doi: http://dx.doi.org/10.11606/issn.1679-9836.v100i3p306-311 Rev Med (São Paulo). 2021 May-June;100(3):306-11.

Humerus epiphyseal displacement in a newborn due to intrapartum trauma – a case report

Deslocamento epifisário de úmero em recém-nascido por trauma intraparto - um relato de caso

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Fernandes B, Oliveira DK, Banovski DC, Dal'Negro SH, Duessmann DL, Futagami RB, Futagami PB, Erdmann K, Pereira S. Humerus epiphyseal displacement in a newborn due to intrapartum trauma – a case report */ Deslocamento epifisário de úmero em recém-nascido por trauma intraparto - um relato de caso*. Rev Med (São Paulo). 2021 May-June;100(3):306-11.

ABSTRACT: Introduction: Traumatic intrapartum separation of the distal humerus epiphysis is an extremely rare fracture. This injury results from rotational shear forces employed on the distal humerus which results in a Salter-Harris type I fracture by vigorous forearm rotation with the elbow flexed or hyperextended. Objective: To report a case of a humerus distal transphyseal fracture in a newborn male. Case description: Newborn male, twin, late preterm, born by surgical delivery, in pelvic presentation, diagnosed in his 5th day of life with postero-medial epiphyseal displacement of the right distal humerus (Salter-Harris type I) and subjected to closed reduction with percutaneous fixation with Kirschner wire. Conclusion: Type I Salter-Harris fracture in newborns has a high potential for bone remodeling and rapid recovery when diagnosed early and properly managed, even though it is a rare lesion, difficult to diagnose with complex radiological interpretation and nonspecific signs.

Keywords: Cesarean section, Epiphyses, Humeral fractures, Newborn

RESUMO: Introdução: A separação traumática intraparto da epífise distal do úmero é uma fratura extremamente rara. Essa lesão resulta de forças de cisalhamento rotacional empregadas ao úmero distal que resulta em fratura tipo I de Salter-Harris por rotação vigorosa do antebraço com o cotovelo fletido ou hiperextensão do cotovelo. Objetivo: Relatar um caso de fratura transfisária distal do úmero em recém-nascido do sexo masculino. Descrição do caso: Recém-nascido, masculino, gemelar, prematuro tardio, nascido de parto cirúrgico, em apresentação pélvica, diagnosticado no quinto dia de vida com deslocamento epifisário póstero-medial do úmero distal direito (Salter-Harris tipo I) e submetido a redução incruenta com fixação percutânea com fio de Kirschner. Conclusão: A fratura Salter-Harris tipo I em recém-nascido possui elevado potencial de remodelamento ósseo e rápida recuperação quando diagnosticada precocemente e manejada de forma adequada ainda que seja uma lesão rara, de difícil diagnóstico, de interpretação radiológica complexa e de sinais inespecíficos.

Palavras-chave: Cesárea, Epífises, Fraturas do Úmero, Recém-Nascido

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Summary of the article presented at the 12th Congresso Gaúcho de Atualização em Pediatria, online, Porto Alegre, RS, Sept.18th and 19th, 2020.
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INTRODUCTION

Traumatic intrapartum separation of the distal humerus epiphysis is a rare fracture, evidenced by Medsen in 1995 when reviewing 105.119 deliveries, documented only one case of humerus distal epiphyseal displacement.(0.001%)[1-2]. This injury results from rotational shear forces employed on the distal humerus that results in a Salter-Harris type I fracture by vigorous rotation of the forearm with the elbow flexed or hyperextended[1].

The fracture etiology may be associated with birth, especially in cases of cesarean delivery, dystocics, breech presentation, twin pregnancy, first time mothers, and others[3]. When is not related to childbirth, it is essential to list among the differential diagnoses the hypothesis of child abuse[3].

In radiographic interpretation the elbow joint epiphyses non-ossification at birth, associated with the nonspecific clinical condition, making the diagnosis difficult, which may corroborate to the rarity in the identification of this fracture and for the absence of the fracture diagnosis at birth[1,4]. The literature identifies local edema, pseudoparalysis, limited range of motion, pain expression and crying when limb movement are the main clinical signs that lead to diagnostic suspicion[1].

This article aimed to report a case of epiphyseal displacement of the distal humerus in a neonate cause by obstetric trauma, highlighting the importance of clinical suspicion among differential diagnoses and favoring early intervention in order to enable the range of motion preservation in the affected limb.

CASE DESCRIPTION

Newborn (NB), male, twin pregnancy, cesarean delivery of 36 5/7 gestational weeks in breech presentation, with birth weight of 2,690 grams, appropriate for gestational age (AGA), 49 centimeters in length, an Apgar score of seven in the first minute and eight in the fifth minute.

Intrapartum with complications due to the brother, the first removed twin, having been referred to the neonatal intensive care unit (NICU) for breathing difficulties, which caused tension in the team and, need a quick resolution in the delivery for fear of fetal suffering. This scenario, associated with a second difficult extraction due to the greater weight and length of the second fetus, in addition to the unfavorable position, resulted in a right upper limb hyperextension at birth, according to the team's verbal report. However, the second twin had no difficulty in initiating satisfactory breathing, remaining with the mother and start breastfeeding.

During the trinomial stay at the maternity hospital, two simple radiographic examinations were performed to investigate the limb pseudoparalysis, crying and the pain in the right upper limb movement noticed in the newborn. The radiological interpretation performed by the pediatrician did not find any abnormalities, but with the persistence of these signs, in his fifth day of life, the child was evaluated by the pediatric orthopedist, edema, pain in the right upper limb movement and pseudoparalysis were observed, and a new simple elbow radiograph was requested in two views (anteroposterior and profile), which showed a postero-medial epiphyseal displacement of the right distal humerus, a fracture classified as Salter-Harris type I.

Surgical treatment was instituted on the same day as the radiological diagnosis, during the procedure, an arthrography was made for better lesion visualization, followed by closed reduction with percutaneous fixation and lateral Kirschner insertion, with immediate surgical evaluation performed by fluoroscopy. On the return, 13 days later, the synthesis material was removed. In post-surgical outpatient follow-up a small posterior deviation was observed, but with preservation of the functional elbow arch and bone remodeling.

According to Circular Letter No. 166/2018-CONEP / SECNS / MS, this case report was approved by CEP / HC / UFPR in the consolidated opinion number 4.478.934. The authors declare that there is no conflict of interest.

DISCUSSION

Trauma during childbirth is considered a common event related to any physical injury for the mother or NB accompanied or not by death[5]. Among the upper limb injuries, shoulder dislocation, trauma to the brachial plexus, collarbone and humerus fracture, including traumatic separation of the distal humerus epiphysis (transfisional fracture of the distal humerus) can be mentioned[4-6]. This rare injury was first described by Smith[7] in 1850 and can be mistaken for radiographic elbow dislocation.

The distal humerus fracture is almost exclusively in children under two years, a period that non-ossified physis is susceptible to injuries, to the interface between the distal humeral epiphysis and the metaphysis being smoother and transversal, mainly in neonates, representing the humerus weakest part[6]. The main mechanisms of this injury are rotational shear and elbow hyperextension[7-8].

The traction when removing the baby in complicated deliveries, as described in this case, are evidenced in the literature as an risk factor for a distal humerus transfision fracture, as well as low weight, macrosomia, shoulder dystocia, pelvic presentation and primiparity[3-4,9].

From a clinical point of view, signs such as edema, pain in the right upper limb movement and pseudoparalysis require investigation for differential diagnoses such as elbow dislocation, brachial plexus obstetric injury, septic arthritis, osteomyelitis, child abuse and other skeletal injuries[1]. The sign that possibly differentiates the distal transfisional fracture of the humerus from elbow dislocation is the constant three-point relationship between the medial

and lateral epicondyles with the olecranon, observed in the forearm mobilization, which is disrupted at dislocation. These reference points, described in the literature, are difficult to identify due to the edema present in the elbow and in the adjacent soft tissues[10-11].

Although the study by Gigante et al.[9] shows that average time for the diagnosis of this fracture is 40,8 hours after birth, it is common for the diagnosis of transfusion injury in newborns happen in periods greater than the time highlighted by these researchers, since they are rare events, with nonspecific clinical symptoms and radiographs are difficult to interpret[9]. Late diagnosis causes a delay in the patient's treatment and as consequently, a higher risk of complications such as avascular necrosis, growth plate trauma and the possibility of loss in the limb range of motion[12].

Some authors claim that a simple radiography, in the appropriate anteroposterior and profile views, generally establish the diagnosis of transfision fracture, the most important indicator of the elbow posteromedial displacement (Figure 1), differentiating from dislocation, in which the displacement is posterolateral and has never been described in children under four years of age[3,9,13-14]. In addition, it is possible to identify on the radiography of some cases the sign of a fat pad, which is usually present in transfisional fractures because it represents intra-articular bleeding, not identified in the image of the case presented[15]. On one year old radiographs, the capitulum ossification centers appear, facilitating the observation of alignment and, consequently, of joint congruence [15-17].

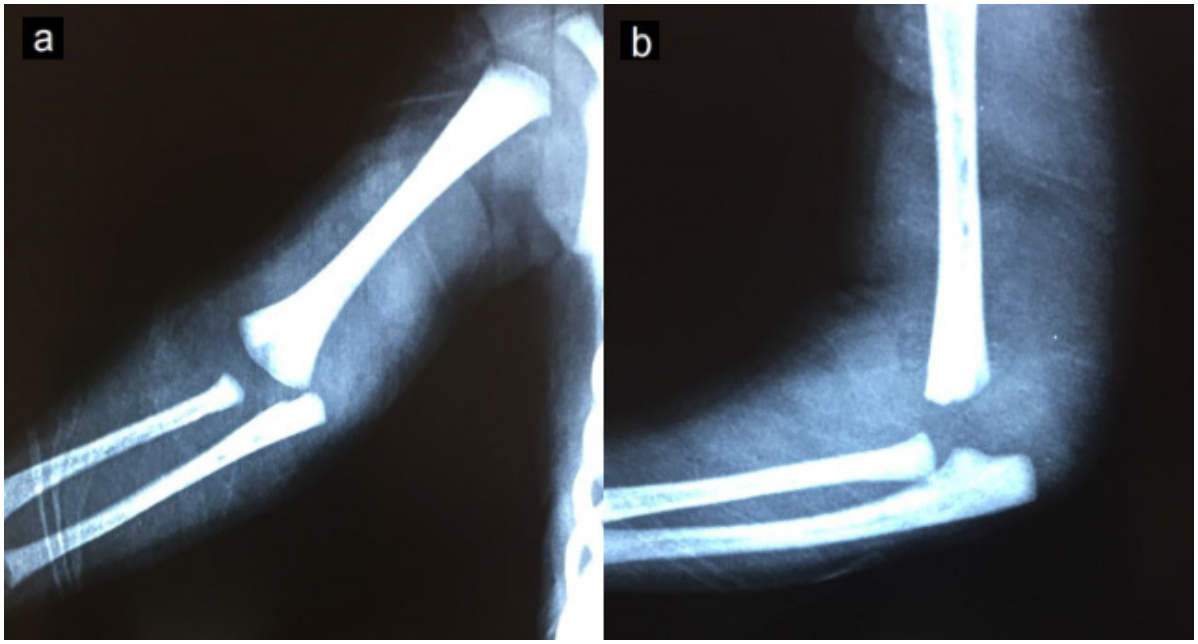

Figure 1: Preoperative right upper limb radiograph, in a five-day-old neonate, presenting a distal humerus Salter-Harris type 1 fracture. Anteroposterior (A) and profile (B) views showing postero-medial elbow deviation

For the radiographic analysis of the peculiarities evidenced in newborns with no bone mineralization, it is necessary to draw an imaginary line parallel to the radio diaphysis that must cross the chapter. In the absence of chapter ossification, the bones anatomical position is used for evaluation. A new line must be drawn in the humerus anterior cortex, which must also cross the chapter (Figure 2). If this does not happen, bone displacement resulting from the fracture and absence of joint congruence is evident. If there is a displacement of only one line, with the preservation of the alignment of the radial head and the chapter, the diagnosis of distal epiphyseal separation of the humerus is suggested, while the displacement of both lines indicates dislocation.

There are difficulty in interpreting the radiographic peculiarities of neonates, doctors resort to complementary exams such as ultrasound, magnetic resonance and arthrography for a diagnostic clarity[18]. Davidson[19] and collaborators have highlighted the use of ultrasound in these cases, since it provides information about non-ossified cartilaginous elbow structures and is generally available in services, in addition to being less expensive and avoiding child exposure to radiation, however it requires specialization significant for realization and interpretation[13,19]. Magnetic resonance imaging has been shown to be useful as an additional method to identify radiographically hidden fractures, however it requires the use of general anesthesia or immobilization to hold the child, white also being an expensive and not always an available technique[14,20].

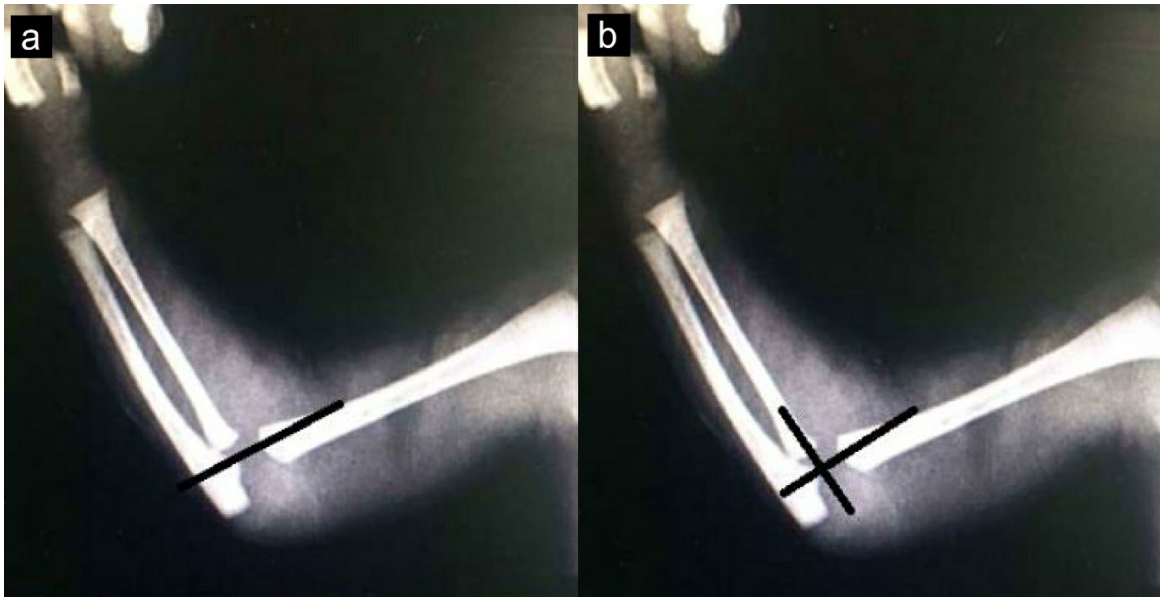

Figure 2 - Radiograph in profile of distal humerus epiphyseal fracture. Image shows absence of mineralization of the chapter's ossification center

Intraoperative arthrography, as described in the report, although is invasive, is useful in the diagnosis, especially in young children without humerus capitulum ossification, as it allows the contour of the entire epiphysis with contrast when filling the elbow joint space and extend to the line of the fracture, diagnosing and indicating the most appropriate treatment[13,21-24].

It is worth poiting out the importance of the suspected diagnosis of distal humerus epiphyseal fracture by radiologists and pediatricians amidst the posteromedial displacement of the radius and ulna identified in radiological examinations of infants, especially when followed by the risk factors described in the literature and identified in this case, enabling an possible early intervention.

Due to the uniqueness of reported cases of distal humerus fracture in newborns, there is no consensus between treatment guidelines. Some authors choose conservative treatment with or without closed reduction and immobilization with a cast splint, while surgical treatment with closed or open reduction and transfusion fixation with synthesis material for cases with late diagnosis, failure or possible complication during reduction and / or recovery[1,13]. Other professionals choose closed or closed reduction and percutaneous fixation with Kirchner wire as the best therapeutic option in cases of deviation due to loss of anatomical parameters necessary to preserve the proper range of elbow motion, specially in early diagnoses as described in this case. Both procedures, conservative and surgical, have been described as presenting good results, maintaining the functional arch viability of the affected limb, as well as the correct anatomical alignment in most cases, as shown in Figure 3 after eight months of post-surgery[1,3,13].

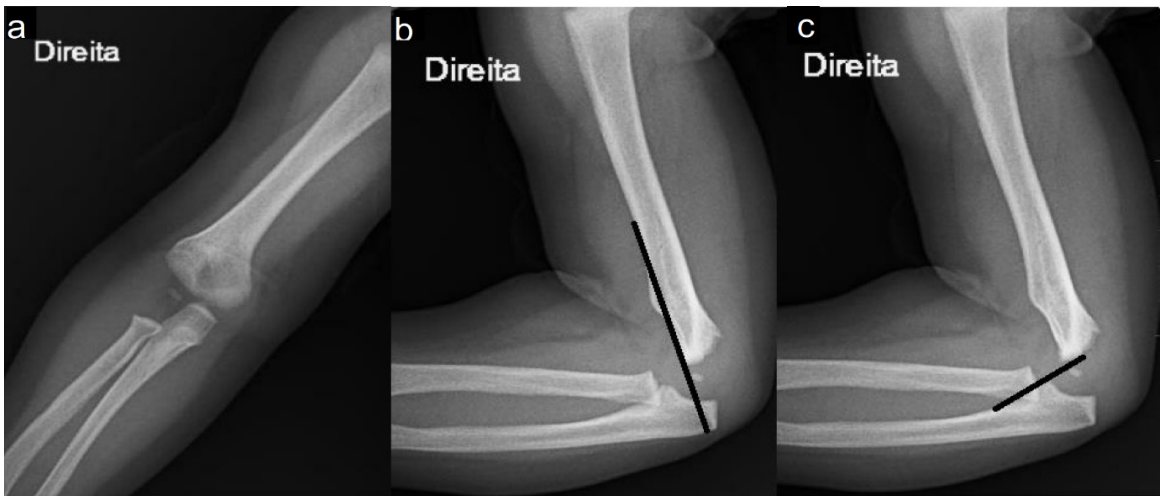

Figure 3 - Postoperative radiograph of the right upper limb in an 8-month-old infant. Antero-posterior (A) and profile (B and C) views showing joint congruence, making it possible to visualize the line drawn in the humerus anterior cortex and the line drawn parallel to the radius crossing the capitulum

Even with adequate treatment, there is a possibility of sequelae, which must be evaluated in the newborn follow-up with the aid of radiographs. The loss of elbow range of motion or stiffness are the biggest sequelae of a vicious consolidation, that is, without reestablishment of the anatomical parameters, in addition to neurological injury, pseudoarthrosis and avascular necrosis[12].

Although it is a rare lesion, difficult to diagnose and easily confused with elbow dislocation, it is possible with early diagnosis and proper management to reestablish the fracture with maintenance of range of motion and anatomical alignment. This case is a type I Salter-Harris fracture in a child under two years of age, characterized as a more susceptible age group and which also has a high potential for bone remodeling and recovery in a short period of time.

Authors' participation: *Bruna Fernandes:* Data collection and compilation, clinical case description, final text review, conclusion, summary and methodological adaptation to the journal. *Dagna Karen de Oliveira:* Data collection and compilation, clinical case description, final text review, conclusion and summary. *Dyayne Carla Banovski*: Literature review and discussion of clinical findings, final text review, conclusion and summary. *Sadana Hillary Dal'Negro*: Literature review, discussion of clinical findings and standardization of references. *Diana Loch Duessmann*: Literature review, discussion of clinical findings and standardization of references. *Renata Bragato Futagami*: Review. Paula Bragato Futagami: Review. *Karin Erdmann*: Data availability and review. *Suelin Pereira*: Data availability, clarifications on radiological interpretation, text review and work orientation.

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Submeted: 2021, January 25
Accepted: 2021, March 15