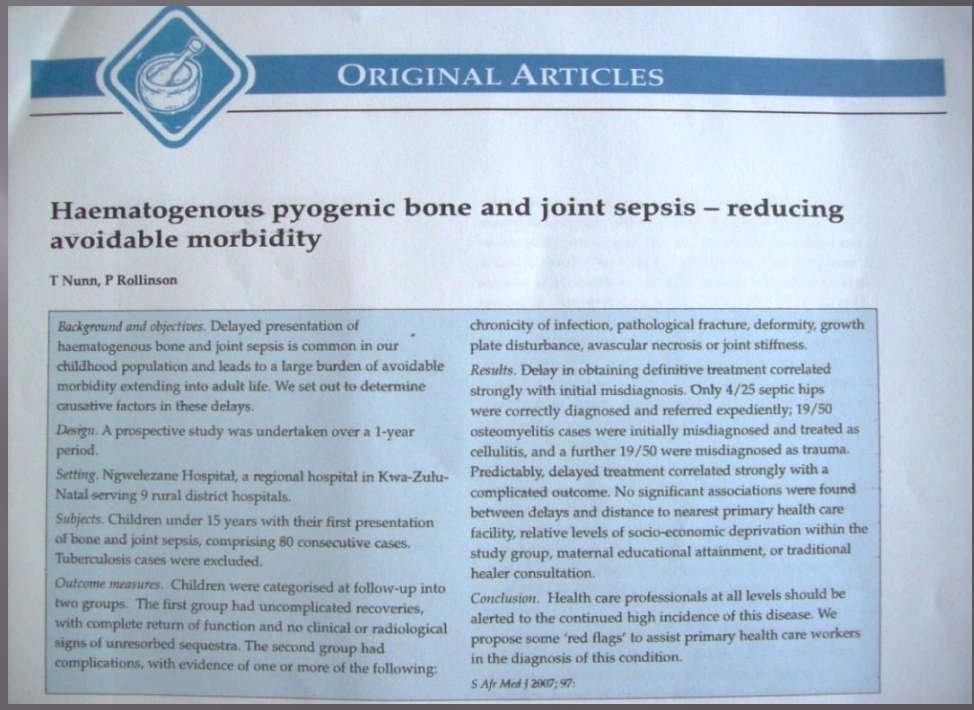
- Background/Introduction
- Extent and severity of problem
- Patho-anatomy
- Investigations
- Antibiotic Rx
- Surgery
- Long term complications

Bone and Joint Sepsis in South Africa

- Approx. 80 new children (under 15 years) admitted at Ngw each year with haematogenous bone and joint sepsis.
- Late presentation to the **Orthopaedic department** is the rule and over 95% require surgical drainage.
- 40% of these children will get a complicated outcome often with very significant disability and multiple extensive operations
- Worst published results for the septic arthritis of the hip in children

Prospective Study 2004-2006

- Work done at Ngwelezana over a 2 year period from 2004 – 2006
- Identify factors that cause significant delay to treatment in our population
- Published in SAMJ in 2007



ORIGINAL ARTICLES

Haematogenous pyogenic bone and joint sepsis – reducing avoidable morbidity

T Nunn, P Rollinson

Background and objectives. Delayed presentation of haematogenous bone and joint sepsis is common in our childhood population and leads to a large burden of avoidable morbidity extending into adult life. We set out to determine causative factors in these delays.

Design. A prospective study was undertaken over a 1-year period.

Setting. Ngwelezane Hospital, a regional hospital in Kwa-Zulu-Natal serving 9 rural district hospitals.

Subjects. Children under 15 years with their first presentation of bone and joint sepsis, comprising 80 consecutive cases. Tuberculosis cases were excluded.

Outcome measures. Children were categorised at follow-up into two groups. The first group had uncomplicated recoveries, with complete return of function and no clinical or radiological signs of unresorbed sequestra. The second group had complications, with evidence of one or more of the following: chronicity of infection, pathological fracture, deformity, growth plate disturbance, avascular necrosis or joint stiffness.

Results. Delay in obtaining definitive treatment correlated strongly with initial misdiagnosis. Only 4/25 septic hips were correctly diagnosed and referred expediently; 19/50 osteomyelitis cases were initially misdiagnosed and treated as cellulitis, and a further 19/50 were misdiagnosed as trauma. Predictably, delayed treatment correlated strongly with a complicated outcome. No significant associations were found between delays and distance to nearest primary health care facility, relative levels of socio-economic deprivation within the study group, maternal educational attainment, or traditional healer consultation.

Conclusion. Health care professionals at all levels should be alerted to the continued high incidence of this disease. We propose some 'red flags' to assist primary health care workers in the diagnosis of this condition.

S Afr Med J 2007; 97:

Follow up

- Minimum of 3/12 follow up

- Categorized into 2 groups:

  1. Uncomplicated
     - Full recovery
     - No signs of sequestrum or chronicity of infection, clinically or radiologically

  2. Complicated
     - Signs of residual infection
     - Other issues either clinical or radiological

Anatomical Distribution

Multifocal cases = 9

Pelvis = 3

Hip & prox. Femur = 27

Distal Femur = 15

Fibula = 5

Ankle & Hind foot =2

Forefoot = 1

Shoulder, Prox. Humerus & clavicle= 10

Dist. Humerus Elbow= 6

Forearm = 3

Knee = 8

Prox. Tibia = 12

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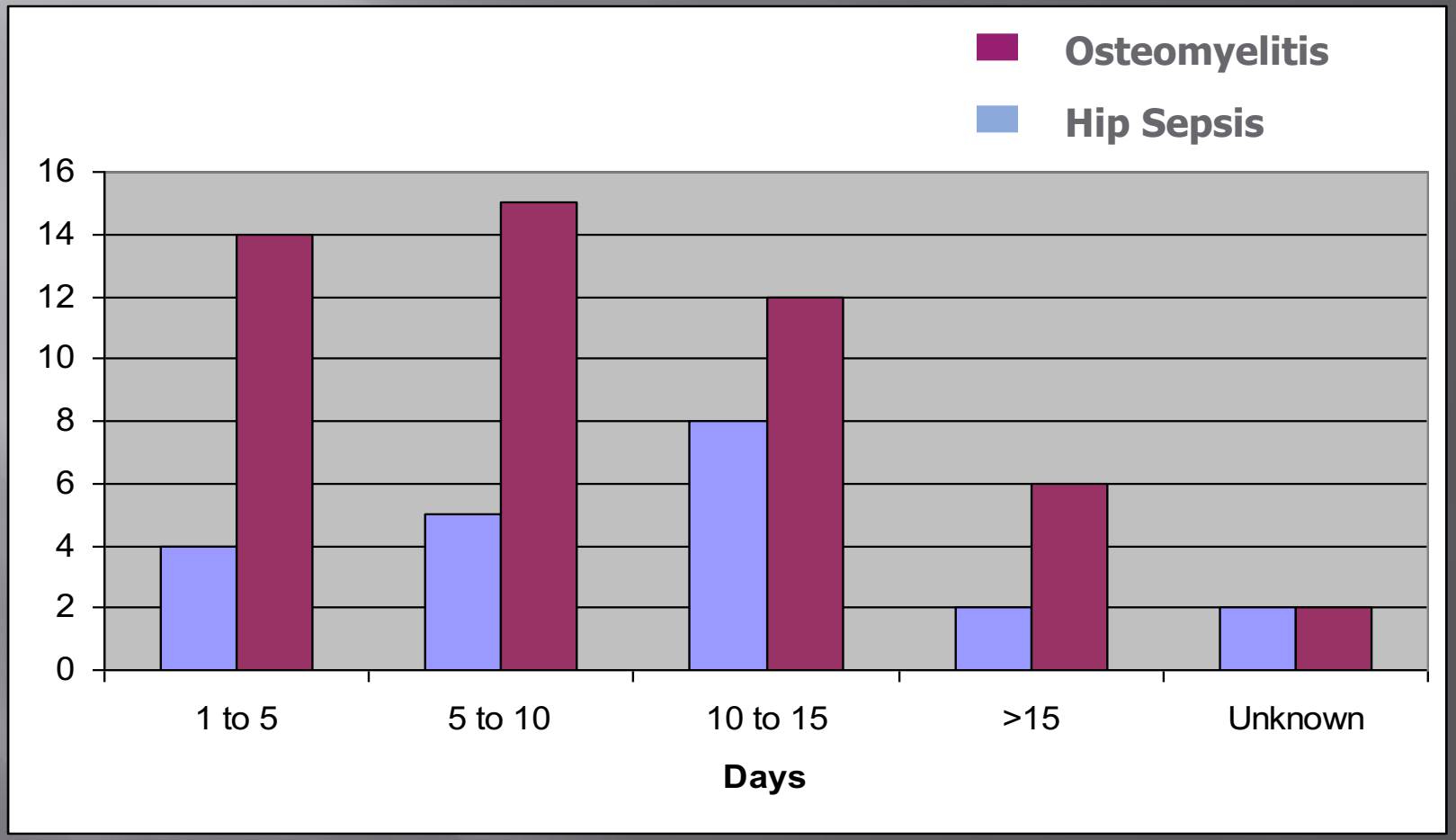
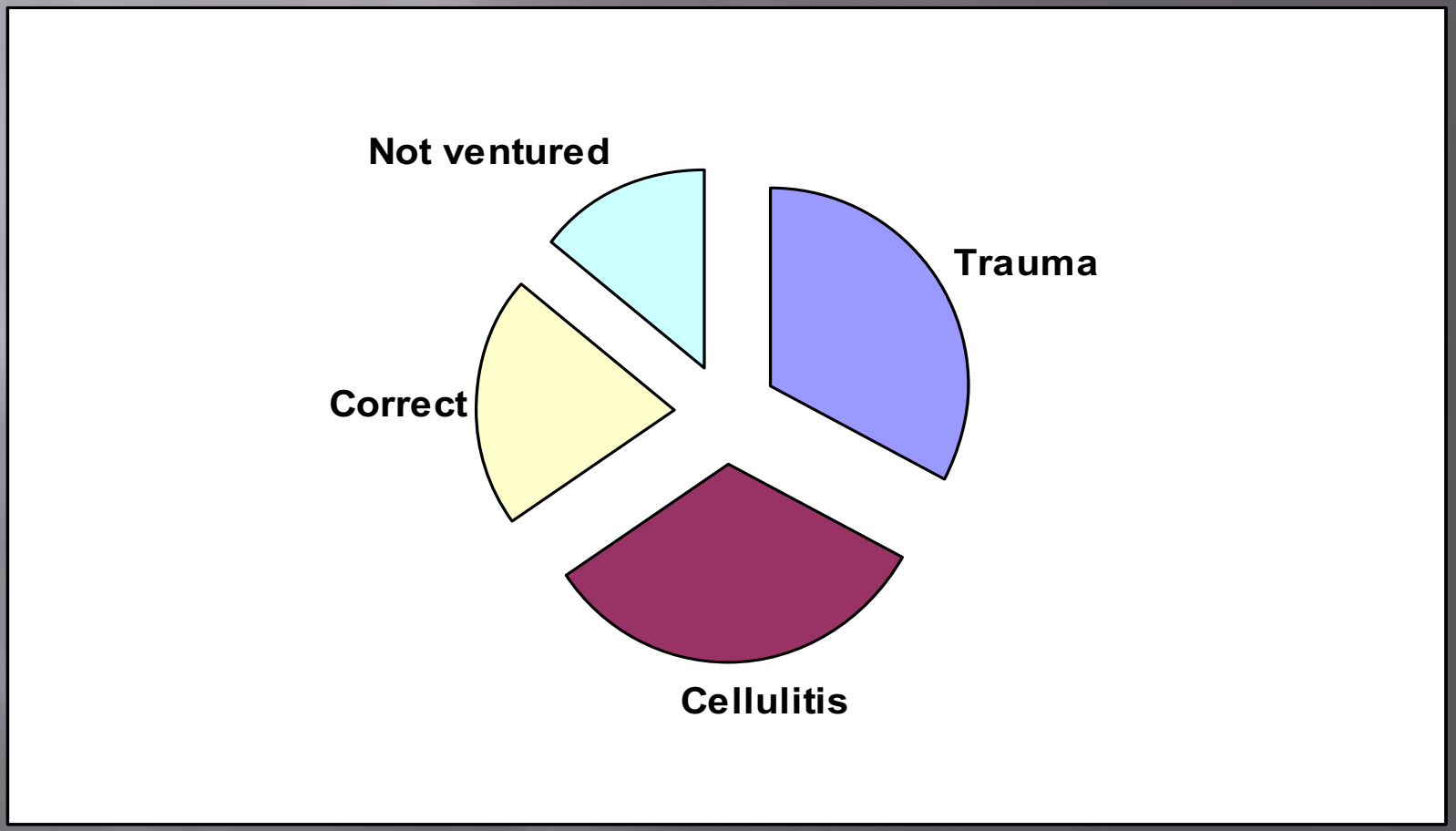
Results: Bony pathology

- 18% of the osteomyelitis cases were early cases:
  - Confined to medullary cavity
  - Confirmed with bone drilling and bacteriology
  - Treated with IV antibiotics alone
- 24% of the long bone osteomyelitis cases were very advanced
  - Circumferential periosteal stripping

Results: Delay to Surgical Drainage

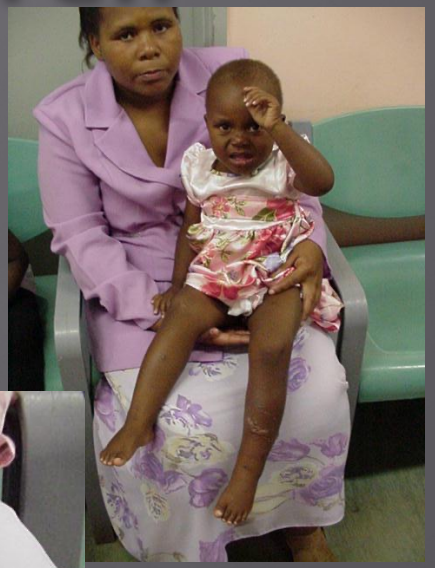


Erroneous diagnosis in the osteomyelitis group (50 patients)



Cellulitis in Children

- Mercer Rang "Diagnosis of the naïve"
- "Cellulitis does not exist in children - it is always osteomyelitis"
- But !
  - Occ. seen in toddlers, usually chubby and nearly always covered in skin sores
  - Then trial of antibiotics for 24 – 48 hours
- Also Pre-patellar swelling
  - Cellulitis
  - Pre-patellar bursitis
    - ? Antibiotics alone
    - ? Drainage needed



Statistical Analysis Kendall_tau

No significant correlations between:

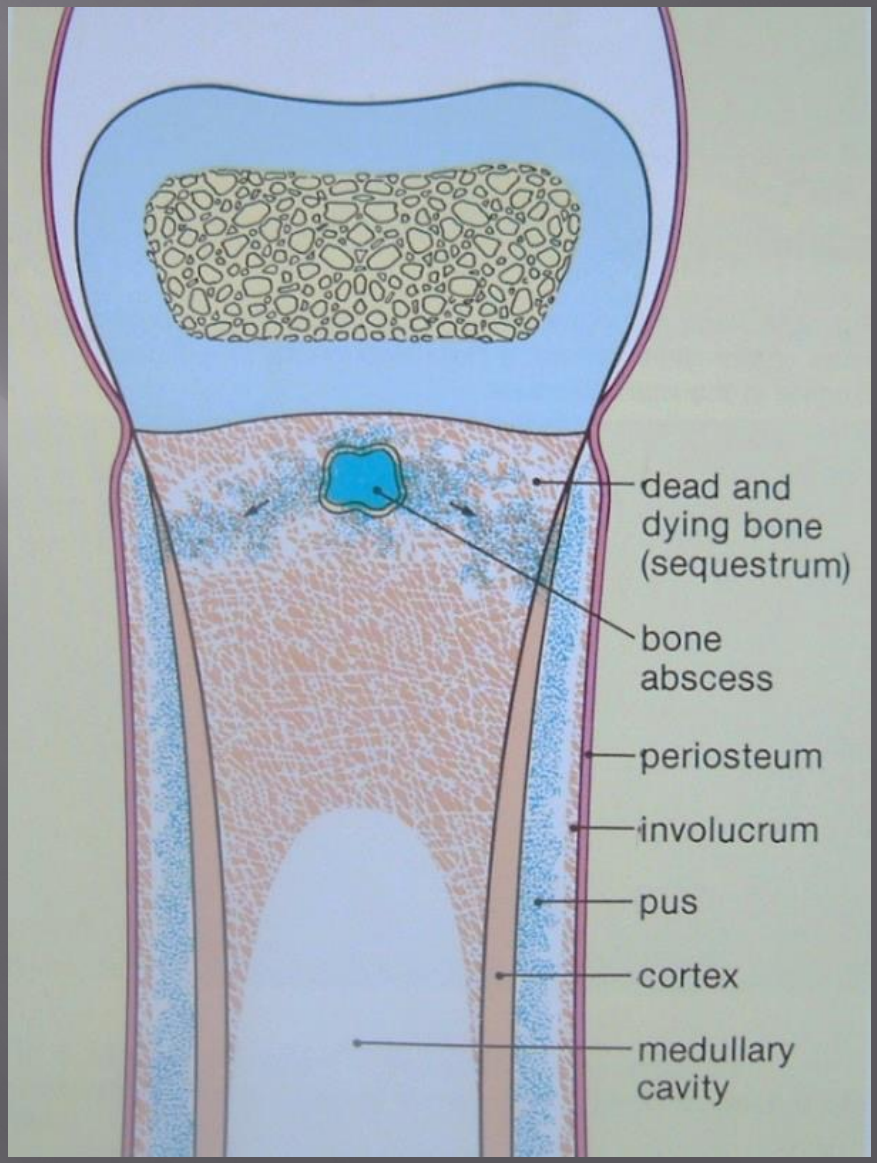
1. Delay and relative levels of deprivation (0.2)
2. Delay and distance to clinic (<0.1)
3. Delay and maternal education (0.1)
4. Delay and visiting a traditional healer (0.1)

Patho-anatomy

- Classic teaching has primary source as sore throat/middle ear infection
- Probably due to skin sores
  - Infected mosquito bites
  - Scabies
- Also most kids are malnourished with a degree of impaired immunity.

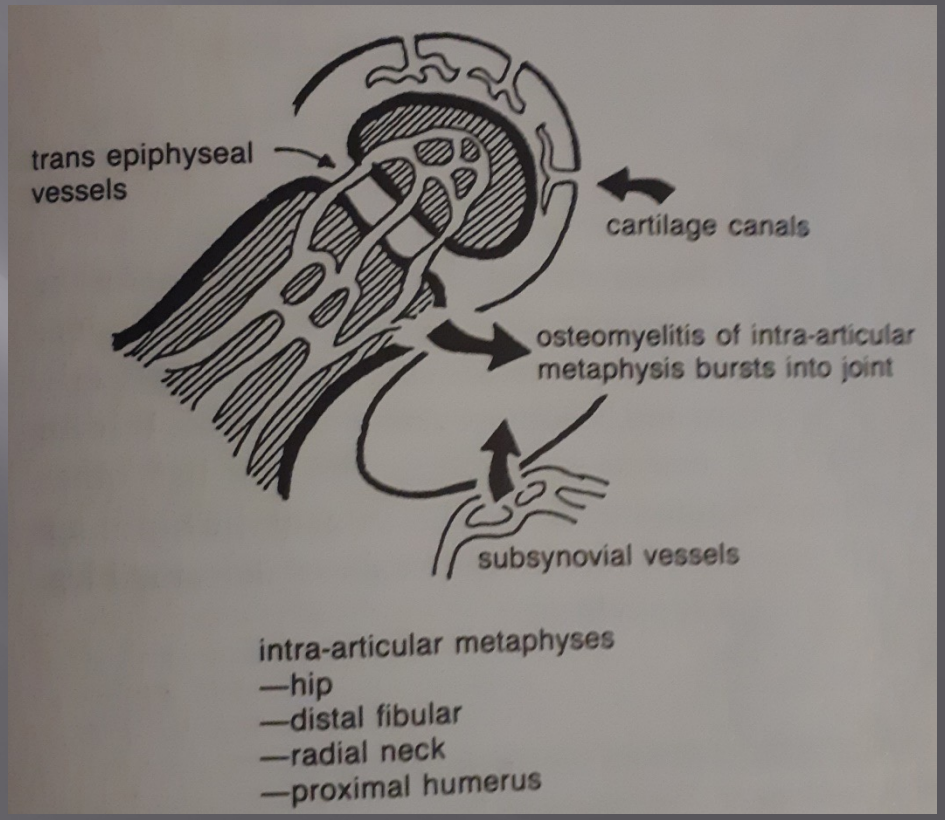
Patho-anatomy

- Haematogenous
  - Blood born
  - Usually from skin sepsis
- ? Minor trauma
- Metaphyseal sepsis
  - Impaired immune surveillance
- Sub-Periosteal abscess
- Longitudinal & circumferential periosteal stripping
- Child usually presents to ortho dept at this stage
- Cortical bone denuded of its blood supply



Patho-anatomy

- Septic arthritis
  - Direct spread to the joint
    - Indirect spread from underlying metaphyseal bone.
    - Infants under 12 months have vascular channels the epiphysis and into the joint
  - Hip joint sepsis
    - Mostly from prox. femoral osteomyelitis
    - Primary manifestation is that of septic hip, only later X- rays showing bone involvement reveal the true origin of the sepsis

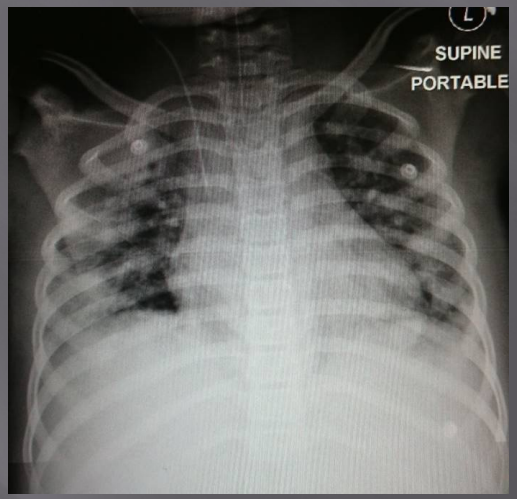


Who is at Risk?

- Who is at risk?
  - Any under-privileged, malnourished child
- HIV
  - False assumption that HIV has had a significant impact in the incidence and severity of bone and joint sepsis in children
  - But has impacted significantly in young adults re-activating their quiescent childhood osteomyelitis years later after sero-converting as an adult.

Presentation

- Three presentations :
  - Neonates and infants
    - Apart from very sick ICU neonates, most infants not sick
    - Pseudo-palsy
    - X-ray
  - Standard child
    - Swollen, painful limb
  - Very sick child
    - Pneumonia
    - Multi-focal B & J sepsis
    - Invariably Hip sepsis



Infant Presentation

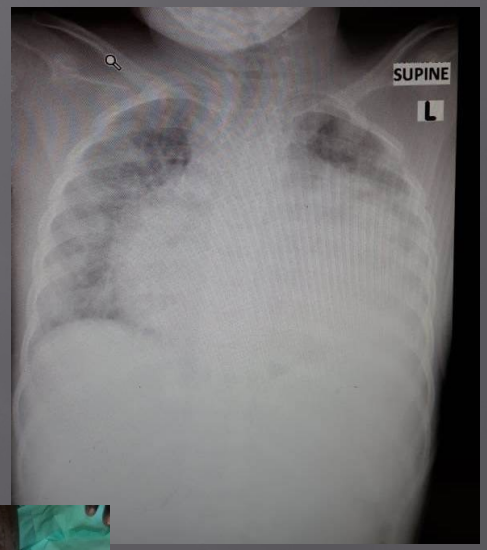
- Infant not moving arm/leg
- Not toxic, often apyrexial and not very ill
- Upper limb problem in neonate often attributed to "birth palsy"
- X-ray will nearly always show widened joint space and from there the diagnosis of joint infection should be evident

Standard Presentation

- All ages but peaking about 6 – 7 years
- Swollen, painful limb
- Usually alleged or real preceding trauma history
- Toxic and pyrexial (if temperature actually taken)
- Normal X-ray if presenting in first 7 – 10 days

Sick Child/Adolescent Presentation

- Very sick, toxic & sometimes confused
- Usually obvious florid pneumonia and presentation to Paediatrics
- Often sepsis in other systems eg. heart with endocarditis , pericardial effusion, liver abscesses
- Swollen limb(s) and invariably hip joint infection
- Often multiple sites of bone and joint infection



Investigations

- Clinical Diagnosis
  - supported by imaging and blood tests
- Blood tests
  - FBC
    - Raised WCC
    - Sick child may be very anaemic
  - U & E
    - Especially in sick child, may be dehydrated with AKI
  - ESR and C-reactive proteins
    - Significantly raised
    - ESR rises slower (starts after 48 – 72 hours) than CRP (peaks at 48 hours) and also falls slower than CRP
    - If normal then query diagnosis of bone/joint sepsis
  - Blood Cultures
  - Others eg ASO titre

Investigations – X-rays

Osteomyelitis

- soft tissue swelling is always evident
- it takes approx. 10 days for recognizable bony changes of metaphyseal bone rarefaction and the more obvious, raised periosteum to be evident

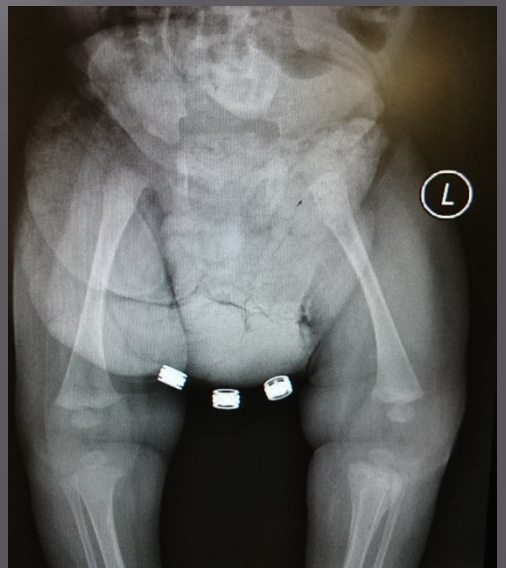
Investigations- X-rays

Joint sepsis will invariably show joint space widening

especially in the smaller child

- widening of joint space
  - 90% of infants
  - less evident in juvenile/adolescent
  - position as symmetrically and nappy off!

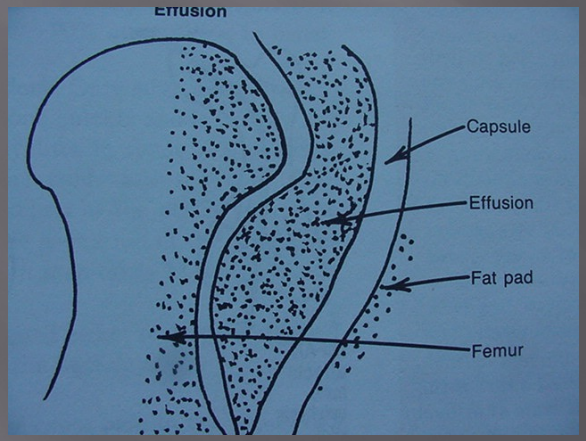
Difficult to detect unless both joints are shown symmetrically on the same film

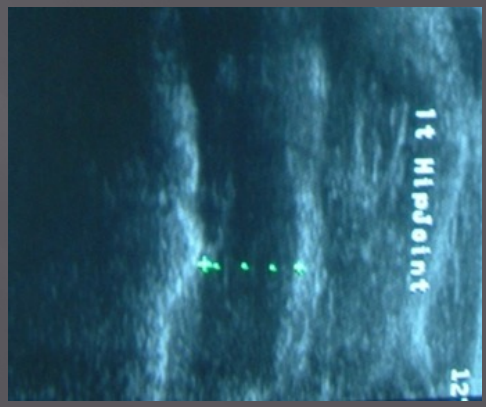


Investigations Ultrasound

- Operator dependant but not difficult to gain expertise.
- Especially useful for looking at a hip joint
- Anterior (not lateral)
- Assess both hips
- If does not confirm clinical suspicion either CT or operate

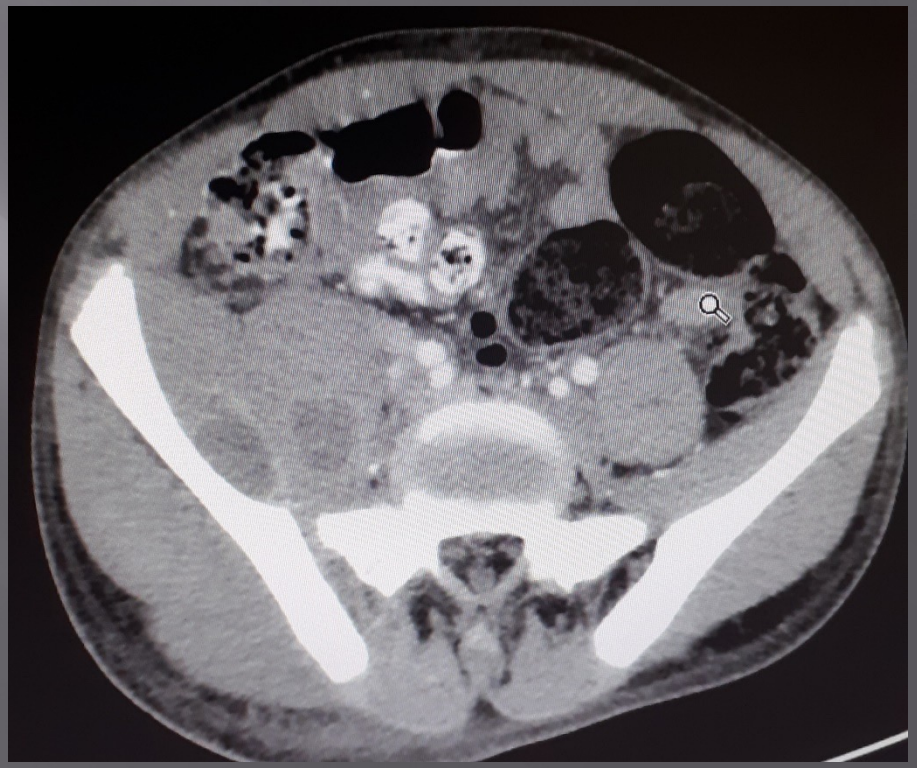
Fig. 1. Linear transducer orientation and position for ultrasound of the hip.





Investigations
Contrasted CT

- Used a lot
  - More readily available
  - Quick so no sedation
  - Contrast required to show enhancement of vascular abscess periphery
- Especially useful for hip and pelvis region
- Shows intra pelvic collection in Iliacus and psoas muscles with extra-pelvic, swollen gluteal muscles

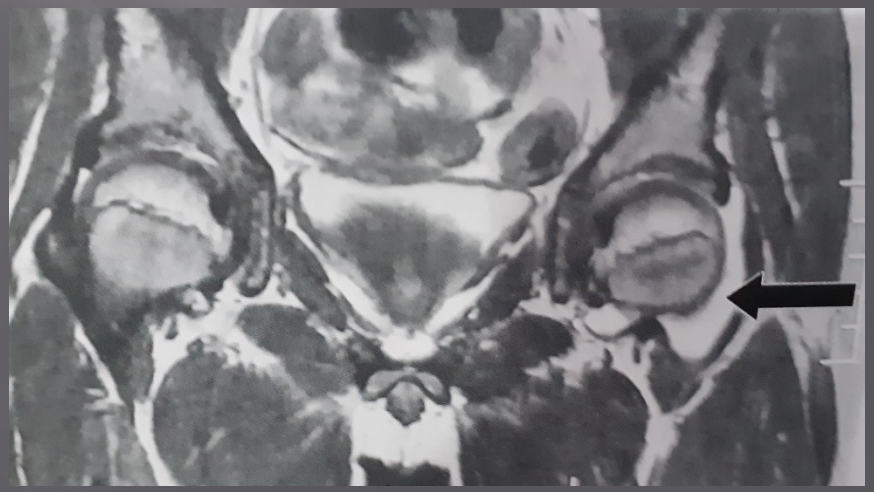


Investigations
Contrasted CT

- Also used to re-assess post-operatively when clinical suspicion of further infection
- Contrasted CTs of proximal R femur
  - done after hip joint drainage
  - Shows for the collections all around femur

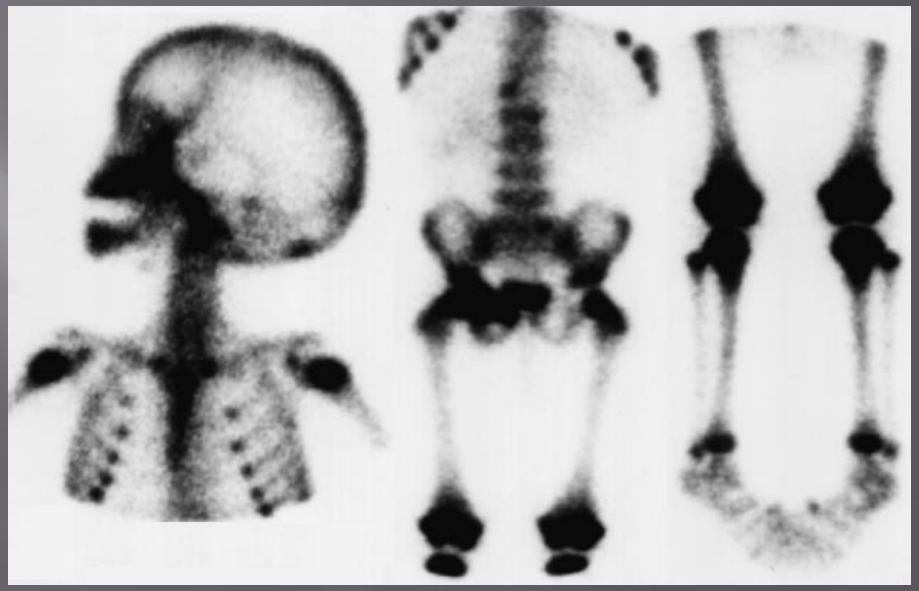
Investigations - MRI

- "Gold Standard"
  - With or without contrast
- Shows very early changes of bone infection inside the medullary cavity
- Shows the full extent of a sub-periosteal abscess
- Limitations
  - Only available in a few government hospitals
  - Most children will require sedation or a G.A.
  - Individual limbs only



Investigation - Bone Scans

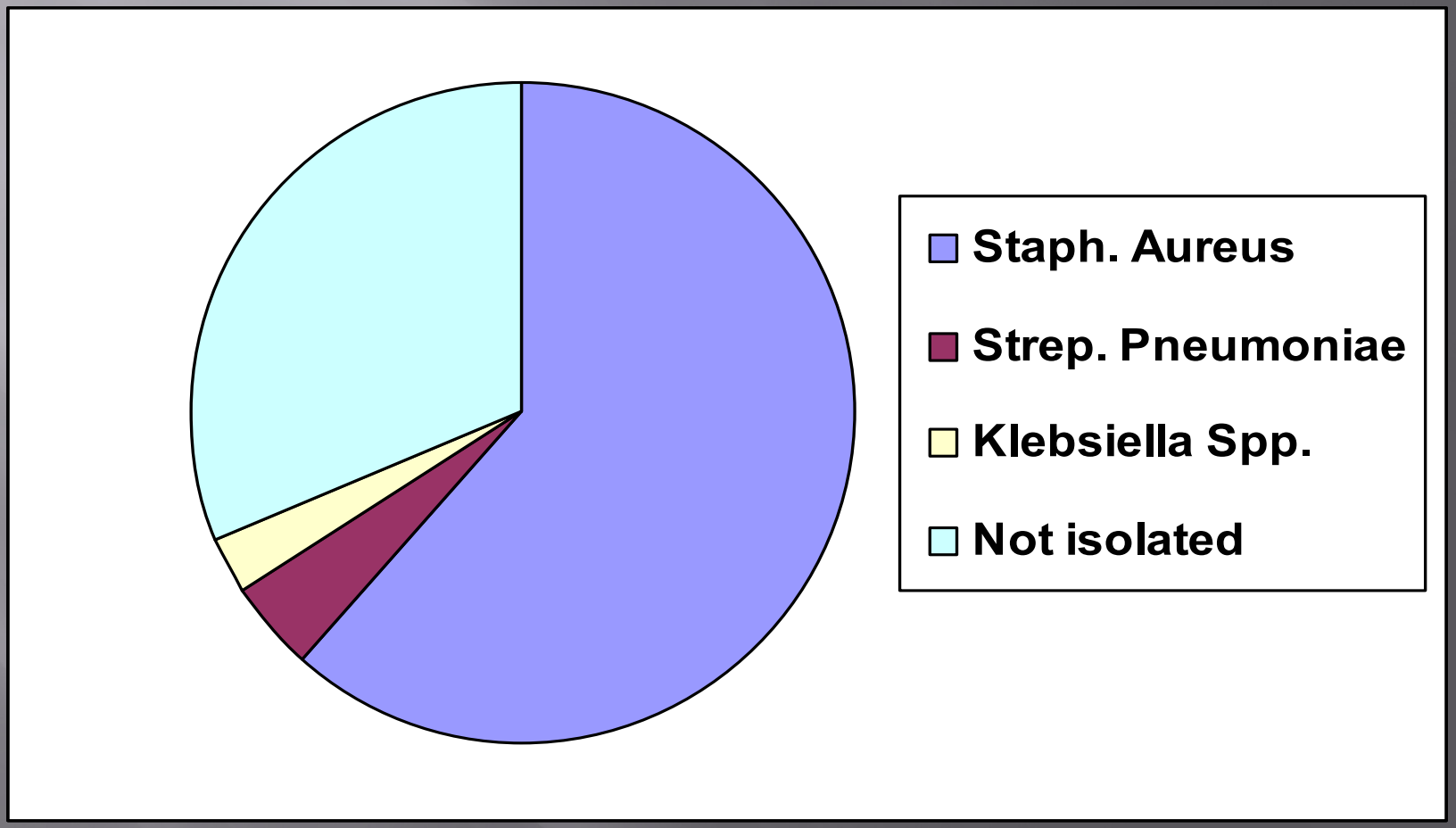
- Various labelled isotopes can be used eg standard technicium bone scan, gallium, labelled white cell.
- Infection shows either as hot spots or cold spots
  - Overall accuracy about 80% with a significant amount of false positives and negatives
  - Able to scan whole body and detect multi-focal sepsis
- Limitations
  - In the First World setting, superseded by MRI
  - Only available in a few government hospitals
  - Takes a number of hours to do the scans



Other Investigations

- Chest X-ray
  - Often associated pneumonia esp in sick child with multifocal sepsis
- Cardiac assessment
  - Again very sick child may have pericardial effusion and vegetation on valves (Acute Bacterial Endocarditis)

Bacteriology and Antibiotics



Antibiotics – Prof. Teddy Hoffman

Cloxacillin qds 200 mg/kg/24 hours for 3- 4 days post-op changing to oral

- Then Flucloxacillin qds (100mg/kg/24 hours)

- Add gram-negative cover for very sick children
  - 3rd generation cephalosporin
  - Aminogycoside eg gentamycin

- Infants under 24 months
  - Significant number of Gram negative infections eg Klebsiella , E coli.
  - Cloxacillin with Gram negative cover

- Await swab/blood culture results
  - Amend appropriately

- Usually total 4 weeks Rx (minimum of 3 weeks)

- Many publications on bone and joint sepsis

- Management is largely based on his published work

Surgery

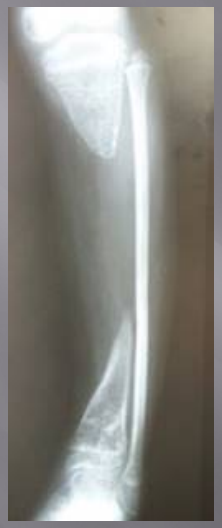
- Surgical principle = drain abscesses
  - usually not difficult surgery
  - difficulty is getting child to theatre
    - anaesthetic concerns
    - small children
    - emergency surgery to drain pus under pressure
- Extensive osteomyelitis with circumferential and longitudinal spread
  - will require multiple small drainage portals
  - pan-tibial osteomyelitis will require up to 4 drainage portals
- Open corrugated drain
  - removed at 48 hours
- GeneXpert and synovial biopsy
  - required for all joints opened

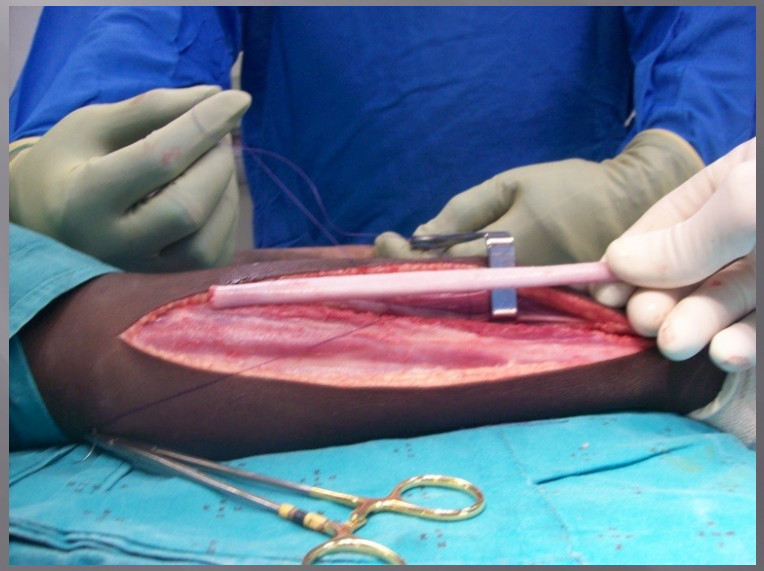
Surgery

- Further post-op management
  - careful clinical re-assessments
  - by day 4 or 5 should be getting better (CRP useful)
  - if not then may require further drainage of same site or other sites of bone and joint sepsis may have appeared and require drainage

- Further surgery often the case with multiple bone and joint sepsis and multi-system sepsis

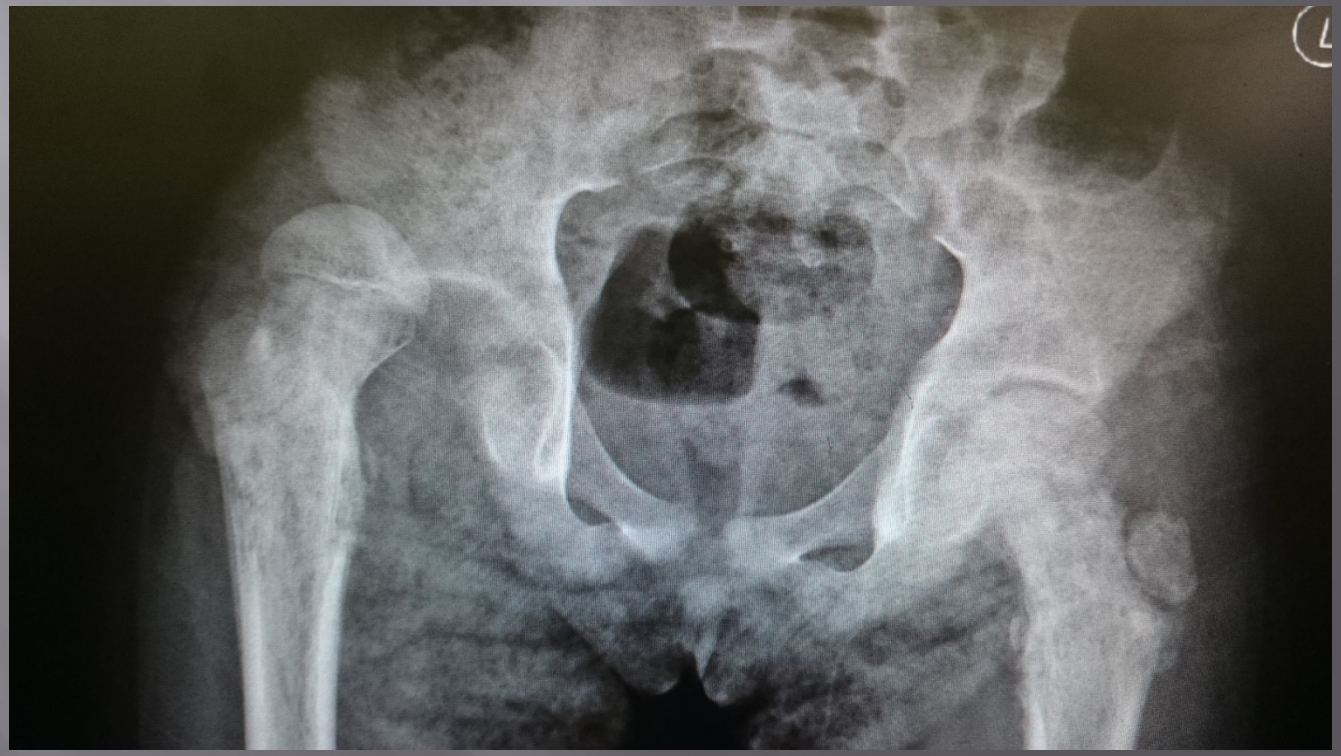
Long term problems – Tibial Osteomyelitis





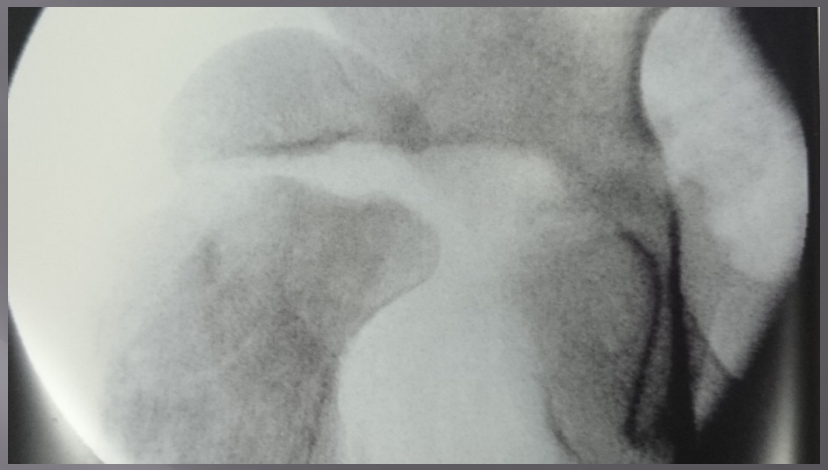
Long term problems - Hip sepsis

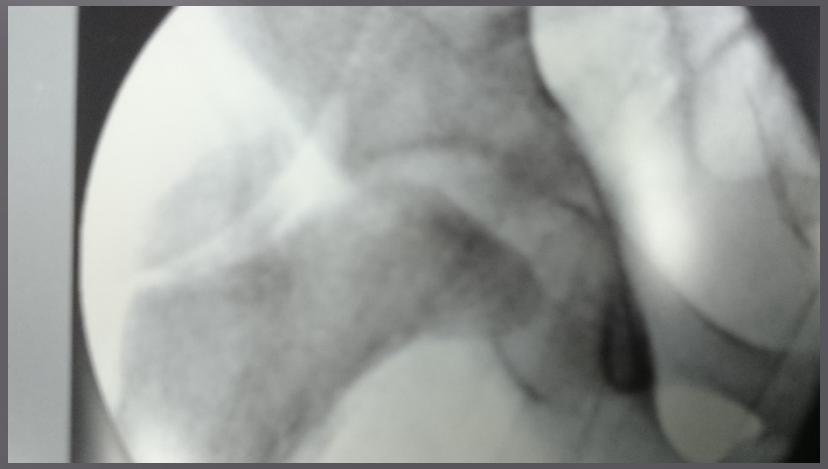
- 10 year old boy, initially treated for 2 months as a “PUO” in a district hospital until a pelvis X-ray was taken
- Showed extensive osteomyelitis of both proximal femurs and hips with bilateral hip joint sepsis and now a septic dislocation



Long term problems - Hip sepsis

- Closed reduction resulted in head falling off
- Dead head removed and femoral neck "reduced" into acetabulum
- Prolonged Rx in hip spica





Conclusion

- Bone and joint infection is common, easily treated and curable but with devastatingly bad results when misdiagnosed and incorrectly managed