www.jmscr.igmpublication.org
Impact Factor 5.244
Index Copernicus Value: 83.27
ISSN (e)-2347-176x ISSN (p) 2455-0450
crossref DOI: https://dx.doi.org/10.18535/jmscr/v4i11.121

IGM Publication
Journal Of Medical Science And Clinical Research
An Official Publication Of IGM Publication

Role of MRI in Correlation with NCS in Brachial Plexopathies

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ABSTRACT
The brachial plexus is a part of the peripheral nervous system, responsible for innervation of the shoulder, upper extremity upper chest muscles, and cutaneous nerves of the skin and hand. The brachial plexus can be involved in many different pathological processes which can broadly be classified into two categories: traumatic and non-traumatic. The therapeutic measures for brachial plexus injury depend on the pathologic condition and the location of the injury. Damage to the brachial plexus i.e. cervical spine and nerves may result in profound functional disability in the arm and shoulder. Diagnosing brachial plexus pathologies can be clinically challenging due to its complex anatomy and non-specific symptomatology. Clinical examination and electrophysiological studies may be useful but may not provide accurate diagnosis or localization. Hence imaging plays a very important role in the evaluation of brachial plexus pathologies. MRI plays an essential role in differentiating preganglionic injuries from postganglionic lesions, a differentiation that is crucial for determining the management of brachial plexus injury. Our study aims to determine the efficacy of MRI in Brachial plexopathy in correlation with patients who underwent Nerve conduction study at our institution.
Keywords: *MRI, NCS, Brachial plexopathy.*

INTRODUCTION

The brachial plexus is a part of the peripheral nervous system, responsible for innervation of the shoulder, upper extremity upper chest muscles, and cutaneous nerves of the skin and hand. It is a complex anatomical structure which carries motor, sensory and autonomic fibres that supply the upper limb. The brachial plexus can be involved in many different pathological processes which can broadly be classified into two categories: traumatic and non-traumatic. Diagnosing brachial plexus pathologies can be clinically challenging due to its complex anatomy and non-specific symptomatology. Clinical examination and electrophysiological studies may be useful but may not provide accurate diagnosis or localization. Hence imaging plays a very important role in the evaluation of brachial plexus pathologies. Clinical assessment, nerve conduction studies, and imaging studies are used in conjunction for complete evaluation of the brachial plexus pathologies.

AIMS AND OBJECTIVES

To evaluate the role of MRI in correlation with NCS in patients with brachial plexopathies

MATERIAL AND METHODS

This is a cross sectional descriptive study done in patients with suspected brachial plexus pathologies, referred to the department at our institution, for unenhanced brachial plexus MRI over a 3 year period, from April 2014 to August 2016.Clinical suspicion of brachial plexus involvement was raised after detailed clinical evaluation, and such patients with suspected brachial plexus dysfunction were referred for MRI brachial plexus. MRI brachial plexus imaging was performed using 1.5T superconductive System (Magnetom Avanto; Siemens, Erlangen, Germany or GE SIGNA HDxt) with a dedicated HNS [head, neck spine coil]. The patient was positioned supine, head first orientation and routine sequences are performed.

- The entire study was routinely completed over a period of 30-40 minutes.
- The source data was analyzed on a post processing workstation
- (Magnetic Resonance Satellite Console), and multiplanar MIP reformations were studied for the presence of brachial plexus pathologies.

INCLUSION CRITERIA

- Patients with clinical suspicion of brachial plexopathies who were referred for MRI brachial plexus.

EXCLUSION CRITERIA

Patients with contraindications for MRI including

- Pacemakers.
- Cochlear implants.
- Ferromagnetic surgical clips/staples.
- Metallic foreign body.

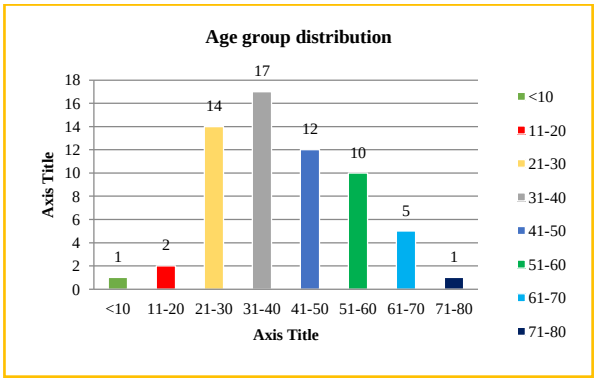
RESULTS

TABLE1: Gender Distribution of Study Population

Gender	Number	Percentage
Male	47	75.8
Female	15	24.2
Total	62	100

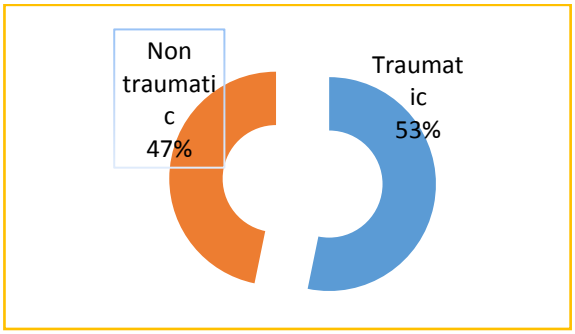
MRI brachial plexus was performed in 62 patients with suspected brachial plexopathies. Our study included 47men (75.8%) and 15 women (24.2%).

CHART1: Age Group Distribution



Our study population were in the age group ranging from 2-80 years(mean 40.2 years).Most of our patients were in the age group of 31-40years (17 patients) followed by 21-30years (14 patients) and 41-50 years (12 patients).

CHART 2: Traumatic Vs Non Traumatic



Our study population comprised patients presenting with trauma as well as non-traumatic presentations

CHART 3: Distribution of Involvement

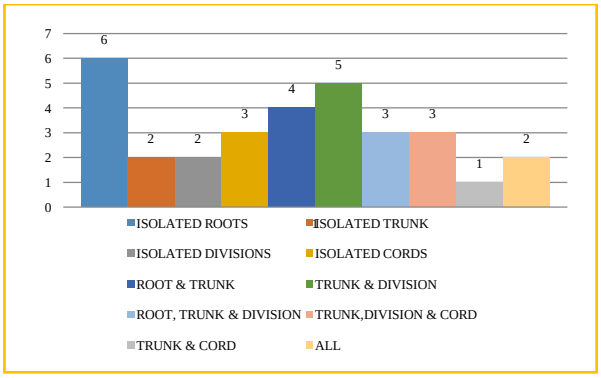


Table 2: Distribution of Involvement

Parts involved	Number of patients	Percentage
Isolated Roots	6	19.35%
Isolated Trunk	2	6.45%
Isolated Division	2	6.45%
Isolated Cords	3	9.68%
Root & Trunk	4	12.9%
Trunk & Division	5	16.13%
Root, Trunk & Division	3	9.68%
Trunk, Division & Cord	3	9.68%
Trunk & Cord	1	3.23%
All	2	6.45%
Total	31	100%

Out of 31 patients with brachial plexus involvement, majority of patients had isolated root involvement (19.3%) followed by trunk and division (16.3%) and root& trunk (12.9%) involvement
Out of 31 patients with abnormality, 20 patients hadbrachial plexus oedema / T2 hyperintensity.

CHART 4: NCS and MRI Correlation

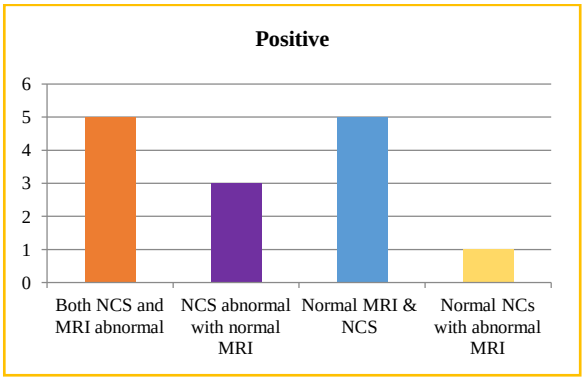


TABLE 3: NCS And MRI Correlation

	Both NCS and MRI abnormal	NCS abnormal with normal MRI	Normal MRI & NCS	Normal NCs with abnormal MRI
Positive	5	3	5	11

Both NCS and MRI where normal in 5 patients, and both where abnormal in 5 patients (71% correlation). 3 patients with abnormal NCS had normal MRI, where as 1 patient with abnormality at MRI imaging had normal NCS.

DISCUSSION

Our study included 62 patients referred to our department with clinical suspicion of brachial plexopathy by the clinicians. All the patients were referred for MRI of the brachial plexus. We elicited relevant clinical history from these patients. 62 patients were subjected to MRI brachial plexus imaging which was performed using 1.5T superconductive System (Magnetom Avanto; Siemens, Erlangen or GE Signa HD XT) with a dedicated HNS[head, neck spine coil].The patient was positioned supine head first orientation and routine sequences were performed.
The study population included 47 males (75.8%) and 15 females patients (24.2%). Midha et al[(1)] stated that the male population is more involved in traumatic brachial plexopathy due to more motorcycle ride and sport activities. The ages of these patients ranged from 2-80 years (mean 40 years). The most common age of presentation was the fourth decade (17patients) followed by third decade (14patients) and fifth decade (12patients).
33 of our 62 patients (53%) presented with brachial plexopathy following trauma which were mostly due to road traffic and vehicular accidents. Our youngest patient was a 2year old boy who was investigated for suspected brachial plexopathy following birth related trauma. No antecedent history of trauma was seen in 29 (47%) patients.
Mauricio Castillo et al[(2)] stated in their study that not all patients referred with brachial plexus injury had abnormal findings, about 40% had normal study too. MRI of the brachial plexus did not reveal any obvious abnormality in half of our patients (31/62). In patients with abnormalities, the findings demonstrated included brachial plexus oedema, preganglionic nerve avulsion with pseudomeningocele, nerve root atrophy, surrounding soft tissue changes and neoplastic infiltration/compression of the brachial plexus. 35 patients presented with right sided complaints,

whereas 27 presented with left sided complaints. Upon imaging the distribution of brachial plexus abnormality was as follows (in brachial plexus patients with abnormality)

Isolated root involvement– 6 patients
Isolated cord involvement – 3 patients
Isolated trunk involvement – 2 patients
Isolated division involvement – 2 patients
Combined root and trunk involvement– 4 patients
Combined trunk and division involvement- 5 patients
Combined trunk and cord involvement– 1 patients
Combined root, trunk and division – 3 patients
Combined trunk division and cord – 3 patients
Global plexus involvement– 2 patients

A study done on 100 brachial plexus injuries by Dubuisson et al in 2002[3] stated that the combination of root and trunk involvement was predominant (50%) , rather than isolated root or cord injury, which accounted for about 20 to 30%, of cases.

Concomitant NCS in addition to MRI where performed in 14 of our patients. Both NCS and MRI where normal in 5 patients, and both where abnormal in 5 patients (71% correlation). 3 patients with abnormal NCS had normal MRI, where as 1 patient with abnormality at MRI imaging had normal NCS.

Dianaquan et al[4] stated that the value and limitations of these studies are best understood in the context of peripheral nerve anatomy and predictable responses to injury and mechanisms of recovery. They stated that it is important to recognize that electro diagnostic studies are examiner dependent. A study by Songcharoen P et al in 2004,[5] stated that an injury to major cords or branches often contains a mixed injury pattern, with portions of the nerve being avulsed, ruptured, or stretched, in these cases the sensitivity and specificity of NCS is decreased.

CONCLUSION

- Magnetic resonance imaging is the modality of choice in evaluating brachial plexus pathologies.
- It can exactly localize the pathology, identify associated findings and helps in early appropriate treatment.
- Differentiation between pre and post ganglionic injury is of at most importance in treatment planning and MRI helps in the same.

REFERENCES

1. Midha R et al in PMID in 1997 Canada "Epidemiology of brachial plexus injuries in a Multitrauma population" University of Toronto, Ontario, Canada, (54 of 4538).
2. Imaging the Anatomy of the Brachial Plexus: Review and Self-Assessment Module, Mauricio Castillo1, Department of Radiology, University of North Carolina School of Medicine, American Journal of Roentgenology. 2005; 185: S196-S204. 10.2214/AJR.05.1014
3. September 2002 - Volume 51 - Issue 3 - pp 673-683, Clinical Studies, Brachial Plexus Injury: A Survey of 100 Consecutive Cases from a Single Service, Dubuisson, Annie S. M.D.; Kline, David G. M.D.
4. Nerve Conduction Studies and Electromyography in the Evaluation of Peripheral Nerve Injuries DIANNA QUAN, M.D. AND SHAWN J. BIRD, M.D. The University of Pennsylvania Orthopaedic Journal 12: 45–51, 1999 The University of Pennsylvania Orthopaedic Journal.
5. Songcharoen P, Shin AY. Brachial plexus injury: acute diagnosis and treatment. In: Berger RA, Weis APC, editors. Hand surgery. Philadelphia: Lippincott, Williams & Wilkins; 2004.