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OBSTETRIC BRACHIAL PLEXUS INJURY COMPLICATED WITH GLENO-HUMERAL DYSPLASIA

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Brachial plexus injury is the most common cause of plegic arm in neonates. Detection of nerve root avulsions and intraspinal nerve lesions is most valuable for treatment strategy. Magnetic resonance imaging (MRI) is the modality of choice for imaging the brachial plexus in infants as it allows visualization and localization of different types of nerve lesions in a noninvasive way and without radiation exposure. Conventional radiography of the shoulder is of interest in follow-up to assess osseous deformities of the glenoid fossa and humeral head. We report a case of obstetric brachial plexus injury complicated with glenohumeral shoulder deformity in a 3-year-old girl.

Key-word: Brachial plexus, MR.

Case report

A term female infant was delivered after an uneventful pregnancy and labor. Delivery was complicated by shoulder dystocia and the infant was noted to have a left upper extremity palsy. There was no Horner syndrome. EMG confirmed the diagnosis of a left C5-C6-C7 injury. Despite intensive physical therapy, follow-up at the age of 5 months showed no biceps muscle function.

Consecutive imaging studies were performed at our department. An MRI at the age of 5 months showed a pseudomeningocele at the level C7-T1 with a root avulsion of C8 on the left side (Fig. 1). Hence a surgical intervention was required. At the age of 6 months she was treated with peripheral nerve grafting followed by several months of multidisciplinary therapy for optimizing shoulder outcome. A partial motor functional recovery of the left upper limb was observed during this period.

At the age of 3 years and 2 months, a radiograph of the shoulders demonstrated glenohumeral dysplasia of the left shoulder (Fig. 2). A subsequently performed MRI confirmed a posterior subluxation of the left shoulder, glenohumeral deformity and severe atrophy and fatty degeneration of the supraspinatus, infraspinatus and subscapularis muscles (Fig. 3).

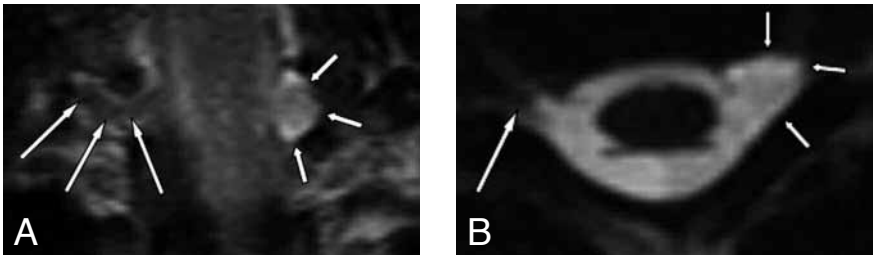

Fig. 1. — Coronal T1 MR-image (A) and axial T2 CISS MR-image (B) demonstrate presence of right sited root avulsion of C8 with pseudomeningocele (short arrows). A normal contralateral root is seen (long arrow).

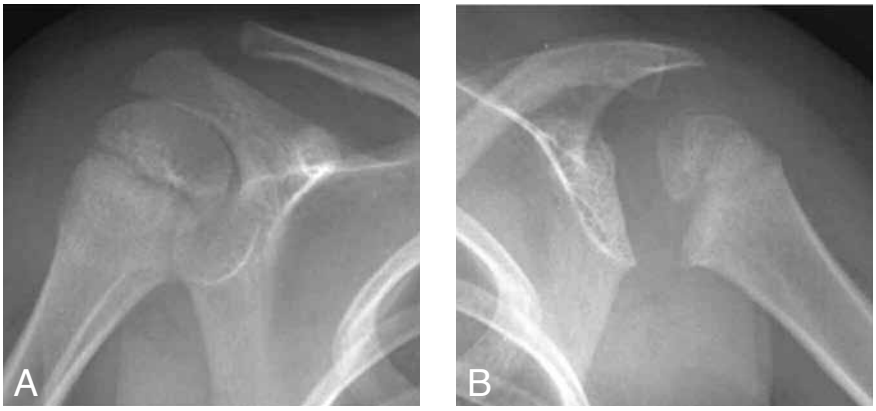

Fig. 2. — Standard radiograph of the shoulders (A, B) demonstrates an asymmetric, smaller proximal humeral epiphysis on the left side (B) with concomitant glenoid dysplasia.

Discussion

Brachial plexus injury (BPI) is the most common cause of plegic arm in the neonatal period. It occurs in 0,4 to 4 per 1000 live births per year (1). It is most commonly a complication of shoulder dystocia, which is impaction of the infant's anterior shoulder behind the maternal symphysis pubis. Lateral traction on the head in attempt to deliver the infant, stretches the brachial plexus. This may result in various types of injuries to the nerves, from a mild stretch injury up to avulsion of the nerves from the spinal cord.

The brachial plexus supplies sensory and motor innervation to the upper limb. It forms from the ventral rami of the C5 through T1 spinal nerves. The majority of obstetric brachial plexus injury involve the 5th-7th cervical nerve roots, clinically recognized as an 'Erb's palsy'. The affected limb is positioned in the

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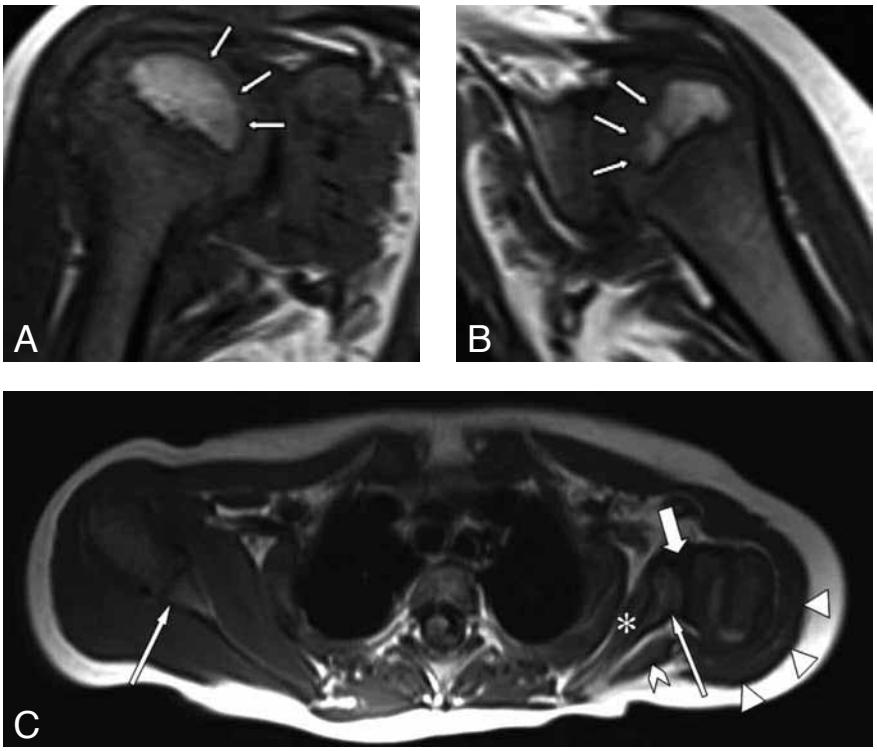

Fig. 3. — Coronal T1 (A, B) and axial T1 (C) MR images show asymmetric size of proximal epiphysis (short arrows) with glenoid dysplasia (long arrow).
Posterior subluxation (fat arrow) of the glenohumeral joint is noted.
Atrophy and fatty degeneration of the subscapularis muscle (asterisk), infraspinatus muscle (open arrowhead) and deltoid muscle (arrowheads) are seen.

'waiter's tip' pose: adducted, internally rotated with elbow extension, forearm pronation and wrist and finger flexion. Up to 25% involves the entire plexus, with a completely flaccid arm. Injuries to the stellate ganglion or cervical sympathetic trunk cause Horner syndrome (miosis, ptosis and anhydrosis) (1-3).

Shoulder deformity is the most common musculoskeletal complication following a brachial plexus birth injury. Denervated muscle can cause muscle imbalance. If left untreated, this muscle imbalance about the glenohumeral articulation results in a secondary subluxation or dislocation. Even a fixed articular deformity of both the glenoid and humeral head may occur, worsening as the child grows (3, 4).

Clinical assessment, electrophysiologic examination and imaging studies are used for evaluation of the brachial plexus.

Detection of nerve root avulsions and intraspinal nerve lesions is most valuable for treatment strategy. MRI is the modality of choice for imaging the brachial plexus in infants as it allows visualization and localization of different types of nerve lesions, such as root avulsions or nerve ruptures, in a noninvasive way and without radiation exposure.

Avulsions are often associated with pseudomeningoceles -isointense to cerebrospinal fluid-, which occur after disruption of nerve root sleeves allowing cerebrospinal fluid to extrude from the subarachnoid space. Nevertheless, pseudomeningoceles can be isolated injuries with intact nerve roots. Avulsion is likely when images in at least two planes fail to demonstrate continuous roots (2, 3, 5).

MRI demonstrates enhancement and thickening of nerve roots which might represent neuroma or scar tissue. After (in)complete nerve ruptures, a neuroma is formed. A posttraumatic neuroma is a disorganized proliferation of regenerating axons at the proximal stump of the transacted nerve. It can be recognized using MRI as a fusiform mass. Perineural fibrosis of the brachial plexus can be distinguished as thickening of plexial structures with ragged borders (2, 3, 5).

In addition, MRI can also assess dysplasia of the glenohumeral joint, subluxation or dislocation of the humeral head and rotator cuff muscle pathology.

For long-term follow-up conventional radiography of the shoulder allows evaluation of osseous deformities of the glenoid fossa and humeral head. Conventional radiographs are also of value in the newborn to demonstrate associated lesions such as fractures or luxations of the humerus, clavicle or cervical spine (3, 4).

Conclusion

Brachial plexus injury is the most common cause of a plegic arm in the neonatal period. MRI is the imaging modality of choice for evaluation of brachial plexus lesions. MRI allows detection of nerve lesions such as root avulsions or nerve ruptures, pseudomeningoceles, neuromas, or scarring and visualizes secondary deformities of the shoulder joint.

Conventional radiography of the shoulder is used to evaluate osseous deformities of the glenoid fossa and humeral head in long-term follow-up.

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