Multiple Fractures of Long Bone in Premature Infant Occurring in Neonatal Intensive Care Unit

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Case Presentation

- Male

- M/Hx : 1-0-0-1

- B/Hx.
  
  $26^{+4}\text{wks}-1.06\text{kg-PSD}$

  A/S : 1/1
Dx
- Very low birth weight
- Prematurity
- Bronchopulmonary dysplasia
- Seizure
- Sepsis

Treatment
- Assisted ventilator
- TPN
- Antibiotics
- Anticonvulsant
4 month of life

- C/C: Deformity of his left wrist
- P/Ex
  - No obvious swelling, tenderness and any other sign of local inflammation
- Trauma history (-)
4 Mon 1 Wk
Lt Distal radius & ulna fracture
Rt humerus shaft fracture
Lt fibula shaft fracture
Radiologic Findings

- Fractures of left distal radius and ulna, right humerus, left fibula
- No evidence of loss of bone density or thinning of the cortex
Laboratory Findings

At birth: 1221
Before fracture: 729
After fracture: 3515
Last: 897

Alkaline phosphatase (IU/L): 310-790
Laboratory Findings

<table>
<thead>
<tr>
<th>Calcium (mg/dl)</th>
<th>Phosphorus (mg/dl)</th>
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<tbody>
<tr>
<td>After fracture</td>
<td>9.9</td>
</tr>
<tr>
<td>After fracture</td>
<td>9.5</td>
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<tr>
<td>At birth</td>
<td>8.8-10.8</td>
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<tr>
<td>After fracture</td>
<td>5</td>
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<tr>
<td>Last</td>
<td>6.8</td>
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- **Calcium (mg/dl)**: 8.8-10.8
- **Phosphorus (mg/dl)**: 4.8-8.2
Treatment

- Immobilization of limbs
- Manual stretching: wrist
Result

Satisfactory healing occurred without sequelae
Elevation of Alkaline Phosphatase

- Enfant < upper limit of adult X2
  - : physiologic
- DDx
  1) Liver disease
  2) Bone
     - : Hyperparathyroidism, hyperthyroidism, rickets, osteomalacia
     Hyperphosphatasia ( transient, familial )
  3) Others : kidney, intestine, placenta
Multiple Fractures

DDX

- Osteogenesis imperfecta
- Metabolic disease
- Child abuse
Osteopenia of Premature Infant

Cause: multifactorial etiology (?)

- Prenatal deficiency of phosphate due to placental insufficiency
- Parenteral nutrition including aluminum
- Delay in maturation of the renal enzyme 1-alpha hydroxylase
  - Low level of 1,25-dihydroxyvitamin D
- Immobilization
- Prolonged use of steroids and diuretics
- Iatrogenic vertebral body compression fracture in a premature infant caused by extreme flexion during positioning for a lumbar puncture.

  : L3 vertebral body compression fracture immediately after lumbar puncture

  Habert J, Haller JO. Pediatr Radiol. 2000 Jun;30(6)

- Distal radius fracture in a premature infant with osteopenia caused by handling during intravenous cannulation.

  Jones S, Bell MJ. Injury. 2002 Apr;33(3)
Bone mineralisation in ex-preterm infants aged 8 years

- Perinatal mineralisation deficits are common
- 46 ex-preterm infants <32 weeks gestation together with controls at 8 years of age
- Hologic QDR 1000 dual energy X-ray absorptiometer: bone mineral content and density (BMC and BMD) were measured in lumbar, spine, forearm and hip

- Shorter by 4.9 cm and lighter by 2.6 kg
- BMC: significantly lower in the preterm group, but did not remain so when adjusted for height and weight.
- BMD: significantly reduced in the hip of the preterm group

- Prolonged ventilation was associated with the lowest BMC
  Duration of preterm formula feeding correlated with higher BMC

Bowden LS, Jones CJ, Ryan SW.
Conclusion

The osteopenia makes the premature infant more susceptible to fractures during minimally invasive procedures and even with routine handling while in the NICU.

⇒ Extreme care in handling
Thank you for your attention!!