



EVALUATION OF TENDON PATHOLOGIES OF HAND AND FOOT BY SONOGRAPHY AND MRI-A COMPARATIVE STUDY

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ABSTRACT

Background And Aims: Traumatic and non-traumatic tendon lesions are common at the hand and foot. For the diagnosis, therapy management, and long-term prognosis of tendon lesions, a detailed understanding of the complex anatomy and knowledge of typical injury patterns is crucial for both radiologists and clinicians. The aim of the study was to evaluate the various non-traumatic or traumatic pathologies of the tendon of the hand and foot by USG and MRI. **Materials And Methods:** In this cross-sectional study, 50 patients referred from various departments of Silchar Medical College and Hospital to the department of Radiology for pain and swelling of the hand and foot, as well as hand and foot injuries following trauma, were evaluated with USG and MRI. USG examination done by using SAMSUNG PRESTIGE RS-80A via high frequency probes. MRI evaluation was carried out on SIEMENS TIM AVANTO 1.5T Scanner. **Results:** In our study, the 20-30 year age group had the highest number of cases, accounting for 26% of all cases. The right side was mainly involved, constituting 68% of pathologies (34/50). Our study included 50 patients with an age range of 10 to 61 years, with 24 males (48%) and 26 females (52%)—a slight predominance of females over males in our study. Thus, the male-to-female ratio in our study was 1: 0.92. In our study, we found that the sensitivity, specificity, and accuracy of the USG assessment of tendon pathologies of the hand and foot were 94.3%, 98.2%, and 95.1%, respectively. **Conclusion:** MRI and US are imaging modalities that allow for anatomic evaluation of tendons as well as the identification of tendon pathologies. Tenosynovitis can be diagnosed and treated quickly using high-quality sonographic exams.

KEYWORDS : Hand, Foot, Tendon, Injuries, Sonography, MRI

INTRODUCTION

Tendon pathology can be broadly categorised into two classes: inflammatory enthesitis, which develops in spondyloarthritis, and tendinosis or tendinopathy, which includes mechanical, degenerative, and overuse diseases. The names "tendinosis" or "tendinopathy" are preferable to the older term "tendinitis" because they better convey the pathology's degenerative rather than inflammatory nature. Tendinosis has several risk factors connected to it. Tendons change as they age, losing water content and developing a different collagen structure that makes them more vulnerable to injury. Tendon disease is more common in areas with poor blood flow, and vascularity declines with age.

Tendon damage risk may also be increased by metabolic or endocrine abnormalities. Due to instability or impingement, abnormal and excessive loading of the tendon increases the risk of injury. Tendon degeneration histologically is linked to myxoid, hypoxic, hyaline, fatty, fibrinoid, or calcific degeneration. There is disorientation of the collagen structure with an accumulation of mucoid material and increased water and proteoglycan content with the thickening of the tendon. Collagen fibril rupturing takes place, and these areas may combine to generate intrasubstance tears, which may then spread to the surface before developing into full-thickness tendon tears. There is often ingrowth of vessels into the tendon. However, there is no proof of inflammatory cells or mediators to support a true inflammatory response.

It is uncommon for a tear to develop in a normal tendon, and degenerative signs typically come before the occurrence of a macroscopic tendon rupture.

Clinically underdiagnosed, plantar tendon disease may be a substantial cause of foot pain. Tenosynovitis, tendinosis, and tendon tears are

common pathologic diseases of the plantar tendons that can be traumatic or inflammatory. The plantar tendon can be evaluated with the help of both ultrasonography (US) and magnetic resonance imaging (MRI).¹

The present study "Evaluation of tendon pathologies of hand and foot by Sonography and MRI-a comparative study" was conducted in the Department of Radiology, Silchar Medical College & Hospital, Silchar, Assam. It is situated in the Cachar district in the state of Assam, India. It is the tertiary and referral centre for patients from different nearby districts and the nearby northeastern states such as Mizoram and Tripura. A total of 50 patients presenting with pain and swelling of the hand and foot, as well as hand and foot injuries following trauma, were evaluated in our study with USG and MRI. The main source of data for this study will be the patients referred from both OPD and Indoor sections from the Departments of Orthopaedics, Surgery and other departments of Silchar Medical College, Silchar with a history of trauma or complaints of pain and swelling of hand & foot. In all cases, a thorough history taking and physical examination will be done. Informed and written consent will be obtained from the subjects before the commencement of the investigations after a proper explanation of the procedure.

Study Design: cross-sectional observational study.

Sample Size: 50 patients.

Inclusion Criteria: -

- Patients of any age group,
- Patients presenting with pain in the hand and foot.
- Patients presented with swelling in their hands and foot.
- All the patients were referred to with hand and foot injuries following trauma.

Exclusion Criteria:

- Patient with general contradiction for MRI.
- The patient did not give consent for the examination.

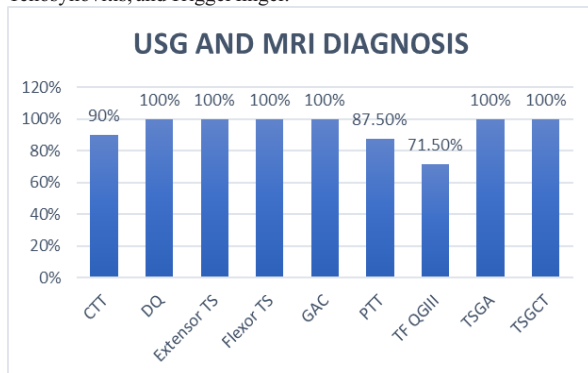
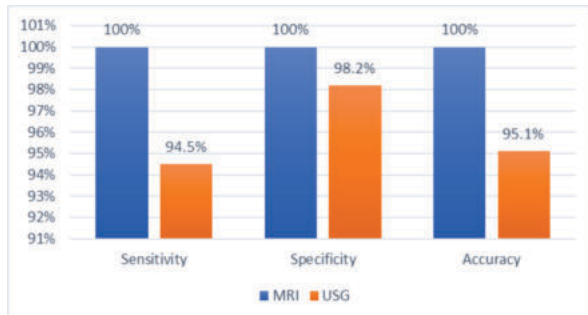
RESULTS:

In our study, out of the 50 patients constituting the study population, all patients had unilateral pathologies. The results have been summarized and presented in tabular forms under different headings.

Table 1: Incidence Of Various Tendon Pathologies

	Frequency (n)	Percentage (%)
Tendon tear	18	36 %
Tenosynovitis	5	10 %
Ganglion cyst	12	24%
Trigger finger	7	14 %
Tenosynovial giant cell tumour	8	16 %
Total	50	100%

In our study, Tendon tears were the most common tendon pathologies comprising 18 of the 50 cases. The accompanying common pathologies include Ganglion cyst, Tenosynovial giant cell tumour, Tenosynovitis, and Trigger finger.

**Chart1: Comparison of USG and MRI Diagnosis****Chart 2: Overall sensitivity, specificity and accuracy of MRI and USG results**

Our study included 50 patients with an age range from 10 to 61 years (mean) with 24 males (48%) and 26 females (52%) They presented with different pathologies, tendon tear (18 cases, of which 10 were complete tendon tears and 8 were partial tendon tears), ganglion cyst (12 cases), tenosynovial giant cell tumours (8 cases) trigger finger (7 cases) and tenosynovitis (5 cases). This diagnosis was confirmed by MRI examination . USG detected 5 from 5 (100%) cases with tenosynovitis. It detected 5 from 7 (71.5%) cases of trigger finger and was unable to diagnose 2 cases (4%) as normal study. It detected 6 from 8 (87.5%) cases with partial tendon tear and misdiagnosed 2 cases as tenosynovitis which were diagnosed by MRI as partial tendon tear. USG detected 12 of 12 (100%) cases with ganglion cysts. It detected 8 from 8 (100%) cases with tenosynovial giant cell tumours. Over all, USG correctly diagnosed 46 cases (true positive), and falsely diagnosed 2 cases as a normal study (false negative) which were diagnosed as trigger fingers by MRI. Two false positive cases were diagnosed by USG; they had been diagnosed as tenosynovitis which was diagnosed by MRI as a partial tendon tear surrounded by an inflammatory reaction.

In our study, we had found that sensitivity, specificity, and accuracy of USG assessment of tendon pathologies of the hand and foot 94.3%, 98.2%, and 95.1%, respectively.

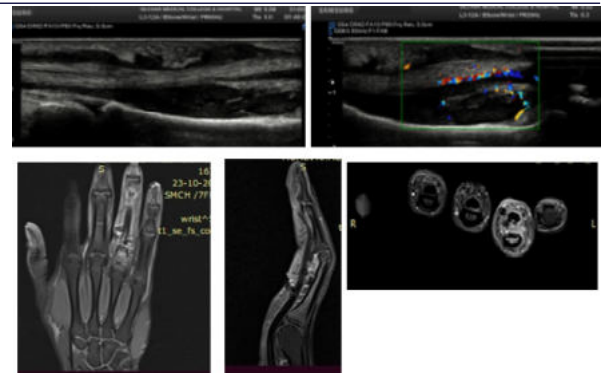


Fig1:USG images shows synovial thickening, thickened hypoechoic flexor digitorum superficialis and profundus tendons & mild debriginous fluid along tendon sheath and increased vascularity on colour Doppler study. Post contrast T1WI MRI images shows intense enhancement with marked thickening of synovium

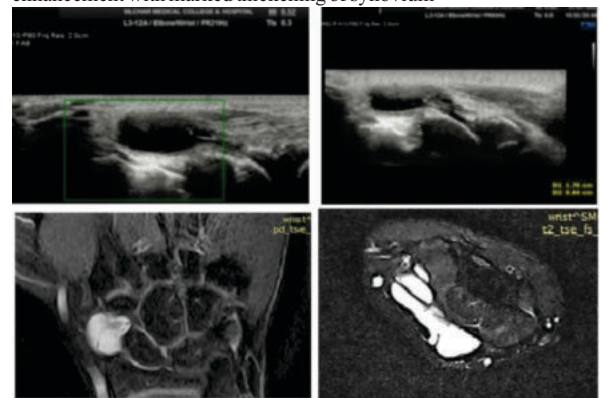


Fig2: USG images shows well-defined multiloculated anechoic cystic lesion noted over dorsum of wrist.

MRI images shows well defined multiloculated T1 hypointense and T2/STIR hyperintense cystic lesion noted over dorsum of wrist

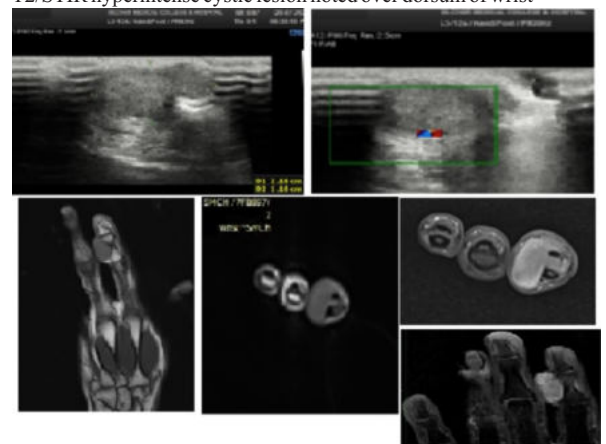


Fig3- USG: A lobulated hypoechoic lesion of the size measuring approx. 1.9cm x 1.6cm noted arising from the tendon sheath of flexor digitorum profundus in the medial aspect of the right middle phalanx and showing minimal increased vascularity on color Doppler study.

MRI: (a) coronal T1WI and (b) axial T1WI demonstrated a lobulated, isointense soft tissue mass at the volar aspect of the tendon sheath of flexor digitorum profundus in the medial aspect of the right middle phalanges. The lesion appears hyperintense on (PDFS) image and shows moderate homogenous enhancement on (d) axial T1 post contrast image.

DISCUSSION:

In our study, USG diagnosed isolated tenosynovitis with peritendinous fluid collection and increased vascularity in 5 of 5 cases (100%). In the diagnosis of tenosynovitis, USG is both sensitive and specific. Grassi et al.(1995)(2)(100%) provided the first evidence of the USG ability

to detect tendon pathology.

Most cases (2/3, 66%) of De Quervain's tenosynovitis in our study were in the age group of 40–60 years, followed by 20–40 years (1/3, 33.3). In our study, the mean age of De Quervain's tenosynovitis was 40.3 years. There were two women and one man for a M: F ratio of 1:2. The right wrist was involved in 2 patients and the left wrist in 1 patient. In two patients, the dominant hand was involved. The female predominance of De Quervain's tenosynovitis has been shown in studies by **S. S. Suresh et al. (2010)(3)**, **Harshvardhan et al. (2009)(4)** and **Azmy Al-Hadidy et al. (2009)(5)**, and our study correlated with these studies. In our study, the mean age of De Quervain's tenosynovitis (45 years) correlated with studies such as **Harshvardhan et al., (2009)(4)** (49 yrs) and **N. Glajchen et al., (1996)(6)** (45 yrs).

In our study, we found a total of 18 cases of tendon tears, 14 male and 4 female patients affected, with an age range from 10 to 60 years (mean age of 30.5 years). All of them had a history of trauma. Our studies correlated well with the studies of **De Jong et al.(2014)**, (7), which showed that the mean age at the time of injury was 35.9 years (range 1–91 years).

Individually among the ganglion cases, we found female predominance with a male: female incidence of 1:5, which correlated with studies such as **Jebson et al., (2007)(14)(9:15)**, **Andrew S. Wong., (2007)(15)(24:79)**. The mean age of the patients with ganglion cyst was 33.6yrs, which also correlated with studies such as **Andrew S. Wong., (2007) (15) (34yrs)**, **S. E. Anderson et al., (2006)(16)(29.5yrs)**. Thus, our study reinforced that ganglion cysts are predominantly found in women and most commonly in the 2nd to 4th decade.

In our study, we found a total of eight cases of tenosynovial giant cell tumour. Among these, 6 cases were seen in female patients, and 2 were seen in male patients. The mean age of these cases was 28.1 years, which correlated with studies such as **Wang et al.(2015)(19)** (34 years) and **Middleton et al. (2004)(20)(43years)**.

Among the total 7 cases of trigger finger in our study, most cases (6/7, 88.8%) were in the age group of 40–60 years, followed by the >60 years (1/7, 11.1%) age group. Thus, the mean age of the trigger finger was 51 years old in our study. There were four women and three men, with an M: F ratio of 1.3: 1. The right hand was involved in 5 patients and the left hand in 2 patients. The dominant hand was involved in five patients. Involved fingers were the middle finger (5/7), ring finger (1/7), and thumb (1/7), with the middle finger being the most commonly involved. Our studies were well correlated with studies by **S. S. Suresh et al. (2010)(3)** found female predominance in trigger fingers.

CONCLUSIONS

Tendon pathologies of the hand and foot are common and can cause disabling clinical symptoms and cosmetic issues. In the general population, trigger fingers are a common cause of disability. Ultrasound is an effective and valuable technique for evaluating trigger fingers, providing static and dynamic assessments and comparisons with adjacent normal digits. So, the US should be the first-line radiologic method for confirming the diagnosis of the trigger finger, finding any underlying causes, and guiding the proper treatment. MRI is also a good imaging modality for tendon pathologies such as tendon tears, tenosynovitis, trigger finger, ganglion cysts, and tenosynovial giant cell tumours of the hand and foot, with very high sensitivity in detecting tendon pathologies. However, the long duration of the scan and higher cost result in reduced patient compliance. Both USG and MRI are complementary in diagnosing, planning treatment, and follow-up studies for hand and foot pathologies.

REFERENCES:

1. Donovan A, Rosenberg ZS, Bencardino JT, Velez ZR, Blonder DB, Ciavatta GA, et al. Plantar Tendons of the Foot: MR Imaging and US. *RadioGraphics*. 2013 Nov;33(7):2065–85.
2. Grassi W, Tittarelli E, Blasetti P, Pirani O, Cervini C. Finger tendon involvement in rheumatoid arthritis. *Arthritis & Rheumatism*. 1995 Jun;38(6):786–94.
3. Suresh SS, Zaki H, Ali A. Does Radial Styloid Abnormality in de Quervain's Disease Affect the Outcome of Management? *Hand (N Y)*. 2010 Dec;5(4):374–7.
4. Harshvardhan null, Kamath BJ, Kamath KR, Kumar A, Shetty M, Bhardwaj P. Preoperative ultrasound in de Quervain's disease: an investigation worth doing. *J Hand Microsurg*. 2009 Jun;1(1):12–6.
5. Hadidy A, El Hadidy S, Haroun A, Hadidi M, Mahafza W, Badran D, et al. De Quervain's tenosynovitis imaging: Ultrasonography versus magnetic resonance imaging. *Journal of the Bahrain Medical Society*. 2009 Oct 1;21:328–33.

6. Glajchen N, Schweitzer M. MRI features in de Quervain's tenosynovitis of the wrist. *Skeletal Radiol*. 1996 Jan 1;25(1):63–5.
7. de Jong JP, Nguyen JT, Sonnema AJM, Nguyen EC, Amadio PC, Moran SL. The Incidence of Acute Traumatic Tendon Injuries in the Hand and Wrist: A 10-Year Population-based Study. *Clin Orthop Surg*. 2014;6(2):196.
8. Jebson PJJ, Spencer EE. Flexor tendon sheath ganglions: results of surgical excision. *Hand (N Y)*. 2007 Sep;2(3):94–100.
9. Wong AS, Jebson PJJ, Murray PM, Trigg SD. The Use of Routine Wrist Radiography is Not Useful in the Evaluation of Patients with a Ganglion Cyst of the Wrist. *Hand (New York, N.Y.)*. 2007 Sep;2(3):117–9.
10. Anderson SE, Steinbach LS, Stauffer E, Voegelin E. MRI for Differentiating Ganglion and Synovitis in the Chronic Painful Wrist. *American Journal of Roentgenology*. 2006 Mar;186(3):812–8.
11. Wang CS, Duan Q, Xue YJ, Huang XM, Wang LL, Chen ZY, et al. Giant cell tumour of tendon sheath with bone invasion in extremities: analysis of clinical and imaging findings. *Radiol med*. 2015 Aug;120(8):745–52.
12. Middleton WD, Patel V, Teefey SA, Boyer MI. Giant Cell Tumors of the Tendon Sheath: Analysis of Sonographic Findings. *American Journal of Roentgenology*. 2004 Aug;183(2):337–9.