



Musculoskeletal and Emergency Imaging

Classic metaphyseal lesion acquired during physical therapy

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ABSTRACT

A classic metaphyseal lesion (CML) is highly specific for nonaccidental trauma. Missing CMLs can be devastating to the child as the child can continue to be exposed to inflicted trauma. Yet, there are rare case reports on CMLs that occur due to birth trauma, IV line placement, and treatment for clubfoot. We present a case of a CML in the tibia that occurred in the hospital secondary to physical therapy, that also caused a femoral shaft fracture, in a term child with hypertonic lower extremities secondary to myelomeningocele. Radiologists, as well as child abuse pediatricians, should be aware of the rare exception when CML is secondary to non-abusive injury.

1. Introduction

A classic metaphyseal lesion (CML) is a fracture between the primary and secondary spongiosa of the metaphysis and undercuts the subperiosteal bone collar. The separated bone fragment is therefore thicker at the periphery and radiographically appears as a corner or bucket handle fracture [1]. CMLs are highly specific for non-accidental trauma [1,2]. Since first described, there have been a number of reports in which CMLs were attributed to causes other than child abuse. It has been described in serial casting for club foot, in association with birth trauma, and with IV placement [3–6].

This case report adds to the literature and to the differential for the rare exceptions of CMLs not attributed to child abuse by providing an example of a CML associated with physical therapy in a child with myelomeningocele.

2. Case report

A term newborn, born with a lumbar myelomeningocele, was admitted into the NICU and underwent myelomeningocele repair on day 1 of life. The child was born with hypertonic lower extremities that lacked sensation, as well as bilateral flexion contractures of the knees and club feet. The physical exam at birth was negative for signs of trauma, swelling, or erythema. After 11 days of admission, the child developed erythema and swelling of the right leg, and an ultrasound was obtained to evaluate for an abscess. The ultrasound instead revealed a femoral shaft fracture. Radiographs of the leg were obtained for further characterization and imaging revealed an oblique fracture of

the femoral shaft, as well as a CML of the proximal tibia (Fig. 1a, b). The CML was initially missed and was diagnosed only on follow-up radiographs obtained three weeks later (Fig. 2a, b). The child protection team was then consulted and a skeletal survey was obtained. The skeletal survey did not reveal any additional fractures. The child abuse pediatrician examined the hospital records, performed a history and physical, and did not identify any additional injuries or evidence of abuse. On retrospective review, the patient was undergoing physical therapy in the NICU with massage, passive range of motion, and positioning techniques of the lower extremities. The patient had undergone physical therapy treatment with the therapist about 4 h before the erythema and swelling were noted. This sequence of events in this child, who remained in the hospital at the time when the fractures occurred, makes accidental trauma secondary to physical therapy the likely etiology of the CML.

3. Discussion

To cause a classic metaphyseal lesion, it has been proposed that shearing forces, potentially excessive valgus or varus forces, are needed [1,2]. Although highly uncommon, such excessive forces can be applied during medical management and treatment, as seen in serial casting for club feet, obstetrical maneuvers during birth, IV placement, and now physical therapy in a patient with myelomeningocele [3–6].

The most common cause of CMLs continues to be non-accidental trauma, and the presence of a CML warrants full evaluation for child maltreatment. This case adds to the differential for CML in the rare circumstance when non-accidental trauma has been ruled out as a cause

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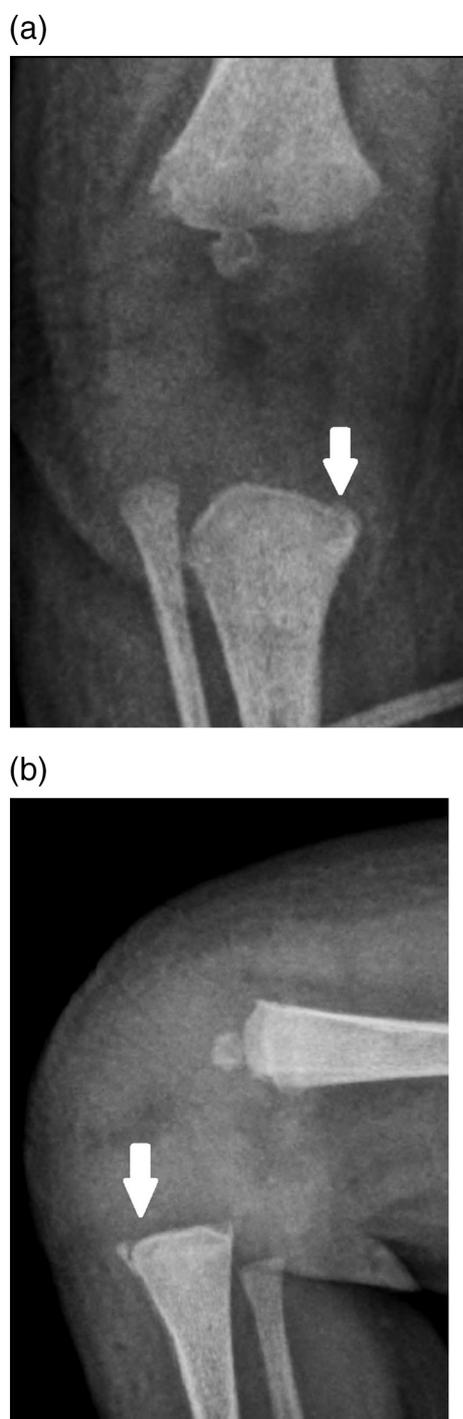


Fig. 1. (a) Initial frontal view demonstrating a proximal tibia CML. (b) Initial lateral view demonstrating a proximal tibia CML. Arrows point to the CML.

of a CML. Fractures in the lower extremities in children with myelomeningocele are common and can be secondary to trauma, sometimes from physical therapy [7]. One series reported six neonatal fractures, one was attributed to physical therapy [8]. As far as we know, this is the first publication reporting physical therapy as a cause of CML in a newborn with myelomeningocele. Like the other isolated cases of CML occurring during medical management, this case report reconfirms excessive physical force as the etiology of CMLs [3–6]. Like the case reports of CML due to birth trauma and IV placement, the initial physical exam findings after the trauma were erythema and swelling that occurred shortly after the event [3–6]. For the CMLs after C-section, the

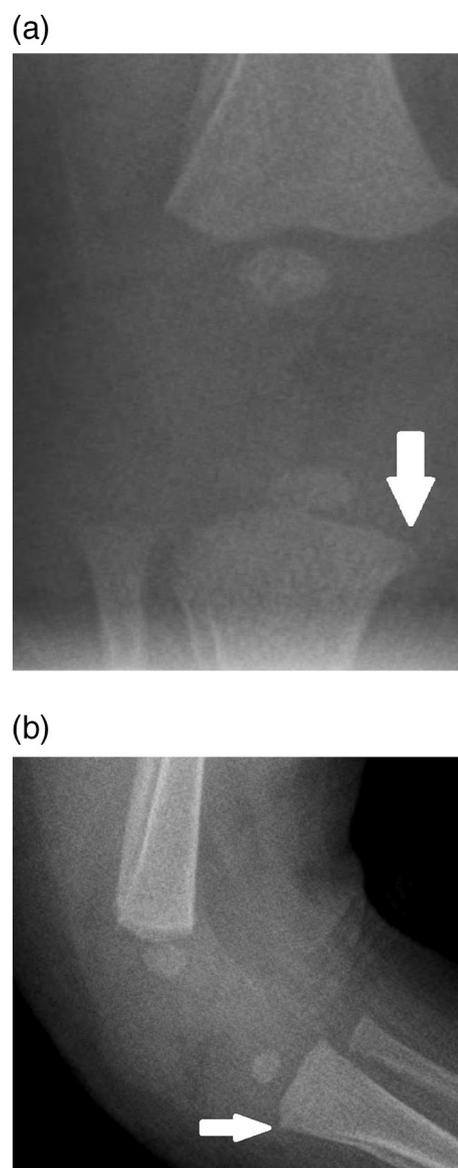


Fig. 2. (a) Frontal view, follow up radiograph 24 days later. (b) Lateral view, follow up radiograph 24 days later. Arrows point to the CML. Periosteal reaction can be seen about the tibial plateau and proximal tibial shaft.

erythema and swelling showed on physical exam within 48 h after birth and in our case, erythema and swelling were noted within hours after physical therapy on day 11 of life.

The CML was visible on the initial radiographs in retrospect, but was not noted until the follow up imaging. This emphasizes the point that CMLs can be initially missed [9]. Often CMLs are subtle and are not identified until periosteal reaction is present; however, not all CMLs heal with classic periosteal reaction [1,5].

A limitation of this case report is that the etiology of the CML is based on indirect evidence. However, the clinical circumstances of a child that did not leave the hospital, and the timing of events, namely presentation of swelling and warmth in the leg after physical therapy, as well as the lack of documentation of any other manipulation or injury, point to physical therapy, potentially excessive physical therapy, as the etiology of the CML.

In summary, this case report emphasizes the need for a meticulous history and evaluation of children with CMLs. By itself, having undergone physical therapy is not a valid reason to eliminate child abuse as the cause for a CML. Child abuse should always be extensively

investigated in a patient with a CML, and CMLs remain synonymous with child abuse. This case report illustrates a rare circumstance when a CML was not related to non-accidental trauma of which radiologists, as well as teams evaluating patients for non-accidental trauma, should be aware.

Disclosure

Drs. Della Grotta, Marine, Harris, and Karmazyn declare no conflicts of interest or funding for this research.

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