

## CASE REPORT

## Classic Metaphyseal Lesion: A Rare Presentation in a Preterm Neonate

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### Abstract

Classic metaphyseal lesions occur in infants due to indirect forces, in particular, the shearing and acceleration-deceleration forces, exerted on their limbs. These fractures are very rare and resemble a “corner fracture” or a “bucket handle fracture” based on their radiographic appearance. We present a case of bucket handle fracture of right distal femur in a preterm neonate following malpresentation that required an emergency cesarian section. The neonate was managed conservatively with complete resolution on a follow up X-ray.

**Keywords:** Classic Metaphyseal Lesion; Bucket Handle Fracture; Moderate to Late Preterm Neonate

## Introduction

Classic metaphyseal lesions (CMLs) are described as partial or full planar microfractures that transect the primary spongiosa of the bone in close proximity to its growth plate [1]. These microfractures appear as “bucket handle” or “corner fracture” depending on the direction of the X-ray beam in relation to the actual longitudinal axis of the long bone [1, 2].

CMLs, although rare, have a strong association with child abuse and their incidence varies from 11 – 28% [3, 4]. These have been reported in children who were suspected of enduring non-accidental trauma [5]. However, isolated CMLs have also been reported with various organic causes such as Vitamin D deficiency and hypophosphatasia as well as some inorganic causes like forceps deliveries and caesarian sections [6, 7].

CMLs occur in the rich vascularity of bone metaphysis; however, there is usually no bleeding seen in the bone or sub periosteum microscopically [1]. Initially, the blood supply is only interrupted, and then the terminal chondrocytes resorb following trauma. Overtime, the bone heals as the hypertrophic chondrocytes proliferate and the growth plate revascularizes [1].

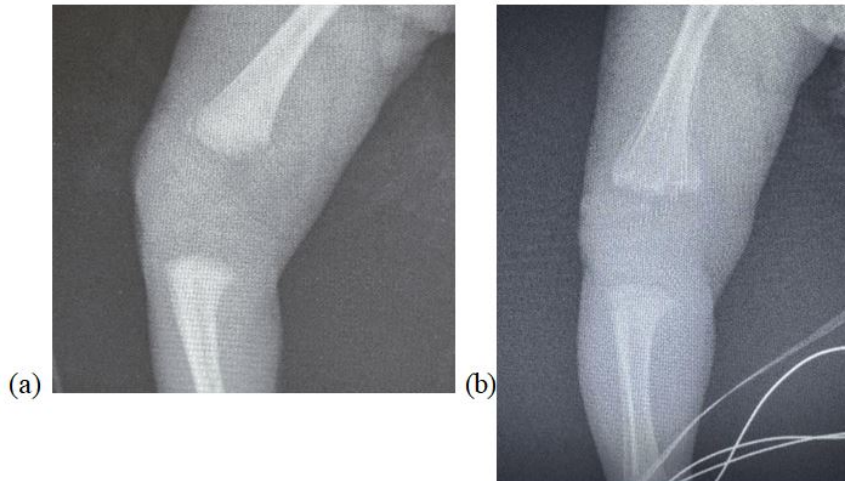
Although CMLs are commonly linked to non-accidental trauma, their presence in certain clinical contexts warrants consideration of alternative causes. Here, we present a noteworthy case of a CML identified in a neonate following an emergency cesarean section. Recognizing birth trauma as a potential etiology is crucial to avoid misinterpretation and unnecessary concerns about abuse. The presence of localized swelling and reduced limb movement, combined with a history of complicated delivery, raised suspicion of CML and prompted further investigation in this case.

## Case Report

A 33-week preterm neonate was delivered via Cesarean (C) section when mother had presented in labor with malpresentation. Of note, fetus had turned breech during contractions and required emergent C section instead of the expected vaginal delivery. Infant's delivery otherwise was non-traumatic with no complications at delivery. Her Apgars were 8 & 9 at 1 & 5 minutes, respectively. Infant was admitted to our Neonatal Intensive Care Unit (NICU) on nasal continuous positive airway pressure (nCPAP) with mild respiratory distress.

Her weight was 1310 g at birth, length was 39.5 cm, and fronto-occipital circumference (FOC) was measured to be 28.5 cm. The initial physical examination was normal for age except for mild subcostal and intercostal retractions. Her clinical course was consistent with mild respiratory distress syndrome of newborn that required a 7-day course of nasal flow support, initially with nCPAP and then high flow nasal cannula (HFNC). She required Phototherapy for a few days for jaundice and was maintained on caffeine for apneas of prematurity till she was 34 weeks of corrected age.

Her clinical course was remarkable for developing mild swelling to the lower third of right thigh and around the knee on day of life (DOL) 3. There was decreased spontaneous movement of the right leg compared to left while the swollen area had slight guarding to note. No redness, warmth, or discoloration were observed. The X-ray, as shown in Figure 1(a), revealed a femur bucket handle fracture with diffuse soft tissue swelling. The Vitamin D level was found to be 38 ng/dl and the parathyroid hormone-related peptide (PTHrP) was 0.8 pmol/L (both within the normal range). Notably, her calcium and phosphorus levels were also normal: 10.3mg/dl and 7.8mg/ml respectively. A repeat X-ray in 3 weeks showed a healing bucket-handle fracture involving the distal right femur, as shown in Figure 1(b).



**Figure 1(a):** X-ray of the leg reporting a femur bucket handle fracture with diffuse soft tissue swelling but without osseous erosion of joints. (b) X-ray of the leg showing healed bucket-handle fracture in the distal right femur.

## Discussion

Classic metaphyseal lesions (CMLs) can be described as “bucket handle” or “corner” fractures radiologically. Bucket Handle Fractures, are seen as large peripheral fragments that resemble a crescentic radiodensity; this occurs when the bone is projected diagonally with craniocaudal angulation [8]. Our case had similar appearance. On the other hand, corner fractures are seen as rough triangular fragments; they occur when the large peripheral component of the fracture fragment is projected obliquely [8].

Classic metaphyseal lesions(CMLs) have a strong correlation with child abuse [9]. However, there have been many other causes reported. Some organic causes include Vitamin D deficiency, hypophosphatasia, Vitamin D resistant rickets, renal tubular acidosis and metabolic bone diseases of infancy while breech extractions, difficult vaginal deliveries, forceps deliveries, and caesarian sections are some of the common inorganic ones [6, 7]. Hence, it becomes imperative to take a detailed history and determine whether the fracture occurred during the delivery or postnatally before proceeding with any further evaluation [10]. In our case, based on the course of events, fracture was likely associated with the caesarian section, as the neonate lab reports were all, also, within normal limits. Caesarian sections affect the anterolateral aspect most frequently as compared to the posteromedial aspect in most classic metaphyseal lesion(CML) cases [10]. Our case also reported an anterolateral fracture.

CMLs are uncommon and tend to occur more frequently in the lower limb, than the upper limb [4]. Some of the most common sites include the posteromedial aspect of distal femur, proximal tibia, distal tibia, and proximal humerus in infants [10]. Among these, femoral fractures have been reported to have an incidence as low as 0.13 per 1000 live births and they commonly occur in newborns weighing greater than 2600grams [11]. Our neonate, however, was 1310 grams at birth.

CMLs, mostly, are managed conservatively; the fractures heal on their own without any distortions [12]. Initially, an interruption is seen in the delicate web of primary spongiosa trabeculae which results in the weakening of the subperiosteal bone covering [13]. Later, osteoclasts activate and promote endochondral healing [13]. The healing progresses from the dislocated fracture site towards the metaphysis in the direction of bucket handle fracture [14].

Subsequently, this fills the gap between the dislocated fracture and the metaphysis of the bone [14]. A study in 2020 reported that the healing time differed from case to case and only about 20% of fractures healed within 2 to 3 weeks of follow-up while

another study in 2019 reported subperiosteal new bone formation in about 57% of cases [14, 15]. In our case, the X-ray taken after 3 weeks indicated that the fracture had fully healed.

## Conclusion

In conclusion, classic metaphyseal lesions are rare fractures most commonly associated with child abuse. However, various other causes must be considered, making a thorough evaluation essential to avoid misdiagnosing non-accidental trauma and to ensure appropriate management. In this paper, we present an unusual case of femoral classic metaphyseal lesion (CML) following emergency C-section. This case of a bucket handle fracture was managed conservatively and was fully healed on a 3-week follow-up X-ray.

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