



The Transphyseal Fracture of The Distal Humerus in Neonate: Report of a Rare Case with Review of Literature

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Abstract

The transphyseal fracture of the distal humerus (TFDH) is a very rare traumatic lesion in neonate. We present a case of a neonate seen late at 18 days of life, with history a fetal macrosomia as a risk factor for birth trauma, referred on account of radiologic diagnosis of dislocation of the left elbow. The ultrasound of the elbow was helpful to make the diagnosis of TFDH of the left elbow following a birth trauma. After immobilization of the left elbow by simple bandage, the functional follow-up at 6 months was satisfactory despite the risk of cubitus varus later. The misdiagnosis or a delayed diagnosis of this traumatic lesion is quite common because of the absence of ossification of the distal humeral epiphysis at this age. Prompt and accurate diagnosis of the injury is crucial for a successful outcome, and can prevent any child disability.

Keywords: Newborn; Birth Trauma; *transphyseal* fracture; Distal Humeral Epiphysis.

Introduction

Traumatic bone injuries occurring during birth is relatively frequent in our midst. Their incidence is estimated at 1 per 1000 live births. Fractures of humerus are the second most common bone fractures in the neonate, after fractures of the clavicle, and may involve the distal epiphysis of humerus [1].

Transphyseal fracture of the distal humerus (TFDH), also known as fracture-separation of the distal humeral epiphysis, epiphysiolysis of the distal humerus [2], or neonatal supracondylar fracture [3], is very rare condition in neonates [4]. In a historical review of 30 years of experience, Madsen documented only one case of distal humeral epiphysis separation in 105,119 neonates [5]. In 2015, Ratti et al. published a review of literature of 20 case reports or small retrospective case series, which have been reported over one century [4].

Misdiagnosis is quite common for this injury, creating a delay in diagnosis. Most case reports [6-8] and case series [9,10] in neonate are late presented cases. This case report focuses on recent literature review on epidemiological aspect and management of neonatal cases.

Case Presentation

We present a term 18-day-old girl, referred to our hospital facility on account for the management of radiological diagnosis of the left elbow dislocation. The baby has presented decreased movements of left upper limb noticed on third day of birth. There was no history of trauma, no fever. There was history of a dystocic vaginal delivery with cephalic presentation. The birth weight was 4,700 g. The first immunization was done (located at the ipsilateral fore-arm) the fifth day of life. There was a pseudo paralyzed left upper limb (Fig 1), with localized swelling in left elbow without redness and warm.



Fig 1: Picture of baby showing the pseudo paralysed left upper limb

Movements of left elbow were painful and bony crepitus was felt. No neurovascular complications were found. There was no mark of child abuse.

Investigation

Haemogram including ESR, C-reactive protein were done and were within normal limits. X-ray showed loss of anatomical alignment between humerus and radius and ulna in the elbow region on left side, similar to elbow dislocation, the periosteal reaction noted in the distal epiphysis of the humerus suggestive of the callus formation (Fig 2). An ultra-sonography of elbow was requested, which shown a distal humerus epiphyseal separation compared with normal positioning of the distal humerus epiphysis identified on the right (Fig 3).



Fig 2: Left elbow radiograph, showing posteromedial displacement of radio-ulnar complex, callus formation (blue arrow), soft tissue swelling.



Fig 3: Elbow ultrasonography, showing cortical bone ruptured, and absence of left elbow articular effusion.

Treatment and Follow Up

We performed an immobilization by bandage of the upper limb held against the body for 2 weeks. Functionally, baby had full range of movements at 6 months follow up.



Fig 4: Picture of baby showing the left upper limb bandage

Discussion

TFDH typically occurs in children younger than 3 years. Because, anatomically the physal line is transverse and smooth in neonates and infants. It is also quite proximal, so it is cited closely to the centre of the olecranon fossa [2]. The clinical presentation typically includes a painful elbow swelling, motionless upper limb, and 'muffled' crepitus on movement [8,11]. A case with radial nerve palsy was reported by Kaushal et al. [12]

The most common mechanisms of the injury in neonates are rotatory and shear force usually during birth trauma or child abuse. TFDH can occur in neonates from the forces of labour or during obstetrical manoeuvres, especially if a shoulder dystocia is present and/or the delivery is traumatic [1]. It can also occur during emergency caesarean section and may be related to excessive traction [1,6]. Child abuse should be also considered in young children [1]. However, recent case of TFDH following child abuse in neonates have not been reported in the literature.

Transphyseal fractures of the distal humerus can be classified based on the direction of displacement of the distal fragment. Posteromedial displacement is the most common pattern [4]. However, there are reports of anterior displacement in infant, but not in neonates [13]. The Salter-Harris classification is used to classify these injuries [2]. There are other classifications such as the modified version of the Delee's classification, which is based on the appearance of the primary ossification centres of the distal humerus. Fractures were divided into three groups (Fig 5) [14].

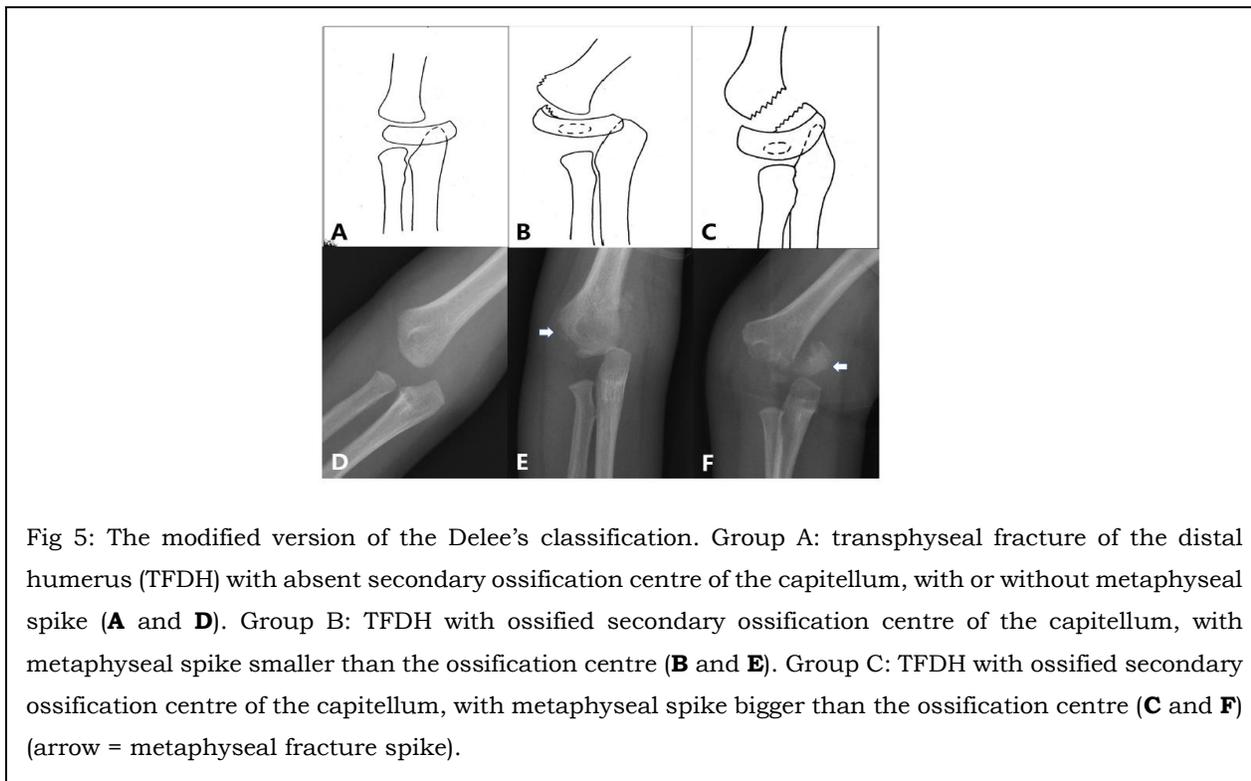


Fig 5: The modified version of the Delee's classification. Group A: transphyseal fracture of the distal humerus (TFDH) with absent secondary ossification centre of the capitellum, with or without metaphyseal spike (**A** and **D**). Group B: TFDH with ossified secondary ossification centre of the capitellum, with metaphyseal spike smaller than the ossification centre (**B** and **E**). Group C: TFDH with ossified secondary ossification centre of the capitellum, with metaphyseal spike bigger than the ossification centre (**C** and **F**) (arrow = metaphyseal fracture spike).

Traumatic elbow dislocation, brachial plexus injury, septic arthritis and osteomyelitis, genetic bone diseases (e.g. osteogenesis imperfecta) should be considered as a differential diagnosis [4]. In our case, brachial plexus injury was ruled out, because the baby presented a localized swelling, pain and bony crepitus in left elbow. In our midst, it is common to have a child with presenting late septic arthritis and osteomyelitis. Despite the history of intradermic injection of BCG vaccine (which could be an infectious lead point), no other risk factors were noted, and the inflammatory tests were normal.

Diagnosing transphyseal fractures can be challenging in neonates because of the absence of ossified epiphyseal cartilage. The first ossification center to form in the elbow is the capitellum, which typically does not appear until 6-12 months of age. Until the capitellar ossification center appears, a distal humerus epiphyseal fracture can easily be mistaken for a pure posterior elbow dislocation on radiographs [10]. For these reasons, to confirm the diagnosis, many authors have suggested further investigations, such as sonography, MRI and arthrography. Arthrography is expensive and invasive and requires significant expertise in both performance and interpretation. MRI is expensive and time-

consuming but is often preferred over arthrography for diagnosis due to MRI being less invasive and requiring less operator experience. Both MRI and arthrography require general anaesthesia, and MRI is expensive and not always accessible. In contrast to these methods, ultrasonography is simple to perform, readily available, non-invasive, non-irradiating, and no sedation is necessary [4].

Treatment options in neonate are quite controversial. There are many treatment options suggested by different authors. Mainly suggest closed reduction followed by different immobilisation techniques [4]. The mode of immobilization may differ among different authors.

In our case, because of late presentation and the presence of callus, we carried out a conservative management. An immobilisation with crepe bandage of the upper limb held against the body for 2 weeks was done. Sherr-Lurie et al. recommend reduction and cast application for 2 weeks with the upper limb held against the body [1]. Jacobsen et al. reported excellent results in four patients with delayed diagnosis (underwent from 9 to 30 days after birth) whose fracture was not reduced but only immobilized in a cast for 2–4 weeks [9]. Anatomical close reduction is not difficult when the diagnosis is early performed, but it may be unstable [4]. In that case, percutaneous pin fixation may be considered [4,15], other authors have reported an open reduction and internal fixation [4]. In late presentation (more than 3 to 5 days), the epiphysis is not freely movable. Attempted aggressive closed reduction may lead to greater physeal injuries, and open reduction may devascularise the physeal fragment and may lead to increased incidence of myositis ossificans [2,10]. Thereby, fractures that have a late presentation are best treated nonsurgically initially, with the understanding that deformity may persist or develop, requiring an osteotomy in the future.

The most common short-term complication of TFDH is decreased range of motion. Cubitus varus is the most common long-term complication. It caused by a malunion, osteonecrosis of the medial condyle, or growth arrest [4]. Cubitus varus is even more commonly associated with a distal humerus transphyseal fracture than a supracondylar fracture, with reported rates as high as 71% [16]. Regardless the choice of treatment, a residual cubitus varus 5° to 10° is commonly observed, which did not progress or remodel during follow-up [2]. The fact that the distal humerus growth plate provides 20% of the growth of the bone and only 10% of the growth of the entire upper extremity, may explain why TFDH has low remodelling potential and why the cubitus varus tend not to significantly worsen during growth.

Conclusion

TFDH is very rare in neonate and the diagnosis is often missed for a posterior elbow dislocation on radiographs. Prompt and accurate diagnosis of the injury is crucial for a successful outcome. The injury should be suspected in any neonate presenting with posterior elbow displacement, particularly if the elbow joint is displaced posteromedially. An advanced imaging such as ultrasonography is needed to confirm the diagnosis. There are no consensus guidelines for treatment. Both conservative and surgical

managements of these fractures have been performed with generally good outcomes, despite the risk of late residual cubitus varus. So, for early and late presentation, the conservative management should be considered in neonate.

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