Congenital Radial Nerve Palsy

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Although advancement in obstetrical care has been made, shoulder dystocia and brachial plexus birth palsy (BPBP) continue to have a relatively stable incidence.[1,2] Isolated congenital radial nerve palsy is much more rare, and may represent only 1% to 2% of cases referred for evaluation of a brachial plexus injury.[3] Whereas brachial plexus injury can have high variability in recovery, isolated congenital radial nerve palsy has almost uniformly resulted in complete nerve recovery regardless of how severe the initial presentation was.[3–7] Due to the low incidence and typical spontaneous recovery, the true incidence of congenital radial nerve palsy remains unknown.[3–7]

EVALUATION

The assessment should begin by obtaining a thorough birth history including the weight of the baby, mode of delivery, utilization of assistive devices, and immediate function in the affected extremity. Subsequently, the physical examination should focus on determining which nerve roots and/or peripheral nerves are not functioning (Fig. 1). It is also important to ensure that there are no fractures present—these may result in a "pseudopalsy." Separating a BPBP from a congenital radial nerve palsy can be difficult, therefore assessment may lie in eliciting flexor functions of the upper extremity. A lack of grasp reflex, or weak hand grip, can be seen in BPBP but not in congenital radial nerve palsy.[5,7] Additionally, shoulder and elbow motion are normal in congenital radial nerve palsies (Video 1, available on the *Journal's* Web site at www.jhandsurg.org) but may not be in BPBP patients.[3,6] BPBP can also be distinguished from congenital radial nerve palsies by assessing for the Moro and asymmetric tonic neck reflexes, as well as symptoms of Horner's syndrome.[1] The Moro reflex will elicit shoulder abduction and elbow extension, which should be present in congenital radial nerve palsies but may be impaired in BPBP. The asymmetric tonic neck reflex induces flexion of the upper and lower extremities on one side with extension of the arm and leg on the contralateral side, which again should be a normal reflex in an isolated peripheral radial nerve injury.[1]

An additional clue in establishing the diagnosis of a congenital radial nerve palsy can be characteristic skin findings (Fig. 2). Of the 55 cases of congenital radial nerve palsies in the literature, 44 of 55 cases (80%) had specifically documented some form of discoloration or skin change at the mid humeral level of the affected limb.[5,6,8–17] Alsubhi et al,[3] with the largest series (25 patients), found that 17 of 25 (68%) of their cases included the presence of a subcutaneous nodule. Biopsy of subcutaneous nodules has confirmed definitively that fat necrosis is present, suggesting that compression in an isolated location is the underlying etiology of a congenital radial nerve palsy.[11,14]

TREATMENT

Congenital radial nerve palsy is managed with observation and physical therapy including passive range of motion exercises.[3–6,8,9] The use of nighttime wrist splinting may also be helpful.[6,8,9] Additional treatments may include stretching exercises[6] or stimulation of active movements.[4] However, there is clear evidence of spontaneous resolution with complete recovery and no sequelae in cases without any intervention.[4,6]

OUTCOMES

Of the 55 reported cases in the literature to date, all had some form of recovery reported.[3,4,6,7,9–16] The average recovery occurred at 9 weeks (range, 1–40 wk).[3–18] All

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FIGURE 1: Left-sided congenital radial nerve palsy in an infant as demonstrated by the left-sided wrist drop. (Image courtesy of Joshua M. Abzug, MD.)

but three patients had full recovery documented.[7,9,14] In these three patients, full recovery likely occurred but complete outcome details were undocumented. One patient had rapid clinical improvement by 12 days of age and only showed mild weakness of left wrist extension. Needle electromyography (EMG) showed polyphasic units in the left radial forearm muscles and a decreased interference pattern, findings consistent with resolving axonal abnormality.[7] Another patient had marked improvement of bilateral wrist drop at 2 weeks with EMG showing no acute denervation of the radial nerve.[14] The third patient initially presented with right wrist drop with dimpling and bluish discoloration of the skin. Day 4 and 8 EMGs showed persistent absence of motor units in the forearm extensor muscles. Improvement was noticed on the 22nd day of life with the EMG showing a few motor units in the forearm extensor group muscles. By 3 weeks of age, there was no longer any dimpling of the skin and the right wrist drop had improved. The child was lost to follow-up thereafter.[9] In the series reported by Alsubhi et al, 72% of patients had full recovery at 8 weeks with all but one patient having recovery by 3 months.[3]

SUMMARY

Neonatal upper extremity "paralysis" can present due to numerous etiologies including clavicle and humerus fractures (pseudopalsy), BPBP, congenital radial nerve palsy, neonatal compartment syndrome, arthrogryposis, perinatal cerebral ischemia, and congenital constriction band.[6] The most important distinction is to differentiate between a BPBP and congenital radial nerve palsy; an accurate diagnosis is imperative because the counseling of the patients' families is different depending upon the diagnosis. All cases of congenital radial nerve palsies in the literature thus far have been noted to have spontaneous resolution. Although some authors may include constriction band syndrome within the spectrum of congenital radial nerve palsies that have much poorer outcomes,[4,5,19,20] we feel these have distinctly different etiologies. Typically, patients with a congenital radial nerve palsy achieve full spontaneous recovery by 3 months of age whether formal therapy and/or splinting was utilized or not.

PEARLS

- Assess for skin changes such as ecchymosis, skin dimpling, a subcutaneous nodule, erythema, or induration at or around the mid lateral humeral region.

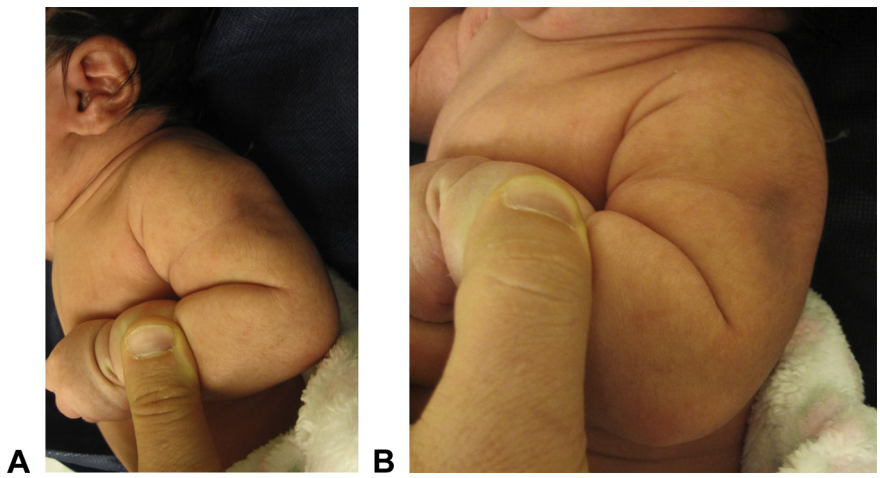

FIGURE 2: Skin dimpling and ecchymosis present at the left lateral mid humerus level in an infant with a congenital radial nerve palsy. **A** Lateral view. **B** Frontal view. (Images courtesy of Joshua M. Abzug, MD.)

- Fat necrosis seen on histologic biopsy of subcutaneous nodules is consistent with isolated compression being the underlying etiology of a congenital radial nerve palsy.
- Differentiate between BPBP and congenital radial nerve palsies utilizing a thorough physical examination.
- Recall that the vast majority of congenital radial nerve palsies have spontaneous resolution.

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