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MRI and MRI Neurography of the Brachial Plexus

-Dr. Khushboo Pilania

The brachial plexus is a complex mesh of nerves, which provides innervation to the upper limb and the upper chest. MRI is a powerful tool for brachial plexus imaging and a dedicated protocol is used to address brachial plexus pathologies.

Indications:

- Trauma
- Compressive plexopathy
- Nontraumatic plexopathy

High-resolution 3T MR neurography (MRN) sequences allow us to directly visualise the nerves of the plexus (Fig. 1). Edema and neuropraxia without any compressive lesion and discontinuity can be delineated. High resolution CISS images at the level of the spinal canal allow visualisation of the intraspinal preganglionic nerve rootlets. At the same time, end organ skeletal muscle denervation changes are picked up well.

In cases of traumatic brachial plexopathy (Figs. 2,3), the management depends upon the site and as well as the severity of the injury. It is essential to differentiate pre from postganglionic injury and to be able to grade the injury from neuropraxia to neurotmesis.

The common causes of nontraumatic plexopathies include infective, inflammatory (Fig. 4) and post –radiation plexopathy. Primary and secondary tumors of the brachial plexus are also common, with the most common primary tumor being a peripheral nerve sheath tumor (Fig. 5).

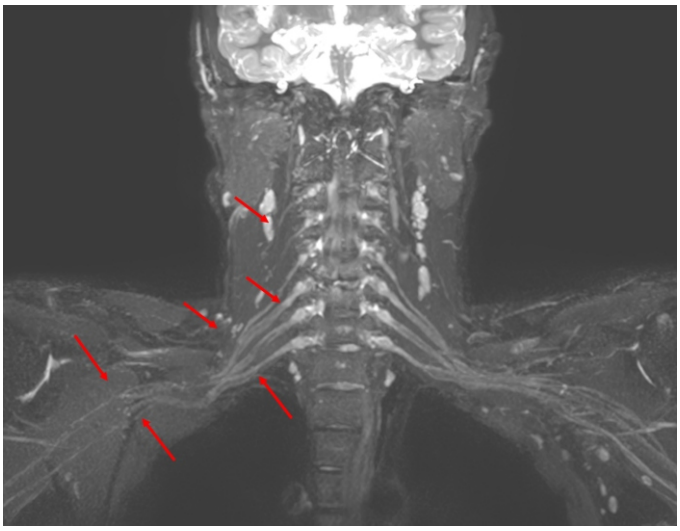

Fig. 1: Coronal MR neurography (MRN) image of brachial plexus (red arrows).

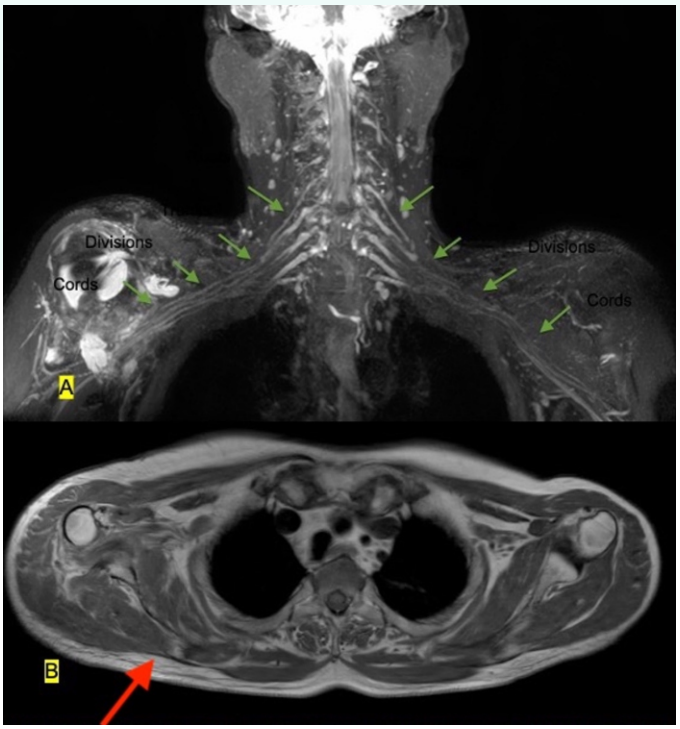

Fig. 2 (A,B): Trauma. Coronal MRN image (A) shows increased signal intensity of the trunks and divisions of the right brachial plexus (green arrows) but with maintained continuity. The axial T1W image (B) shows atrophy of the right rotator cuff muscles (red arrow).

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At a glance:

- The brachial plexus is a complex anatomic area and needs thorough understanding of the anatomy and pathology.
- High-resolution MRI and MRI neurography (MRN) are techniques that delineate the brachial plexus well.
- Virtually all pathologies of the brachial plexus from trauma to tumors can be depicted with MRI and MRN.

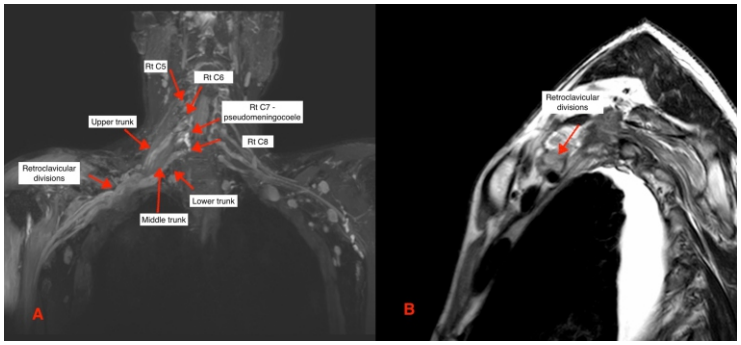

Fig. 3 (A,B): Trauma. Coronal MRN (A) and oblique sagittal T2W (B) images in a 45-years old man with post-traumatic brachial plexopathy shows the following findings:

- Post-ganglionic Sunderland Grade IV/V injury of the right C5 nerve.
- Pre-ganglionic Grade II/III injury of the right C6 nerve with Wallerian degeneration of the postganglionic segment and the upper trunk
- Complete preganglionic avulsion (Grade V injury) of the C7 nerve with pseudo-meningocele and non-visualization of the C7 nerve. The middle trunk is also not seen.
- Partial preganglionic avulsion (Grade III/IV injury) of the C8 nerve with smaller pseudo-meningocele.
- Diffuse thickening with altered signal and clumping of the divisions of the brachial plexus in the supraclavicular as well as retroclavicular region with altered fascicular pattern (Grade III/IV injury).
- Diffuse thickening with edema of the cords of the right brachial plexus (Wallerian degeneration). clumping of the divisions of the brachial plexus in the supraclavicular as well as retroclavicular region with altered fascicular pattern (Grade III/IV injury).
- Diffuse thickening with edema of the cords of the right brachial plexus (Wallerian degeneration).

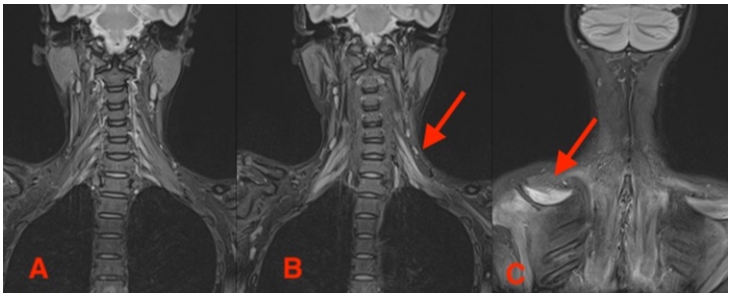

Fig. 4 (A-C): Chronic inflammatory demyelinating polyneuropathy. Coronal MRN images from anterior to posterior. Diffuse symmetrical thickening of the brachial plexus nerves is seen (arrows in B) with diffuse edema of the muscles of the shoulder girdle and the upper thorax (arrows in C).

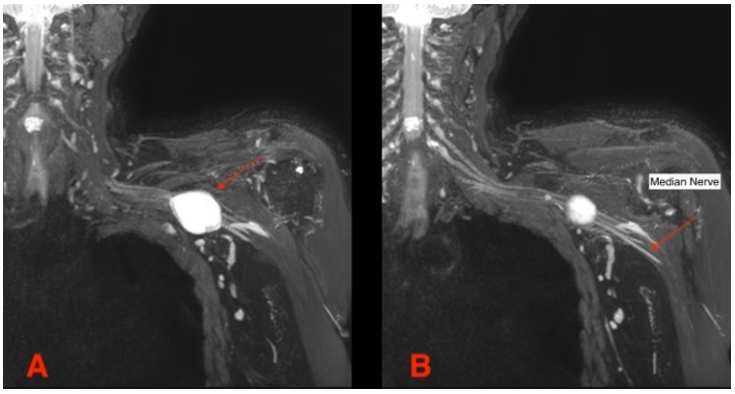

Fig. 5 (A,B): Schwannoma. Coronal MRN images show a well-defined, ovoid T2 hyperintense lesion consistent with a nerve sheath tumor along the course of the median nerve (arrow in A). The median nerve shows increased signal (arrow in B).

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