CASE REPORT

Neonatal Radial Nerve Palsy Associated with Humerus Fracture: Is the Fracture to Be Blamed?

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Introduction

Isolated radial nerve palsy is rare in the neonatal period and may be misdiagnosed as neonatal brachial plexus palsy. It is important to distinguish between these two entities because the prognosis of neonatal radial nerve palsy (NRNP) is very favorable^{1,2}. In this report we present a case of NRNP associated with humerus fracture and review related published reports.

Case Report

An infant girl was born by assisted vaginal delivery without any instrumentation at 39 weeks of gestation. The mother was 28 years old, gravida two and had gestational diabetes. The second stage of the labor was prolonged because of shoulder dystocia. At birth the Apgar score was 9/10 and the infant's weight 3.6 kg. On examination the baby had swelling, tenderness and abnormal mobility of the left arm. There were no ecchymoses, subcutaneous nodules or dimpling of the skin of the arm. A radiograph showed a transverse fracture of the humerus just above the mid shaft of the humerus (Fig. 1), which was then treated by splinting.

On the eighth day, an abnormal position of flexion of the left wrist was noted (Fig. 2). Further, after removing the splint a detailed examination showed no active extension of fingers or wrist. However active abduction of the shoulder and flexion and extension of the elbow was similar to the opposite side. A diagnosis of isolated radial nerve palsy was therefore made and splinting (arm splint and static dorsiflexion splint for wrist) along with passive stretching was advised. The first evidence of recovery of the radial nerve was wrist dorsiflexion, which was noted at 20 days of age. At 4 weeks the fracture was uniting well (Fig. 3). By the sixth week of age, movements of the wrist and fingers had completely recovered.

Discussion

Unilateral restriction of movement of an upper limb in a neonate may be due to a neurological lesion or pseudo-paralysis (fracture of clavicle or humerus, septic arthritis or osteomyelitis)². Neonatal brachial plexus palsy is the most common neurological condition, affecting 0.1%–0.4% of newborns³. With only 61 reported cases, isolated radial nerve palsy is a far less common cause of unilateral restriction of upper

Fig. 1 Radiograph showing fracture of humerus.

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Disclosure: There is no potential conflict of interest. None of the authors have received or will receive any funding of any kind from any authority in relation to the present study.

Received 14 March 2013; accepted 9 May 2013

Fig. 2 Typical posture of left sided radial nerve palsy, flexion at elbow and no extension at wrist.

Fig. 3 Radiograph showing callus at fracture after 4 weeks.

limb movements in neonates^{1,2,4}. However, the case series of Alsubhi *et al.* shows that the real incidence may be much higher¹.

The distinguishing features of NRNP from neonatal brachial plexus palsy are presence of active shoulder abduction, elbow flexion and grasp reflex accompanied by absence of active extension of wrist and fingers^{1,2,4}. The present case has all these features. However the presence of pseudoparalysis due to a fracture of the humerus delayed the diagnosis in this patient.

Causes of NRNP include prolonged intrauterine compression, humeral fracture, septic arthritis of the shoulder, infantile cortical hyperostosis (Caffey disease), constriction band and prolonged application of arm cuff for blood pressure measurement^{1,2,4-8}. Intrauterine compression is considered the commonest mechanism and is characterized by the presence of ecchymosis, erythema, ulceration or skin dimpling over the posterior aspect of the arm in most cases^{1,2,4,5,9}. Coppotelli *et al.* biopsied skin in the affected area and found inflammatory changes and traumatic fat necrosis⁹. Lenn and Hemill performed radiographic pelvimetry before and after birth and found that the fetus had been in a similar position for 13 day resulting in NRNP¹⁰. An electrophysiological study by Ross *et al.* showed acute denervation on the seventh day and fibrillation potential between the 10th and 21st days, suggesting that

these injuries may occur before the onset of labor¹¹. However Hayman *et al.* proposed that the compression occurs during the process of delivery. They believe that subcutaneous fat necrosis may develop up to 4 weeks postnatally and that its presence does not accurately determine the time of onset of injury¹² (Fig. 3).

Before the present case, only one case of NRNP associated with a humeral fracture had been reported⁵. Similarly to the present case, it was associated with prolonged labor and the fracture was above the mid shaft. Though the previous authors had implicated the humeral fracture as the cause of the radial nerve palsy, this seems unlikely because radial nerve injury is unusual in humeral fractures proximal to the mid-shaft¹³. Also humeral fracture is a relatively common form of birth trauma and, unlike in adults, is extremely rarely associated with radial nerve palsy¹⁴. This may be attributable to the low energy of trauma involved and the thick periosteum characteristic of neonates. Thus, we propose that the palsy in the present case was caused by compression *in utero* or during birth and that the humeral fracture was simply an associated lesion rather than a cause. In summary, isolated radial nerve palsy is rare in neonates and may be missed when associated with a humeral fracture. It is important to make this diagnosis because it is simple to manage and has an excellent prognosis.

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