Case report

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# SEPARATION OF THE DISTAL HUMERAL EPIPHYSIS IN A NEWBORN: A CASE AND LITERATURE REVIEW

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**Objective** - To present possible causes of elbow injury in a newborn based on the clinical case of a newborn with separation of the distal humeral epiphysis. Different diagnostic tools and treatment options that have been used by others with good results and rare complications are discussed. **Case report** - A clinical case of a newborn where separation of the distal humeral epiphysis was diagnosed and treated, most likely due to traumatic childbirth. After reduction and immobilization, the normal position of the bones and function of the elbow joint were determined by clinical examination and diagnostic imaging. **Conclusion** - Elbow injury in a new born is very rare, most often it results from traumatic childbirth; it rarely occurs later in the new born period. Newborns present with sensitivity to touch and irritability, decreased mobility of the affected limb and swelling in the area of the injury. Use of diagnostic methods of elbow injuries in the newborn period can be difficult. X-rays are not sufficiently accurate to deduce the nature of the injury, because the distal humeral epiphysis is not yet ossified. Therefore, for exact specification of the injury type, additional imaging diagnostics are usually required: ultrasound as the first line and magnetic resonance as second line imaging method, which help to differentiate between osteoarticular infection and traumatic injury. Treatment is usually conservative, with closed reduction and immobilization; serious complications associated with impaired joint function are rare.

## Introduction

A newborn's bones are vulnerable, particularly in the area of epiphyseal growth cartilage; therefore, the result of excessive stress to this area is usually epiphysiolysis and separation of the distal fragment of the damaged bone. Epiphysiolysis, separating the distal fragment, occurs rarely in the newborn period. Regarding the elbow, Masden (1) reported only one separation of the distal humeral epiphysis among 105,119 births. Tharakan and co-authors reported the incidence of neonatal separation of the distal humeral epiphysis to be 1:35,000 (2). Epiphysiolysis of the humerus is most often a birth injury, so the clinical signs typically occur within the first few days after birth. The clinical picture mainly encompasses soreness and tenderness of the affected limb, swelling, reduced mobility, crepitation in the elbow joint, and asymmetric Moro reflex (3). There are also reports of cases where injury of the epiphysis of the distal humerus occurred later in the newborn

period. Child abuse has to be excluded in such cases (4).

Imaging is important in differentiating osteoarticular infection (neonatal osteomyelitis or septic arthritis) from traumatic injury. X-ray is important in evaluation of malalignment of the joint, but for more accurate diagnosis at least ultrasound (US) examination of the elbow should be performed. Magnetic resonance imaging (MRI) differentiates even better between infection and trauma.

We present a rare clinical case of a small for gestational age newborn, with epiphysiolysis of the humerus, which was primarily treated due to early-onset neonatal infection and hypoglycaemia. Due to excessive irritability, swelling and redness in the area of the humerus, elbow injury was suspected.

## Case report

A newborn Roma girl, of a 37-year-old mother, who had been monitored since the 22$^{nd}$ week of gestation, was born asymmetrically small for gestational age (birth weight 2,600 grams (2$^{nd}$ percentile), birth length 49 cm (29$^{th}$ percentile) and head circumference 35 cm (80$^{th}$ percentile)). Labour started spontaneously in cephalic presentation after 37 weeks of gestation with contractions, and the amniotic fluid was meconium stained. The labour was difficult, especially the prolonged foetal expulsion stage. Medical staff repeatedly exerted pressure on the fundus of the uterus. After birth, the newborn girl immediately started to cry, so additional procedures in the delivery room were not required. Two hours after birth, the newborn was hypoglycaemic, needing intravenous glucose supplementation. Due to increased inflammatory parameters and suspected early neonatal sepsis, she was given empirical antibiotic therapy with ampicillin and gentamicin the day after birth. The newborn was irritable during her first days of life, crying most of the time, and she had some feeding difficulties. At that time abnormalities of the upper extremity were not perceived.

She was admitted to our ward at the age of three days. Upon clinical examination, swelling and erythema of the right upper arm were observed (Fig. 1). The limb was warmer and the circumference larger compared to the healthy arm. The neurological exam revealed excessive irritability, inhibition of normal movement and pain upon passive movement of the right elbow, and asymmetrical Moro reflex.

**Fig. 1** *Clinical picture of painful elbow in a 3-day old newborn.*

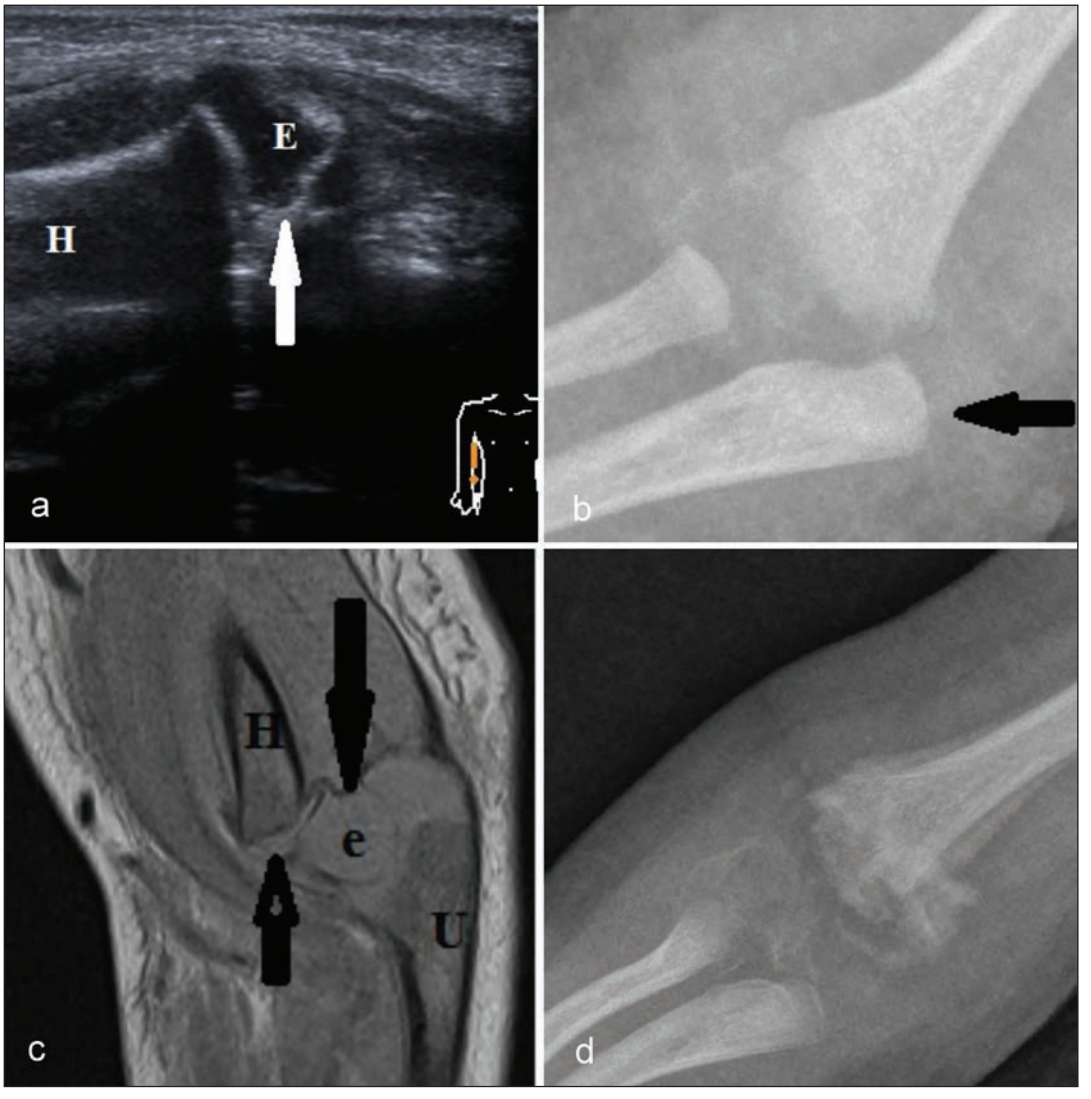


**Fig. 2** *a) Elbow ultrasonography: dislocation of the humeral distal epiphysis (white arrow), H-humerus, E- humeral epiphysis. b) Radiogram of the painful elbow: malalignment of bones in the elbow joint (black arrow). c) Magnetic resonance of the elbow (PD TSE sagittal sequence): humeral epiphysis (e) dislocation from growth plate (empty arrow) is clearly seen. H=humerus, U=ulna. d) Follow up radiogram after 10 day immobilization.*

According to the clinical signs of inflammation and increased inflammation parameters, an osteoarticular infection was suspected, and intravenous oxacillin therapy was administered until additional investigations excluded it. An X-ray of the right elbow showed malalignment of the bones in the elbow joint (Fig. 2b). The orthopaedic trauma surgeon suspected a dislocation of the forearm due to suspicion of traumatic elbow injury, and advised further diagnostic imaging: US (Fig. 2a) and MRI (Fig. 2c), which both showed epiphyseolysis of the distal humerus.

Closed reduction under general anaesthesia, followed by 10-day immobilisation of the arm in a neutral position, together with regular analgesic therapy, were performed. The proper position and mobility of the elbow joint were established during follow up. Periosteal reaction was obvious on X-ray, and

the humerus was correctly aligned with the radius and ulna (Fig. 2d). Additional regular medical examinations were advised primarily to assess the growth and development of the child, but also potential long term complications of the injury.

## Discussion

Epiphysiolysis of the distal humerus and dislocation of the radial head have previously been described as rare cases of neonatal elbow injury (5, 6). We did not find any cases of traumatic dislocation of the neonatal elbow in the reviewed literature.

Breech position with arm protrusion and shoulder dystocia have been recognized as risk factors for epiphysiolysis of the distal humerus (2, 3, 7). Jacobsen et al. described six clinical cases of newborns with separation of the distal humeral epiphysis. Clinical signs were: sensitivity of the affected limb, swelling, reduced mobility, crepitation in the elbow joint, and asymmetric Moro reflex (3). In our case, in addition to the described signs, redness and warmth of the arm were noted. Therefore, osteoarticular infection in the newborn with elevated inflammatory parameters was initially suspected. X-ray based differential diagnosis suggested elbow injury.

Similar diagnostic difficulties have been encountered by others because X-ray of the elbow in the newborn period is not a sufficiently precise test to define the type of elbow injury. The growth zone in a newborn's humeral capitellum is not yet ossified; therefore, it is not visible on X-ray. Due to the displacement of the humeral epiphyseal plate, the bones of the elbow joint are non-physiologically straightened on an X-ray, as seen in the radial head dislocation. The separation of the distal humeral epiphysis is initially overlooked in most cases, and most often mistaken for posterior radial dislocation (2, 4, 7–9). Due to the limited mobility of the upper limb, the differential diagnosis encompassed brachial plexus injury in rare cases (3). X-ray of the elbow had greater diagnostic significance in cases where an elbow injury was diagnosed later after birth, when callus formation had already occurred and was well visible by radiograph (2).

As the method of choice for diagnosing neonatal separation of the distal humeral epiphysis, recent articles often suggest US, which accurately shows the structure of the elbow and the epiphysis, which are invisible on an X-ray image (2, 3, 9). In our case, we also performed MRI investigation, which is certainly the most accurate method, but because of the need for sedation of children it may pose an additional risk for complications associated with anaesthesia (7).

Given the fact that neonatal separation of the distal humeral epiphysis is a very rare injury, no clear guidelines are available yet, to define the proper evidence-based treatment in these cases. In most cases, the authors of the reviewed literature decided on closed reduction of the joint under general anaesthesia, followed by prolonged immobilization (3, 8, 9). In our case, this treatment proved to be successful, since the newborn had no complications after the treatment in terms of reduced mobility, or non-physiological bone alignment of the elbow joint. Tharakan et al. (2) presented a newborn, in which the neonatal separation of the distal humeral epiphysis was further stabilized with K-wires after reduction. Complications after treatment were described in cases with delayed diagnosis that were treated with only immobilization of the joint without reduction. In these cases, limited mobility and a decreased physiological valgus position of the elbow might have occurred. These complications have no significant effect on the joint function (3, 9).

## Conclusion

Separation of the distal humeral epiphysis is a rare cause of elbow injury in newborns.

In cases of pathological clinical signs above the humerus or the elbow and reduced arm mobility, additional imaging diagnostics for exclusion of birth injury are appropriate. Besides X-ray, for a definitive diagnosis at least an US examination is required. Timely treated injuries are generally not associated with complications. In the future, long-term follow-up of children with neonatal separation of the distal humeral epiphysis will be needed to assess the impact of the injury on epiphyseal growth, the development of the upper limbs and the adequacy of the currently used treatment.

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**Conflict of interest:** The authors declare that they have no conflict of interest.

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