

# Physeal Fracture of the Distal Femur in a Newborn: Role of Arthrography

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## Abstract

Making the diagnosis of a physeal separation of the distal end of the femur in a newborn is a true challenge. The radiological diagnosis is not always simple and a high index of suspicion is needed. Also, knowing the age of appearance of the ossific nuclei helps in reaching a diagnosis. However, it is imperative to perform a differential diagnosis with other causes that may compromise the life of the newborn. An early diagnosis and adequate treatment are fundamental in avoiding permanent deformity of the affected limb. We present a case report, along with a review of the literature, to describe the clinical and radiological findings that aid in reaching a diagnosis and giving the proper treatment. We also point out the importance of the role of the arthrography and closed reduction as an alternative to simple open reduction.

The physeal fracture of the distal end of the femur in a newborn is a rare and severe injury that requires early treatment. Diagnosis is difficult due to apparently normal radiographs. Since the typical presentation is swelling and pain, a high index of suspicion is necessary to avoid misdiagnosing it as septic arthritis and to prevent the terrible complications associated with this injury.

We present this case, first because of its rare presentation in newborns, second, to describe the risk factors, clinical findings and its treatment, and last, to emphasize the importance of arthrography as an aid to closed reduction and percutaneous pinning as opposed to performing an open reduction.

The patient's guardian provided written informed consent for print and electronic publication of this case report.

## Case Report

We present the case of a female born at 36 weeks gestation with a birth weight of 2.775 kg. It was an in vitro fertilization, first pregnancy, and twin pregnancy. The child was breech

presentation and born through vaginal delivery with an Apgar score of 5 at 1 minute and a score of 9 at 5 minutes, requiring admittance into the premature intensive care unit. The sister was born without any complications.

On the second day of life, the patient had diminished spontaneous movement of her right lower extremity and swelling of the ipsilateral knee. The laboratory work-up was normal but radiographs (Figure, A-B) showed a displacement of the distal femoral ossific nucleus, which was diagnosed as a Salter-Harris type I physeal fracture. At that moment it was reduced without fluoroscopic control and immobilized in a long-leg splint.

To confirm reduction and avoid further exposure to radiation, we performed an ultrasound and noticed an unstable reduction of the epiphysis and the patient was taken to the operating room for reduction of the fracture. In order to better delineate the femoral condyles and confirm proper reduction, the senior author (FJDC) performed an intraoperative arthrography (Figure, C-D). Afterwards, closed reduction of the epiphysiolysis was performed, fixed with a 1-mm percutaneous K-wire, and immobilized in a long-leg splint.

The patient was discharged on day 8 due to other medical problems not related to the fracture. Twenty-five days later, the patient was brought into the office where consolidation of the fracture was confirmed on radiographs (Figure, E-F). Forty-seven days after the injury, the K-wire was removed under general anesthesia.

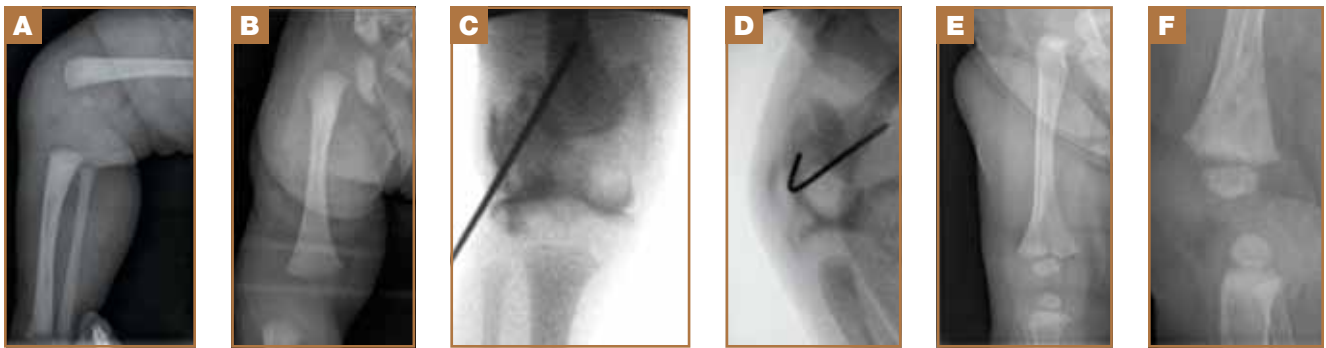
## Discussion

Physeal fractures in newborns are extremely rare, usually wrongly diagnosed as dislocations, and can easily be mistaken with septic arthritis or osteomyelitis since the limbs are swollen and tender to palpation with apparently normal x-rays.<sup>1,2</sup> These injuries may appear at both ends of the humerus or femur.<sup>2</sup>

Knowing the age of appearance of the ossific nuclei in the newborn is very important in order to reach a prompt diagnosis. The distal femoral ossific nucleus always appears on radiographs after gestation week 38.<sup>3</sup> On ultrasound, only 54% appear between week 29 and 36, having a high correlation with x-rays.<sup>3</sup> In our case, the physeal injury was readily visible, but usually x-rays may be of normal appearance. Given these difficulties, other imaging studies can be used such as ultrasound, magnetic resonance imaging, computed tomog-

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**Figure.** Initial AP x-ray, lateral (A) and anteroposterior (B) view. Intraoperative arthrography delineates the femoral condyles and correct placement of the K-wire; lateral view (C) and anteroposterior view (D). X-ray at 3-month follow-up, AP view (E) and lateral (F).

raphy scan, arthrography, or comparative x-ray stress test.<sup>4</sup> These studies are very useful not only to diagnose, classify, and visualize the lesion when only the cartilaginous area is affected, but also as a way to establish a treatment plan since it can determine the amount of fracture displacement.

The risk factors associated with this lesion are breech presentation, macrosomia, difficult vaginal delivery, or precipitous delivery.<sup>5</sup> An absence of conditions that predispose to sepsis such as maternal chorioamnionitis, prolonged membrane rupture, maternal fever or chills, should suffice to discard the possibility of septic arthritis or osteomyelitis as a cause.<sup>2</sup> In addition, it has been shown that these 2 entities rarely appear in the first days of life.<sup>1,2</sup>

Although prolonged traction of the lower limbs with forceps has been proposed as the mechanism of injury, there have been case reports of this injury in noncomplicated C-section deliveries, rendering the idea that there are other factors involved.<sup>1</sup>

This lesion should be suspected when a very irritable newborn presents with swelling, tenderness, and reduced mobility of the extremity.<sup>1,2,4</sup> Disastrous results can be expected if there is a delay in diagnosis and treatment. In our case, treatment was administered promptly, by first attempting a closed reduction that failed due to the unstable fragments that later required internal fixation.

A grossly displaced epiphysis along with instability after an attempt at closed reduction is an indication for fixation.<sup>5</sup> Even though several authors prefer open reduction in this situation,<sup>5</sup> we preferred to perform a closed reduction and internal fixation under C-arm guided arthrography, in order to determine the amount of displacement, evaluate proper reduction, and serve as a guide for adequate K-wire placement. In addition, we avoid the complications derived from an open surgery.

The use of arthrography as an aide to fracture reduction is not new and has been safely applied in ankles for physeal fractures of the medial malleolus as an alternative to open surgery<sup>6</sup> and in children with an ulnar fracture to diagnose occult subluxation of the radial head.<sup>7</sup>

Although our patient healed without complications, we must emphasize the need for a long-term follow-up to timely diagnose a physeal bar that would lead to a secondary deformity.

### Conclusion

Physeal fractures must be included in the differential diagnosis of a newborn with a swollen, tender, and immobile limb in order to perform an early diagnosis and treatment to avoid further complications. We would also like to point out that an open reduction may be avoided by performing an intraoperative arthrography to aid closed reduction and percutaneous fixation.

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