METABOLIC BONE DISEASE (MBD) IN PRE-TERM INFANTS - Paediatric Full Clinical Guideline

Reference no.: NIC ME 08/ Jan 17/v003

1. Introduction

To ensure accurate diagnosis and management of metabolic bone disease in preterm babies.

2. Aim and Purpose

For medical staff to optimise the management of metabolic bone disease in preterm babies.

3. Implementing the Guideline

Background

In-utero mineral accretion is at its most rapid in the last trimester of pregnancy. Prematurity will interrupt this critical period of growth. Preterm infants are therefore at risk of inadequate bone mineralisation if dietary intake of calcium, phosphate, magnesium and Vitamin D is insufficient. In practice calcium and magnesium deficiency is rare and current vitamin supplements give adequate Vitamin D. At low mineral intakes phosphate deficiency is most likely to arise first.

Babies Who Are At Risk

- < 30 weeks of gestation
- Weight < 1000gms
- Prolonged TPN
- Breast fed babies (without any supplementation)
- Prolonged use of Medications – diuretics, steroids ,bicarbonate
- Cholestatic jaundice
- Short gut syndrome (malabsorption of Vitamin D and calcium)

Biomechanical Features

- ↑ Alkaline phosphatase (>1200 IU)
- Hypophosphatemia (<1.2mmol/L).
- Abnormal Ca: PO4 ratio in urine. This should be < 1after 3 weeks of age
- (Both measured in mmols/L)

Clinical Features

Metabolic bone disease presents between 6-12 weeks of age. Babies may remain asymptomatic for weeks. Symptoms include poor weight gain, respiratory difficulty

Some show evidence of severe demineralisation. Features include:

- Radiological features, e.g. fractures, rickets, osteoporosis. Peak time for these changes are 36-40 weeks after conception
- Skeletal deformity, e.g. rib cage softening, craniotabes, reduced growth velocity

Investigations

- Weekly Alkaline phosphate, Calcium (serum calcium may remain normal until late) and phosphate on babies at risk
- Urine calcium and phosphate
- Consider measurement of Vit D and Parathyroid hormone (PTH)

(Low urinary calcium and raised Parathyroid hormone suggest calcium deficiency)

Management

For those at risk of MBD and established on full enteral feeds:

- If alkaline phosphatase >1200 IU, with or without low phosphate, supplement the expressed breast milk (EBM) with potassium acid phosphate 1mmol/kg/day
- From 1 month of age 2-3 mmols ?kg/Day in 2-4 divided doses
- Continue surveillance (weekly check of alkaline phosphatase and phosphate) and supplementation while on EBM, until alkaline phosphatase <1200 IU or the feed is changed to formula milk. Phosphate supplements should be stopped if serum phosphate increase above 3.1 mmols/L
- Once phosphate supplementation is adequate , a relative deficiency of calcium may become evident (elevated alkaline phosphatase in spite of PO4 > 1.8 mmols/L). If there is deficiency of both calcium and phosphate and PO4 is replaced without replacing calcium, it will provoke more PTH production and PO4 loss in the urine. These babies need replacement of both calcium and phosphate. Calcium 1mmol/kg should be given with feeds. Calcium and phosphate should not be given at the same time, as intestinal obstruction has been associated with calcium supplementation, incremental advancement of calcium is recommended.
- Ensure Daily intake of 400IU vitamin D/day

X-rays may be indicated on clinical grounds e.g. suspected fracture. Routine X-rays to detect rickets are not necessary.

At risk babies

- <30 weeks gestation
- Birth weight < 1000gms
- Prolong TPN
- Breast fed babies
- Prolong medication-eg diuretics, steroids
- Cholestasis

Shortgut syndrome

Weekly bone profile

- Alkaline phosphatase, calcium, phosphate
- Urinary calcium and phosphate
- Consider vit D and parathyroid hormone

If alkaline phosphatase is > 1200

Supplement with potassium acid phosphate

- Upto 1 month of age 1 mmol/Kg /day
- > 1 month- 2-3 mmols/kg/day
  Give full daily dose in 2-4 doses

- Ensure daily intake of Vit D 400IU/day

MONITORING

- Weekly alkaline phosphatase, calcium and phosphate
- Weekly urinary calcium and phosphate

Continue treatment until

Alkaline phosphatase is < 1200mmols/L

Or

Phosphate is >3.1 mmols/L

If alkaline phosphatase remain elevated inspite of>1.8 mmols?l of phosphate

- Supplement calcium 1 mmol?kg/day in divided doses
  DO NOT GIVE CALCIUM AND PHOSPHATE SUPPLIMENTS AT THE SAME TIME

4. References (including any links to NICE Guidance etc.)

1. Nutritional Needs of the Preterm Infant: Scientific Basis and Practical Guidelines (1993); Williams& Wilkins; Eds: R.Tsang, A.Lucas, R. Uauy, S. Zlotkin.
2. Ryan, S. (1996) Nutritional aspects of metabolic bone disease in the newborn; Arch Dis Child; 74; F145-148
3. Roberton's text book of Neonatology
4. Newborn Services clinical guidelines- Auckland District Health board -

5. Documentation Controls

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