Complex Birth Injury: Distal Humeral Epiphyseal Separation and Erb's Palsy Following Difficult Extraction in a Late Preterm Infant: A Case Report

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Abstract

We present a rare case with co-occurrence of distal humeral epiphyseal separation and Erb's palsy in a late preterm infant following a complicated breech extraction through cesarean section. Clinical evaluation revealed absent Moro reflex on the right side and Erb's palsy, while imaging (X-ray and ultrasound) confirmed a transphyseal fracture of the distal humerus with posterior epiphyseal displacement. Management included closed reduction with K-wire fixation, and multidisciplinary follow-up for neurological and orthopedic rehabilitation. This case report highlights the risks of traumatic birth injuries during difficult breech deliveries, even in cesarean sections, highlighting the need for thorough postnatal evaluation.

Key words: Distal humeral epiphyseal separation, Erb's palsy, Brachial plexus birth injury, Neonatal fracture, Breech extraction, Cesarean section, Birth trauma, Placenta previa.

Introduction

Erb's palsy is a specific type of obstetrical brachial plexus palsy and is the most prevalent **(1)** It is 50%-60% prevalent birth associated with brachial plexus damage. During tension of aftercoming head in some cases of severe labor there may be stretch, rupture or avulsion of roots in cervical region of spinal cord leading to Erb's palsy. (**2**)

In breach presentation, there is frequently a difficulty of delivery of the "after coming head". In Cesarean section deliveries, through the uterine incisions there is excessive manipulations of head and shoulder producing damage. (**3**)

Erb's palsy produced by traumatic prevaginal birth can be separated into: (1) upper Erb's palsy which involves injury to C5 & C6 roots of spinal cord. Here the newborn is unable to abduct the shoulder, externally rotated the arm and flex the elbow. (**2**)

Extended Erb's palsy involves C5, C6, C7 nerve roots and consequently wrist drop is also visible; the new born appears with the "waiter's tip posture" where the shoulder is adducted, arm is internally rotated, the elbow is extended, and the wrist is flexed i.e. wrist drop (**4**) Neonatal separation of the distal epiphysis of the humerus was originally recorded in 1926 by Camera, there have been relatively few reports of this unusual injury since then. (**5**) Neonatal separation of the distal epiphysis of the humerus is a rare injury, and when it happens in the infant, there is frequently a rotatory or shear force related with delivery trauma or child abuse. (**6**)

This lesion may be readily missed at birth due to difficulties in clinical and radiographic diagnosis. Clinically, edema, instability, and restricted range of motion (ROM) at the elbow indicate potential

fracture separation. Plain radiographs are difficult to interpret due to the unossified epiphyses of the elbow joint at birth (**7**)

Case presentation

A female neonate, born on 30/10/2024 at 36 weeks gestation with lower segment cesarean section (LSCS) due to placenta previa majora and breech presentation. The delivery of the case was complicated, involving difficult extraction of the case. The infant, with a birth weight of 2.460 kilogram, was admitted to the NICU immediately after birth due to respiratory distress and right upper limb weakness. The case was hospitalized for 8 days, discharged on 06/11/2024 with a weight of 2.450 kg.

Antenatal history: The mother has 26-year-old gravida P2+0+0+2 with blood group B+ve, had a complicated antenatal course marked by hypothyroidism managed with Eltroxin and preterm labor risk necessitating dexamethasone for lung maturation. Antenatal ultrasounds revealed a singleton vertex fetus with biometry consistent with 35 weeks gestation and average amniotic fluid volume. Placenta previa majora was a critical factor influencing the delivery mode.

At birth, the infant exhibited weak crying and HR <100/min, requiring positive pressure ventilation (PPV) with a Neopuff for 30 seconds. Though her heart rate improved, she developed tachypnea and subcostal retractions, so connected to nasal cannula 2L/MIN FIO2 30% with SPO2 98%. APGAR scores were seven and nine at one and five minutes, respectively. Initial chest X-ray findings aligned with transient tachypnea of the newborn (TTN), upon discharge SPO2 is maintained on RA with good work of breathing.

During her NICU stay, neurological examination revealed asymmetric Moro reflex, positive on the left and absent on the right and right Erb's palsy (figure 1), attributed to brachial plexus injury during the difficult breech extraction. Concurrently, the infant exhibited right elbow swelling and tenderness. Imaging studies, including X-ray (figure 2,3) and ultrasound (figure 4), identified a right transphyseal separation of the distal humerus with posterior slippage of the cartilaginous epiphysis. On day 7, pediatric orthopedics performed closed reduction with K-wire fixation and posterior slab application.

Non-hemolytic hyperbilirubinemia (total bilirubin was 93.6 µmol/L) was managed with phototherapy, initiated on day 2 and discontinued by day 3 without rebound. Sepsis evaluations, including CBC, CRP, and blood cultures, were negative, though prophylactic ampicillin and gentamicin were administered for 48 hours. Laboratory findings highlighted elevated hemoglobin (Hb was 173 g/L), lymphocytes were 40.2%, and liver enzymes (AST was 52 U/L; GGT was 265 U/L).

Upon discharge, vitamin D3 supplementation (400 IU/day) was prescribed for the case and the infant was scheduled for multidisciplinary follow-up. This included pediatric neurology and orthopedics consultations, physiotherapy for Erb's palsy, and routine neonatal screenings.

Progression and follow up

Orthopedic: The case had a follow-up orthopedic evaluation following the removal of a K-wire. Imaging, including an X-ray of the affected area (Figure 5), revealed normal alignment and healing with no complications. Physical examination of the site was normal. A hip ultrasound was performed, which also was normal, showing no signs of pathology.

Neurology: The case had a neurological evaluation, and the findings were normal. The case showed no deficits in motor or sensory function, reflexes, or coordination.

Figure 1: Erb's Palsy in a newborn child.

Figure 2: The AP view of the right arm demonstrates the separation/fracture at the distal humerus, with the arm being straight, for further assessment.

Figure 3: Lateral view shows the separation/fracture. In the image, there is a notable gap between the distal humerus and the condylar epiphysis as well as a possible small fragment superiorly. The arm is bent at the elbow joint.

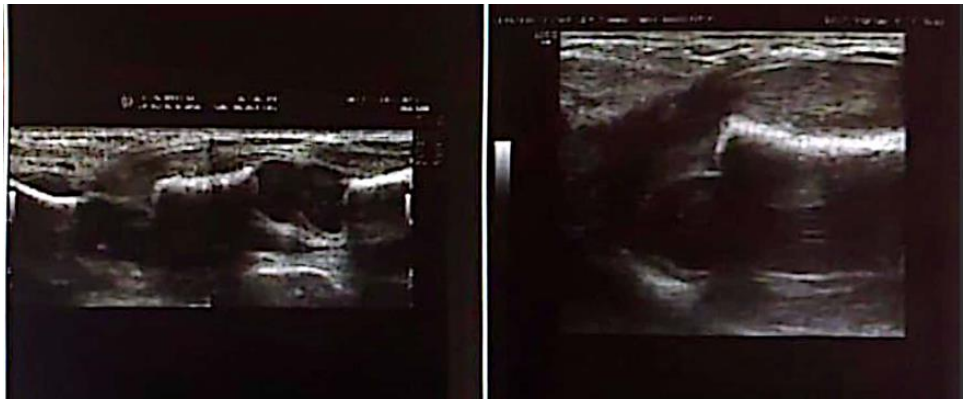

Figure 4: Ultrasound shows the right humeral cartilaginous epiphysis is not aligned with the ossified diaphysis of the humerus and slipped posteriorly. However, the radial head, capitulum, ulnar olecranon, and trochlea articulations remain intact. No significant joint effusion. Intact overlying muscles.

Figure 5: Follow-Up X-ray After K-Wire Removal showing normal Findings.

Discussion

Birth injuries, such as Erb's palsy and distal humeral epiphyseal separation, are rare but significant complications of difficult deliveries. These injuries are more common in scenarios involving breech presentation, preterm birth, or mechanical extraction forces during delivery **(8, 9)**. This case report illustrates the challenges in managing such complex neonatal injuries and emphasizes the importance of multidisciplinary care.

In this case, Erb's palsy was likely caused by traction on the brachial plexus during the challenging breech extraction. The mechanical stress exerted on the shoulder girdle during delivery can lead to nerve injury, particularly in preterm infants with less developed connective tissue. Additionally,

the distal humeral transphyseal separation is attributable to the vulnerability of neonatal bone and cartilage under excessive extraction forces.

The asymmetric Moro reflex observed (positive on the left but absent on the right) is a hallmark sign of brachial plexus injury. Weakness in the right upper limb confirmed the diagnosis of Erb's palsy. Simultaneously, the swelling and tenderness in the right elbow raised concerns for a fracture, which was confirmed as a distal humeral epiphyseal separation through imaging studies.

Management of the transphyseal humeral separation involved closed reduction with K-wire fixation and posterior slab application, which is a widely accepted approach in such injuries. Early orthopedic intervention reduces the risk of long-term complications, such as deformities or growth disturbances. For Erb's palsy, physiotherapy was initiated promptly to facilitate nerve recovery, a key component of the multidisciplinary management strategy.

This was in consistent with **Tudisco C et al., (10)**, who also reported that Distal humeral epiphyseal separation is uncommon in neonates. The clinical signs involve soft tissue edema in the elbow joint, skin abrasions, and atypical or limited elbow joint mobility. The above mentioned symptoms typically manifest among two to three days post-delivery. All of these signs, resembling those of elbow dislocation, are nonspecific. Additionally, this was in concordant with a similar previous case was reported by, **Yan X et al., (11)**, who revealed that complete distal humeral epiphyseal separation, identical to elbow dislocation, is an uncommon injury in neonates. While ultrasonography and magnetic resonance imaging (MRI) are beneficial, simple radiographs are inadequate for diagnosing this condition. A case has been described in which fracture-separation of the distal humeral epiphysis was accurately identified utilizing ultrasonography and MRI, providing a clear delineation of the injury. The condition was treated with internal fixation using percutaneous Kirschner wires, and follow-up revealed excellent recovery. Notably, traumatic separation of the distal humeral epiphysis can be overlooked in maternity wards and may remain undiagnosed until after hospital discharge. However, favorable clinical outcomes are possible even without immediate reduction of the dislocated epiphysis.

Furthermore, this was aligned with the case who investigated by **Sage EE et al., (12)**, involving a 23-year-old primigravida delivered at 39 weeks and 3 days via cesarean section due to breech presentation. During the operation, Lovset's maneuver was utilized to deliver the fetal upper limbs; however, the right arm was difficult to deliver due to its nuchal position. The Moro reflex was observed to be incomplete on the right side postnatally. The initial X-rays of the right upper limb revealed no fractures, and the newborn was diagnosed with Erb's palsy, resulting from a violent birth. On the 2nd day of life, the newborn had edema at the right elbow joint. The ultrasound of the affected region indicated distal humeral epiphyseal separation. The infant subsequently received open reduction surgery. and K-wire fixation performed by the pediatric orthopedic team, their case highlights the importance of maintaining a high index of suspicion and vigilant observation in neonates with suspected birth injuries. Early detection and timely intervention, as demonstrated here, are crucial to avoid long-term complications like cubitus varus, avascular necrosis of the medial or lateral condyle, restricted motion, and growth disturbances.

Moreover, this was supported by, **Deka D et al., (4)** who also presented a similar case to A newborn infant has been discovered unable of flexing his elbow and exhibited abduction of the right arm. They indicated that, from a clinic-anatomical perspective, a diagnosis of respiratory distress in a newborn can be established only through clinical examinations (primitive reflexes, respiratory rate, subcostal retraction) and a limited number of simple investigations (plain chest X-ray, ultrasonography), particularly when delivery is conducted by an untrained hand.

Conclusion

This case highlights the complexity of managing birth injuries in neonates following difficult deliveries, particularly in the context of preterm birth and breech presentation. The combination of distal humeral epiphyseal separation and Erb's palsy is a rare but severe complication, often resulting from mechanical stress during extraction.The case underscores the importance of careful obstetric management during complicated deliveries to minimize birth injuries. Furthermore, early recognition and timely, multidisciplinary interventions are pivotal in optimizing outcomes for neonates with complex injuries like those described here.

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