

MRI Evaluation of Soft Tissue Masses of Hand and Wrist

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ABSTRACT

Introduction: Masses around the wrist and hand are commonly encountered in clinical practice. MRI plays an important role in detection, diagnosis and delineation of these soft tissue masses.

Aim: To evaluate role of MRI in imaging soft tissue masses of hand and wrist and describe MR imaging findings of such lesions.

Materials and Methods: A prospective study was carried out in the Department of Radiodiagnosis, BMC&RI from December 2014 to May 2016. After obtaining consent, 43 patients with hand and wrist masses were studied with 1.5 T Siemens MRI machine using appropriate sequences

and contrast. Radiological diagnosis was compared with histopathology.

Results: The study included 44% males and 56% females. Mean age was 30.4 ± 10.2 years. Five lesions were hyperintense on T1W images. Five lesions were hypointense on T2W imaging. The most common soft tissue mass encountered in the study was ganglion cyst. A correct diagnosis was possible on MRI in 95% of cases.

Conclusion: Benign soft tissue lesions of hand and wrist are more common than malignant lesions. MRI is an excellent imaging modality for evaluation of such hand and wrist masses because it can detect, define and provide definite diagnosis in lesions like lipoma, ganglion cyst, GCTTS and neurogenic tumour.

Keywords: Benign, Ganglion cyst, Haemangioma, Lipoma, Vascular malformation

INTRODUCTION

Soft tissue masses of hand and wrist like ganglion cyst, lipomas, nerve sheath tumours, glomus tumours and haemangiomas are frequently encountered in clinical practice [1]. MRI plays an important role in characterising such masses. It provides information about site, size, extent and relation with surrounding structures. Previous studies have shown efficacy of MR imaging in soft tissue masses of hand and wrist [1-5]. However, these studies have been limited by various factors like patient number, lack of uniform protocols and variable sensitivity etc. Advancement in MRI techniques over the years has had a significant impact in evaluation of soft tissue lesions.

MATERIALS AND METHODS

This hospital based prospective study was conducted in Department of Radiodiagnosis, BMCRI, Karnataka, India, between December 2014 and May 2016 after obtaining ethical clearance. A total of 43 patients presenting with hand and wrist soft tissue masses like lipoma, ganglion cyst, giant cell tendon sheath tumour, neurofibroma and haemangioma were included after taking informed consent. Patients with

contraindications to MRI (metallic implants, incompatible pacemakers and claustrophobia) and contrast agent were excluded. MRI was performed on 1.5 T Siemens Magnetom machine using dedicated wrist coil. Contrast was administered when deemed necessary. The patients were scanned in most comfortable position. T1 weighted axial and coronal, T2 weighted axial, sagittal, coronal and PDFS axial, sagittal, coronal and gadolinium enhanced T1 weighted sequences were performed. Standard of reference was histopathology in all patients.

The diagnostic criteria used included age, gender of patients, duration and characteristic of swelling and MRI characteristics like intensity on T1, T2 and post contrast images. Appropriate statistical analysis was carried out.

Qualitative or categorical variables were described as frequencies and percentages.

RESULTS

Out of the 43 patients in the study group, 19 (44%) were male and 24 (56%) were female.

The age range was 2-68 years [Table/Fig-1]. All patients presented with swelling in hand/wrist region. Total 10 patients

Age	No. of cases	Percentage (%)
0-10 years	6	14.0
11-20 years	5	11.6
21-30 years	10	23.2
31-40 years	8	18.6
41-50 years	6	14.0
51-60 years	4	9.3
61-70 years	4	9.3

[Table/Fig-1]: Overall age distribution.

had associated pain. There was a wide range in duration of swelling.

Three patients had swelling since birth gradually increasing in size. In 79% swelling was soft and in 21% it was firm.

Majority of cases included in the study showed hypointense signal on T1 weighted images. Only five lesions were hyperintense on T1.

Out of these four were lipoma and one was vascular malformation with fatty component. T2 hyperintensity was noted in most of the lesions. Five lesions were hypointense on T2W images. All these were GCTTS on HPE. Only 25% were non-enhancing.

Most common pattern of enhancement was patchy type noted in vascular lesions. Non enhancing lesions consisted of lipomas (n=4) and ganglion cyst (n=1).

GCTTS showed solid enhancement. Peripheral enhancement was noted in tenosynovitis and abscess. A correct diagnosis was possible on MRI in 95%. Incorrect diagnosis included two atypical cases of ganglion cysts. A total of 10 histologically different cases were included [Table/Fig-2]. Maximum number of cases comprised ganglion cysts.

S.No.	Pathological Diagnosis	Number of Patients	Percentage
1	Ganglion Cyst	13	30.2
2	Haemangioma	5	11.6
3	Vascular Malformation	6	14.0
4	Lipoma	4	9.3
5	GCTTS	3	7.0
6	Schwannoma	2	4.6
7	Neurofibroma	2	4.6
8	Non-specific Inflammation (Synovitis)	4	9.3
9	Abscess	3	7.0
10	Malignant Neoplasm	1	2.3

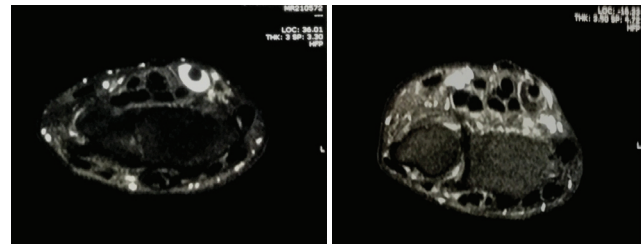
[Table/Fig-2]: Distribution of lesions.

DISCUSSION

Masses of hand and wrist are routinely encountered in clinical radiology practice. Imaging is used for confirmation of diagnosis and extent. Most common swellings in this region are of ganglion, synovial and peritendinous origin.

Few of the lesions have typical imaging appearance on MRI making it a good modality for evaluating soft tissue masses.

Total 13 cases of ganglion cysts were included in present study which showed fluid signal intensity with mild peripheral enhancement [Table/Fig-3a,b]. Atypical findings include debris, haemorrhage, synovial thickening, cyst rupture. Capelastegui A et al., in their study on 134 patients with swellings in hand wrist reviewed MRI findings and case records. They found that cause of swelling could demonstrated in 126 patients. Most common soft tissue mass lesion in their study was ganglion cyst (26.8% cases) [6]. In the present study also, ganglion cyst is the most commonly encountered mass lesion.

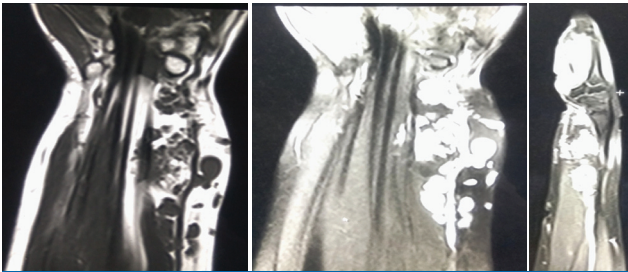


[Table/Fig-3a,b]: Ganglion cyst. A well-defined PDFS hyperintense (a) lesion noted around the tendon of flexor carpi radialis. The lesion shows mild enhancement (b) on contrast administration.

Haemangiomas typically have intermediate intensity on T1W images and high signal on T2W images [7]. They show intense enhancement post contrast administration. However, they can appear heterogenous due to intralesional haemorrhage and reactive inflammation. Theumann NH et al., in their study on haemangiomas recorded MRI findings of 15 patients with haemangiomas [7]. Typical MRI findings were noted in 66% of patients. Five patients showed atypical features like poor enhancement. In the present study all cases showed patchy progressive enhancement [7-10].

Vascular malformations are classified based on flow and predominant component. Low flow vascular malformations are usually septated and include venous, lymphatic, capillary and venocapillary type [9]. Lymphatic malformation shows fluid-fluid level, is more infiltrative and can show septated enhancement. Phleboliths are seen in venous malformations and appear as low signal intensity foci on T1W and T2W images [Table/Fig-4a-c].

In the present study, two cases showed phleboliths. Two cases showed arterial feeders and early enhancement suggesting a diagnosis of high flow malformation.



[Table/Fig-4a-c]: Vascular malformation. Irregular T1 hypointense (a) T2 hyperintense; (b) lesion which shows enhancement; (c) post contrast administration noted in the muscular plane of flexor compartment of distal forearm.

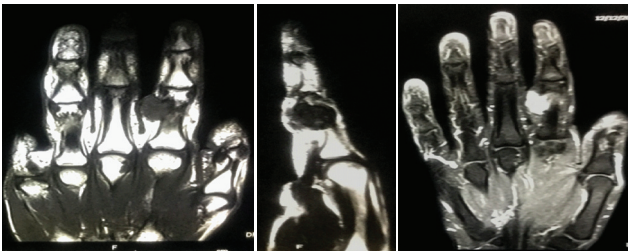
GCTTS show characteristic low signal on T1W and T2W images with enhancement post contrast administration [10]. In present study, 3 cases were studied [Table/Fig-5a-c].

Lipoma has typical MRI signal intensity that parallels fat [Table/Fig-6a,b] on all sequences [11].

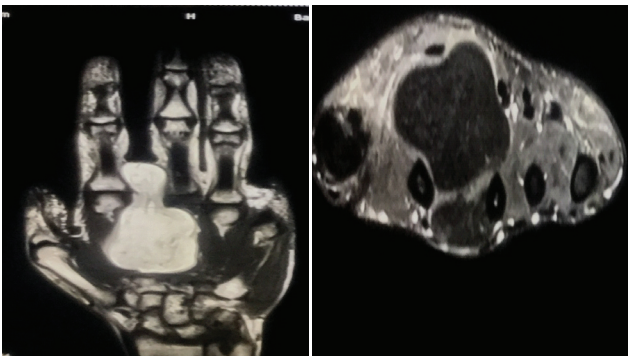
The imaging characteristics of neurogenic tumours [Table/Fig-7a-c], chronic tenosynovitis and abscess [Table/Fig-8a-c] are similar to those occurring elsewhere in the body [12].

In tenosynovitis, there can be hypointense signal on T1 and T2W images.

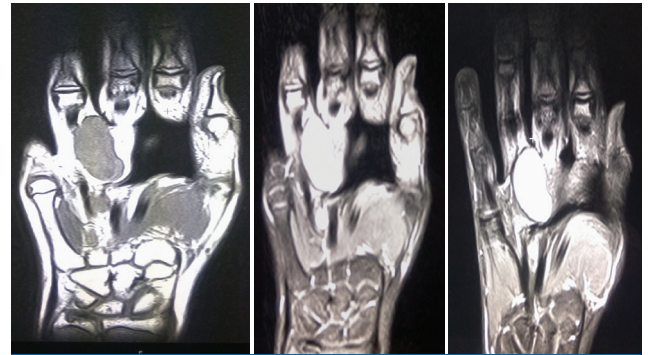
Assessment of palpable lesions of hand and wrist is important in deciding further management. The need for further



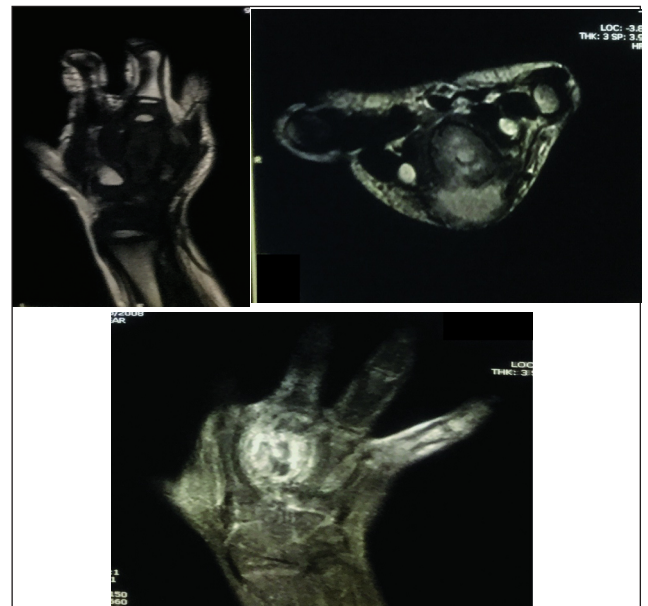
[Table/Fig-5a-c]: GCTTS. A well-defined T1 iso-hypointense (a), T2 hypointense lesion; (b) Showing heterogenous enhancement on contrast administration; (c) Noted in medi-volar aspect of proximal phalanx of right second digit, adjacent to flexor tendon.



[Table/Fig-6a,b]: LIPOMA. A well-defined lobulated T1 hyperintense lesion (a) suppressing on T2 fatsat; (b) Noted in intermuscular and interosseous plane of left hand between second and third metacarpals.



[Table/Fig-7a-c]: Schwannoma. (a) A well-defined T1 hypointense; (b) T2/PDFS hyperintense lesion showing intense enhancement; (c) on contrast administration noted in palmar aspect of right hand.



[Table/Fig-8a-c]: Abscess with osteomyelitis. (a) A diffuse, heterogenous T1 hypointense; (b) T2/PDFS hyperintense; (c) lesion filling medullary cavity of third metacarpal causing expansion of medullary cavity with T1 hypointense/T2 hyper collection in subcutaneous plane that shows enhancement on contrast administration.

biopsy further surgery can be determined fairly reliably by characterisation on MR imaging.

LIMITATION

The present study population is small and number of cases of certain pathologies, especially malignant lesions was insufficient.

CONCLUSION

Excellent soft tissue contrast and multiple imaging planes make MRI an important tool for evaluation of soft tissue swellings of hand and wrist. It can provide definite imaging findings in many lesions and is important for determining extent. Benign lesions of hand and wrist are more common

than malignant lesions. Pathologic confirmation is essential in absence of characteristic imaging findings.

LIST OF ABBREVIATIONS USED

GCTTS-Giant Cell Tumor of Tendon Sheath

MRI – Magnetic Resonance Imaging

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