Pseudo-meningocele secondary to obstetrical brachial paralysis

by Jana Publication & Research

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Introduction :

Obstetrical Brachial Plexus Palsy (OBPP) is a severe paralysis of an upper limb present at birth. The therapeutic measures for brachial plexus palsy depend on the pathologic condition and the location of the injury. Imaging studies mainly MRI are used for evaluation of the brachial plexus. We report a case of a 2-year-old female patient who presents to pediatric department for weakness of the upper left limb since birth

Case report

We report the case of a 2-year-old female patient who presents to paediatric constltation for weakness of the upper left limb since birth. The interrogation found a history of vaginal delivery with macrososmia in the newborn.Traduction en Anglais.

As an exploration of the brachial plexus, a cervical MRI was performed. On the T2 STIR axial sequence with maximal intensity projection (MIP), we find a foraminal and extraforminal cystic formation spoiled in T2 hypersignal without clear individualization of the nerve roots (Figure 1) revealing a pseudo-meningocele. Coronal sections of the same sequence with MIP confirm the diagnosis (Figure 2).

Discussion

Obstetrical Brachial Plexus Palsy (OBPP) is a paralysis of an upper limb present at birth. Its frequency is 0.04 to 0.4% of births , affecting up to 3 per 1000 live births. (1)

The brachial plexus islLocated in the lateral neck and extending posterior to the clavicle into the axilla . It is a complex sensory and motor neural network formed by the 5 nerve roots destined for the upper limb and pectoral girdle : C5, C6, C7, C8, T1 .

The origin nerves are the anterior primary roots of C5 to T1, located at the level of the lateral cervical foramina. The trunks derived from these roots are situated in the antero-inferior portion of the interscalene triangle of the neck, comprising the upper trunk (C5-C6), middle trunk (C7), and lower trunk (C8-T1). Each trunk splits into six divisions at the costoclavicular triangle, joining at the lateral margin of the first rib to form three cords based on their relationship with the subclavian-axillary artery: the medial cord (continuation of the anterior division of the lower trunk), the lateral cord (anterior divisions from the upper and middle trunks), and the posterior cord (formed by the three posterior divisions of the trunks). The branches derived from these cords give rise to the musculocutaneous, axillary, radial, median, and ulnar nerves, which originate lateral to the pectoralis minor muscle.

The risk factors for the occurrence of POPB are mainly macrosomia and shoulder dystocia in the newborn. Gestational diabetes , multiparity and excessive weight gain during pregnancy, were also identified in literature. (2, 3).

Clinical manifestations of permanent nerve dysfunction include muscular weakness, paralysis, and secondary skeletal changes, highlight the importance of early and effective diagnosis and treatment.

At birth, it is impossible to determine, through examining the child, the type of injury involved. Only the progression of paralysis over the first few months of life can guide towards a favorable or unfavorable outcome.

The severity of paralysis varies with the type of injury and the number of affected roots, ranging from a stretch injury to a complete avulsion of the nerves from the spinal cord(4) . The most common involvement affects the upper plexus (C5-C6), where the hand is spared, but there is a deficiency in shoulder active abduction, external rotation, and elbow flexion. This is the mildest form, with complete recovery occurring in only one-third of cases. (3) Involvement of C5-C6-C7 causes additional deficits in elbow and finger extension, adding to the previous deficits, and is known as Erb's palsy. Finally, involvement of all roots results in a "complete plexus" condition, where the limb is completely flaccid with no mobility, particularly at the hand level. This is the most severe form and inevitably leads to sequelae. Nearby roots to the brachial plexus may also be affected. Involvement of C4 (phrenic nerve) leads to paralysis of a diaphragmatic dome, potentially causing respiratory distress. Involvement of C8 and T1 can result in Claude Bernard-Horner syndrome, characterized by miosis, ptosis, and enophthalmos.

In order to achieve a correct diagnosis, it is necessary to perform adequate neurological and electrophysiological exploration plus radiological imaging. The MR is the gold standard imaging technique used to evaluate and differentiate between preganglionic and postganglionic traumatic injuriy. (5)

MR protocol includes axial , coronal and sagital images including the entire brachial plexus in the same plane. Sequences include T1-weighted images to have a fine anatomical resolution; STIR or T2-weighted images with fat suppression help to identify brachial plexus edema. T1 with injection of GADOLINIUM is not necessary in traumatic palsy . (5)

Traumatic plexopathies are generally classified according to the degree, location, and mechanism of injury. The goal is to estimate the likelihood of spontaneous recovery and help identify cases that would benefit from surgical management.

The location of an injury also is important for injury classification. Pre- versus postganglionic injury is a major distinction .

Preganglionnic injuries refer to an avulsion of the nerve rootlets from the spinal cord. In a recent systematic review (6) of MRI for presurgical assessment of preganglionic injury, it is estimated that mean sensitivity and specificity are around 93% and 72%. Discontinuity of the ventral or dorsal nerve roots from the spinal cord MRI is the main direct sign of root avulsion Pseudomeningocele, is one of the most frequent indirect sign of preganglionic injury. It refers to meningeal tear and consequently leakage of cerebrospinal fluid through it . On MRI , it appears as a cystic collection that can track through the neural foramen and communicate with the subarachnoid space .Also up to 23% of root avulsions do not have an associated pseudomeningocele, and pseudomeningocele-like lesions are identified in the absence of root avulsion in up to 24% of cases . Non traumatic extradural meningeal cyst the most frequent differential diagnosis , which is uncommon at the cervicothoracic junction. (8). Spinal cord edema near the level of a root avulsion associated to denervation change of the ipsilateral paraspinal muscles, supplied by the dorsal branch of the spinal nerve, are also other indirect sign of preganglionic injury. The lower C8–T1 roots more commonly manifest with preganglionic injury (7). Although most cases resolve spontaneously, permanent injury is not uncommon. Injuries involving the lower trunk are more likely to result in permanent deficits (9).

In a study on fifteen patients (mean age: 14.5 months) where radiologists reviewed MR imaging in infants with Erb's palsy, before surgical exploration of the brachial plexus . They found at least one pseudomeningocele in 8 of the 15 patients (53.3%) while 3 of the 15 patients (20%) had multiple pseudomeningoceles. Posterior shoulder subluxation was seen in 11 patients (73.3%). Fourteen children (93.3%) had imaging abnormalities consistent with either a reparative neuroma or scar tissue investing plexus elements. (12)

Postganglionnic injuries have better progonosis, the more distal location is better . On MRI it manifests as stretching, rupture, oedema, hematoma, and neuronam as nodular thickening . The upper C5–C7 roots are more susceptible to postganglionic injury (rupture at an extraforaminal location). (7)

Lesion severity is also graded on the basis of the estimated damage to the various layers of connective tissue surrounding the nerve (10). Seddon initially described three types of nerve injuries: neuropraxia, axonotmesis, and neurotmesis (in order of severity). Neuropraxia occurs after disruption of the myelin sheath, without distal Wallerian degeneration, and typically results in transient conduction abnormality and sensory dysfunction. Axontmesis refers to axonal injury resulting in distal Wallerian degeneration with intact endoneurium or perineurium. This may result in motor and/or sensory nerve dysfunction. Neurotmesis, the most severe injury, refers to disruption of multiple layers of the nerve with or without complete transection.(11)

Conclusion :

To conclude, paralysis of brachial plexus in newborn is a rare and severe complication . MRI is the gold standard to explore this affection. The goal is to estimate the likelihood of spontaneous recovery and help identify cases that would benefit from surgical management

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Figure 1: MRI image in axial section of T2 SPACE showing foraminal and extraforminal cystic formation spoiled in hypersignal T2 without individualization of the nerve roots (red arrow)

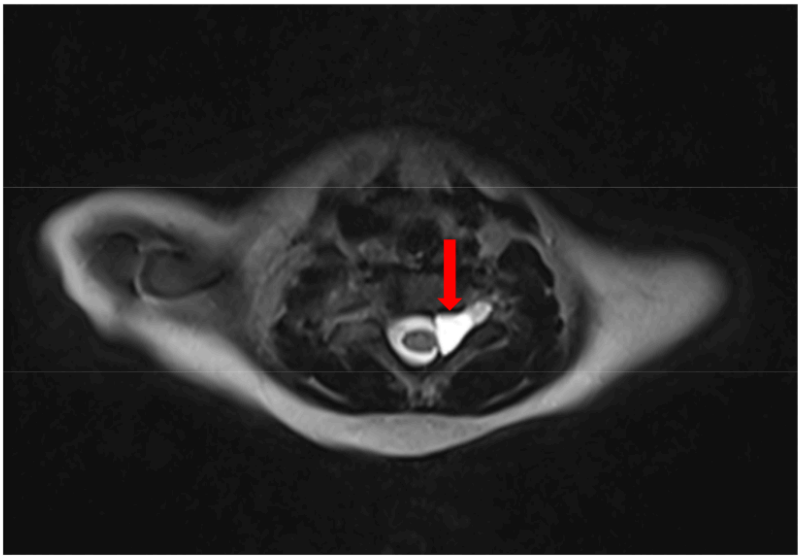
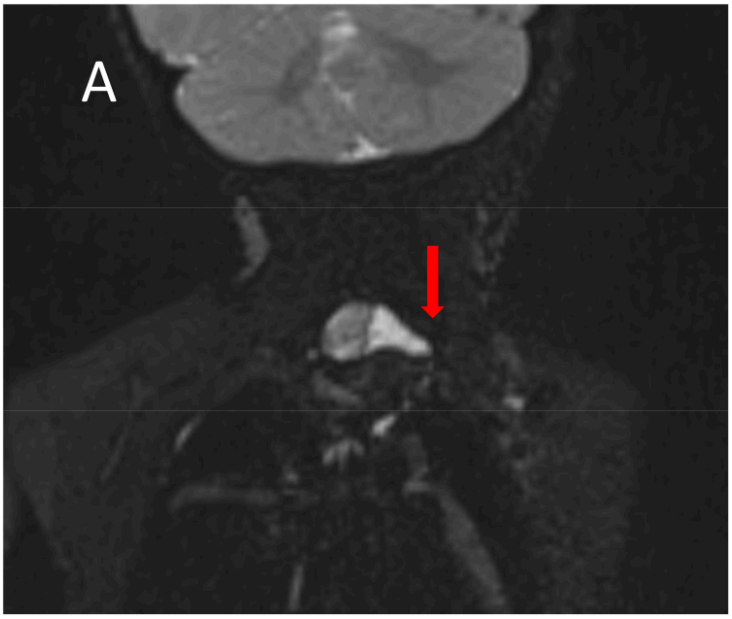
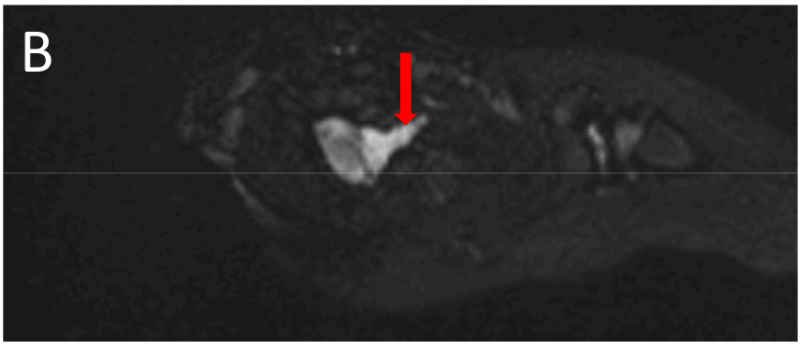


Figure 2: MRI images in coronal (A) and axial (B) sections of T2 3D SPACE showing foraminal and extraforminal cystic formation spoiled in hypersignal without individualization of the nerve roots (red arrow)





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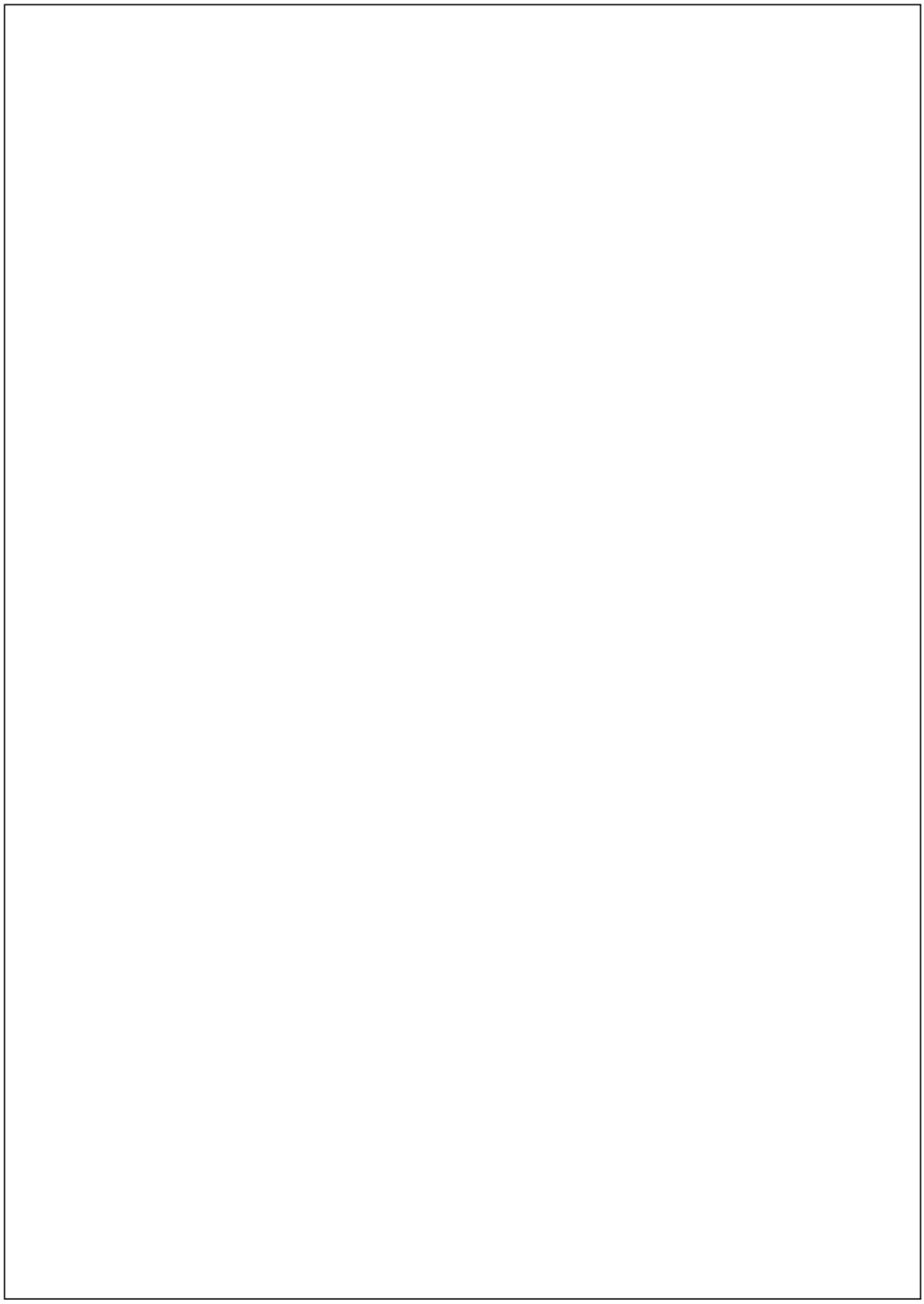

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