Introduction

Prematurity osteopeny is a reduction in osteoid deposition and/or a defect in bone mineralization that usually appears at 3 to 12 weeks of age in preterm babies, as frequent as lower gestational age [1,2].

This pathology can have serious consequences as fractures, prolonged ventilator dependence, rickets, poor extrauterine growth, and short stature, complications that may affect long-term bone health.

In 2013, American Academy of Pediatrics Committee on Nutrition released a statement reinforcing the significance of optimizing nutrition in preterm neonates to improve bone health [3]. The improvements in feeding strategies for premature infants have greatly reduced the incidence of this condition. However, the difficulties for optimum vitamin and mineral inputs, obliged to continue diagnosing and treating this entity, and to strive in its prevention.

The fetus born at term accumulates between 25 and 30 grams of calcium. Two thirds of the total calcium is accumulated in the last trimester of pregnancy, so preterm babies come from a much diminished calcium deposit. After the birth of the preterm infant, it is difficult to achieve the intrauterine calcium accretion mainly because the amount of calcium that can be added to total parenteral nutrition solutions is limited and because intestinal absorption of calcium is between 50% and 60% of intake [3,4,5].

The high risk population is babies less than 28 weeks of gestational age and less than 1000gr.

Delayed enteral feedings, intolerance and prolonged need for parenteral nutrition, and also frequent use of medications such as furosemide, methylxanthines, and corticosteroids promote increased urinary losses and mobilization of calcium from bone [6].

In response to calcium decrease PTH levels increase and: [7]

Promotes renal phosphate wasting.

Stimulates renal calcium reabsorption directly

Stimulates renal conversion of inactive 25-(OH) vitamin D to 1,25-(OH)2 vitamin D, which promotes intestinal calcium absorption.

Serum Biochemical Markers on Diagnosis [7,9]

Calcium Serum is not useful for screening test because infants can maintain a normal calcium level at the expense of a loss of bone calcium.

Phosphate lower than 2mmol/L carries a risk of osteopenia. Levels less than 1.8 mmol/L are strongly associated with radiographically evident of rickets

Alkaline phosphatase: 90% of ALP in infants is of bone origin and is thought to reflect bone turnover.

So the best way to screen seems to be the combination of Serum phosphate and ALP levels. Phosphate lower than 2mmol/L with ALP higher than 600 UI/L has high sensitivity to detect osteopenia [7].

Urine Analysis

It can be useful to measure urinary excretion of phosphorus. Percent tubular reabsorption of phosphate is the best guide to adequacy of phosphate supplementation. A percent tubular reabsorption of >95% shows inadequate supplementation.

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Radiological Investigations

X-ray: Osteopenia can be discovered as an incidental finding on a plain radiograph, at least 20–40% of the bone must be decrease for these changes can be visible.

DEXA: is the gold standard for bone mass measurements in adults and the use is now been validated in preterm and term infants

Quantitative ultrasound: is a reproducible, easily applicable and radiation-free technique that can be used to monitor bone quality, guide calcium and phosphate supplementation [3].

Treatment

We must strive for its prevention by providing adequate calcium and phosphorus for bone mineralization, through feeding fortified human milk or using premature formula.

Unfortified human milk as poor quantity of P, Ca and Vit D.

In 2013, the American Academy of Pediatrics public the Calcium and Vitamin D requirements of enterally fed in preterm Infants and they suggest: [1,2].

- Vitamin D: 200-400 UI/d
- Calcium: 150-200 mg/kg/d
- Phosphorus: 75-140 mg/kg dia.

To achieve a good creation of calcium and phosphorus we must keep the Ratio Ca: P 1,5-1,7: 1 mg-mg [1,2].

Infants who do not tolerate human milk fortifiers or premature formula, or in whom no further increases in alimentation can be made, should be given supplements of elemental calcium and phosphorus (20mg/kg/day of calcium and 10-20 mg/kg/day of elementary phosphorus). Guarantee a minimum concentration of vitamin D of 20 ng/ml [7].

Evolution can be follow by serum alkaline phosphatase and phosphorus concentration weekly or biweekly.

It is also important to reduce corticotheraphia and diuretics like furosemide [7].

Prognosis

Osteopenia of prematurity has a good prognosis by providing the necessary amount of Ca, P and vitamin D [1].

Premature infants perform a catch-up on bone mineralization during the first year of life.

Despite advances in neonatal nutrition, metabolic bone disease continue to be a big morbidity in neonates [5]. Studies have shown that preterm infants <1500g are shorter and have a lower bone mineral density than their term controls during the prepuberal stage and that these differences can be prolonged over time [6].

References

1. Calcium and phosphorus requirements of newborns infants. Review Up-to-date.