



Foot And Ankle Pain : Evaluation With MRI

KEYWORDS

Ankle ,MRI ,Chronic

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ABSTRACT *BACKGROUND: I hypothesized that MRI examinations in persons with chronic ankle pain would show relevant injuries that may have been overlooked by conventional clinical, radiological, and ultrasound examinations.*

METHODS : From September 2013 to September 2015 fifty persons with chronic ankle pain (excluding fracture) were subjected to an MRI examination of the ankle joint, in addition to conventional radiographic procedures .

RESULTS : the most conspicuous finding in majority of cases is bone marrow edema and fluid along the tendon sheath (tenosynovitis) .

CONCLUSION: Chronic foot and ankle pain is related to trivial trauma. So the most conspicuous finding in majority of cases is bone marrow edema and fluid along the tendon sheath (tenosynovitis).

INTRODUCTION^[1]

The anterior tendons are the anterior tibial ,the extensor hallucis longus ,and the extensor digitorum longus .Posteriorly there are the Achilles and plantaris tendons .Laterally the peroneus longus and peroneus brevis tendons pass under the lateral malleolus. Medially ,the posterior tibial and flexor digitorum longus tendons pass under the medial malleolus ,whereas the flexor hallucis longus passes under the sustentaculum tali .

Normal tendons should appear uniformly black on all imaging sequences and have a sharply defined interface with adjacent fatty soft tissues. Any increased signal in a tendon on a T2-weighted image indicates the presence of pathology, typically an intrasubstance tear. In addition, more than a trace amount of fluid around an ankle tendon is abnormal, indicating inflammation or some other pathologic process. The exception to this is the flexor hallucis longus, which can normally contain some fluid in its tendon sheath.

MATERIALS AND METHODS

The present study design was a two year prospective study on 50 patients, to be conducted in the Department of Radio diagnosis, Government Medical College Kota, from September 2013 to September 2015. Fifty persons with chronic ankle pain (excluding fracture) were subjected to an MRI examination(using Phillips achieve 1.5 tesla) of the ankle joint, in addition to conventional radiographic procedures.

RESULTS

Lesion Categorisation :

Total number of cases with marrow edema was 24 out of 50 cases. Only marrow edema was found in 10 cases. Mostly talus and calcaneum bones were involved 19 out of

50 (in this project equally involved) .

Total number of patients with tendon tear was 13 out of 50 .Partial tendon tear associated with bone marrow edema was found in 4 out of 50 cases .Posterior tibial and achilles tendon constitute the major number (3 out of 13 and equal in number) .Number of cases with involvement of 2 or more tendons is three .In one case both partial tendon tear as well as ligament strain was found .No case of complete tear was found .

Ligament strain seen in 5 out of 50 cases three out of 5 had associated marrow edema and 1 has partial tendon tear and marrow edema associated with it .No particular ligament was found to be more prone to injuries . No case of complete tear was found. Table 1-6 gives more insight on all findings .

Table 1. Age Distribution

Total number of cases – 50

Age group	Total number of patients	Percentage
0-10	3	6 %
11-20	15	30 %
21-30	12	24 %
31-40	9	18 %
41-50	5	10 %
51-60	3	6 %
61-70	2	4 %
71-80	1	2 %

Table 2 Distribution of lesion according to tendon group in case of tenosynovitis

Location	Number of patients	Percentage
Medial group	13	26 %
Lateral group	04	8 %
Posterior group	00	0 %
Anterior group	05	10 %

Table 3 : Distribution of lesion according to tendon group in case of tear

Location	Number of patients	Percentage
Medial group	04	8 %
Lateral group	02	1 %
Posterior group	04	8 %
Anterior group	03	6 %

Table 4 :Total number of cases with partial tendon tear v/s complete tendon tear

Partial Tendon Tear (Total Number Of cases)	Complete Tear
13	0

Table 5 : Total number of cases with partial ligament tear v/s complete ligament tear

Partial Ligament Tear (Total Number Of cases)	Complete Ligament Tear
5	0

Tables Depicting various data relating to etiology of chronic ankle pain :

Table 6a

Number of cases having ligament as well as tendon tear	1
Number of cases with involvement of two or more tendons	3
Number of cases having tendon tear with associated tenosynovitis	2
Number of cases having ligament tear with associated tenosynovitis	2
Number of cases with exclusive tenosynovitis	7
Number of cases having tenosynovitis with associated bone marrow edema	9
Total Number of cases having Tenosynovitis	18
Total number of cases with Marrow edema	24

Table 6b

List/Number of cases with partial tendon tear(individual tendon)	
Anterior Tibial	2
Ext. Digitorum Longus	2
Ext Hallucis Longus	1
Posterior tibial	3
Flexor Digitorum Longus	1
Flexor Hallucis Longus	1
Peroneus Longus	1
Peroneus brevis	1
Achilles tendon	3
Plantaris tendon	0

Table 6c

List/Number of cases with partial Ligament tear(individual Ligament)	
Talonavicular	1
Deltoid	1
Calcaneofibular	1
Talofibular	1

Talocalcaneal	1
Talonavicular	1
Tibionavicular	2
Calcaneonavicular	1
Anterior Tibiofibular	0
Posterior Tibiofibular	0

Table 6d

List/Number of cases of tenosynovitis (individual tendon)	
Posterior Tibial	8
Flexor digitorum longus	9
Flexor hallucis longus	1
Anterior tibial	1
Extensor digitorum longus	3
Extensor hallucis longus	2
Peroneus longus	3
Peroneus brevis	2
Achilles	0

Table 6e

List/Number of cases of bone marrow edema (individual bone)	
Tibia	5
Fibula	1
Talus	19
Calcaneum	19
Navicular	7
Cuboid	6
Cuneiform	6
Metatarsals	5
Phalanges	0

Total number of cases of tenosynovitis is 18 out of 50 .Tenosynovitis associated with bone marrow edema was found in 09 out of 50 cases .Maximum number of cases of tenosynovitis was found in flexor digitorum longus (9 out of 18) followed by posterior tibial tendon (8 out of 18) making medial group of tendons most prone to tenosynovitis .No tenosynovitis was found in Achilles tendon.Collectively posterior tibial tendon is most prone to tear as well as tenosynovitis .These findings are in agreement with findings of Rosenberg et al ,according to which posterior tibial tendon is relatively hypovascular along the portion that curves around medial malleolus making it most prone to tear .³

Two cases each of accessory navicular syndrome, plantar fasciitis ,tuberculosis & osteomyelitis was also found ;all are associated with marrow edema .In two cases no abnormality was detected .Ankle TB presenting as localised swelling along with fluid collection and pain in ankle and foot .The recorded clinical results showed good correlation to the injury patterns diagnosed using MRI .

Above findings shows that marrow edema is invariably associated with most other pathologies (28 out of 50). Marrow edema after trauma is a indicator of bone contusion which itself leads to chronic ankle pain .So it becomes obvious that bone contusion after trauma leading to marrow edema is the leading cause of chronic foot & ankle pain which is often associated with tenosynovitis .Tenosynovitis alone come second as an etiology behind chronic foot and ankle pain .While other etiologies constitute a minor number . This is in concordance with the study done by adriana martins et al ,they mentioned that focal bone marrow edema isolated to a single bone is a common finding in the ankle. It is often posttraumatic, related to avulsion fracture or contusion .⁹

Special attention is required in two cases of accessory navicular syndrome one of which was present as bony prominence ,tenderness and pain medially .On CT only subtle findings are present which can be easily missed if there is

no high degree of suspicion when we encounter accessory navicular bone .On MRI fluid at site of attachment of posterior tibial tendon as well as marrow edema in navicular and accessory navicular is seen which conforms the diagnosis .According to Bernaerts et al accessory navicular bone type 2 or 3 and medial foot pain or flatfoot should be examined by MRI for insertion abnormalities of the PTT or painful accessory navicular .⁹

Two patient present with pain and swelling having past history of trauma .One of the patient has extensive destruction of ankle and foot bones .In MRI marrow edema ,bone destruction & thick collection was seen which does not lead us to exact diagnosis .After USG guided aspiration these came out to be Tubercular in origin .According to S.M Ajoy et al a differential diagnosis of TB to be kept in mind while evaluating a patient with chronic ankle pain, in a country like India where TB is not uncommon.¹⁰

Two cases of plantar fasciitis were seen which were well depicted by MRI .

Two cases of osteomyelitis were seen for which MRI is very diagnostic.According to Kapoor et al Magnetic resonance imaging performance was markedly superior to that of technetium Tc 99m bone scanning, plain radiography, and white blood cell studies in the diagnosis of osteomyelitis of the foot and ankle .¹¹

Right Ankle vs Left Ankle

24 persons had involvement of right ankle while 26 had involvement of left ankle .This signify that there is no predilection .Trivial trauma or twisting force can involve either right or left ankle .

Male vs Female

25 patients were female and 25 were male out of 50 .Above data suggests that that there is no predilection .Trivial trauma or twisting force can occur with equal frequency in male & female .

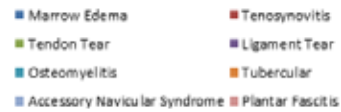
Age Distribution

Maximum number of patient are between 11-30 years of age. This age group includes children ,teenagers and active adults which are highly active in sports ,dancing and day to day routine activities which makes them more prone to injuries which is a major cause for chronic ankle pain. Children below 10 years and adults above 60 years are least likely to have chronic ankle pain .

Distribution of lesion

Medial group of tendons which includes posterior tibial, flexor digitorum longus & flexor hallucis longus are most prone for tenosynovitis and partial tear .Mixed lesions are very common which includes tenosynovitis involving two or more group of tendons .Ligament strain is nearly always associated with tenosynovitis and marrow edema .In case of partial tendon tear and ligament strain no particular group of tendon appears to be more prone. Figure 1 indicates contribution of different etiology behind ankle pain.

Contribution of different etiology for ankle pain



DISCUSSION

Ankle sprains are common injuries, particularly in young individuals participating in sports. However, rather surprisingly, little is known with regard to the best diagnostic techniques, management, and outcomes. There are even less data on the patterns of injury seen on MRI when performed in case of chronic ankle pain . In the management of ankle pain, most would advise conservative management, the duration of which is variable, while advanced imaging is usually only offered to those with persistent symptoms .

Above results indicate that one of the most common cause behind chronic foot and ankle pain is trauma leading to secondary changes such as marrow edema and tenosynovitis. While marrow edema can exclusively be diagnosed by MRI which highlights the importance of MRI. Most significant role of MRI is to rule out or confirm other abnormalities such as assecory ossicle syndrome . Above data also shows that in trivial trauma and in twisting injuries to ankle ligament and tendon partial tear is less common while complete tear is very rare (No case of complete tear in our study) .

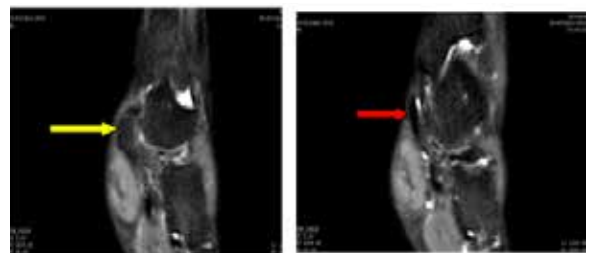


Figure 2 :A female age 15 years came

Figure 2 :A female age 15 years came with pain on medial aspect of foot from last 3months .No history of trauma present .On inspection there was tenderness medially which can be pin pointed .On MRI marrow edema is seen in navicular and accessory navicular along with fluid in the tendon sheath of distal posterior tibial tendon (red arrow) at its point of insertion in Type 2 accessory navicular (yellow arrow) .This suggests accessory navicular syndrome .

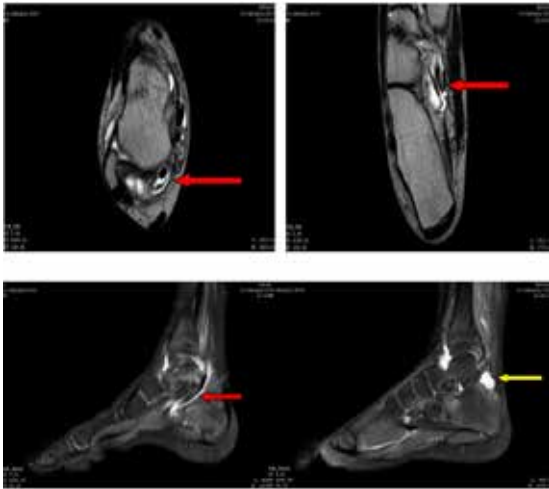


Figure 3 : T2 -weighted axial image a & b) showing fluid within the tendon sheath of posterior tibial tendon, flexor digitorum longus and flexor hallucis longus s/o tenosynovitis. Soft tissue density seen posterior to FHL (indicating fibrosis) s/o chronic tenosynovitis. Splitting of flexor hallucis longus is seen at the crossover site (master knot of henry) s/o partial tear of flexor hallucis longus .Proton density weighted images c & d) showing altered signal intensity within flexor hallucis longus tendon and marrow edema in distal tibia and all tarsal bones .Joint effusion is also seen .



Figure 4 : A female aged 42 years with swelling and pain in right ankle and foot from the the last one year which started after she fell while walking; came in our department for X-ray which shows extensive destruction of tarsals and metatarsals . MRI shows extensive destruction of cuboid ,navicular and metatarsals(red arrow) with marrow edema in talus (Yellow arrow) and calcaneum along with few pockets of fluid collection in

ankle and foot . Subsequent FNAC confirmed it as Tuberculosis .

CONCLUSION

Chronic foot and ankle pain is related to trivial trauma. So the most conspicuous finding in majority of cases is bone marrow edema and fluid along the tendon sheath (tenosynovitis) .

However which tendons or ligaments are involved & whether tear is present or not or is there any other etiology ,these questions remain unanswered by conventional clinical ,X-ray and even USG studies .

Some etiologies such as marrow edema and that are related to accessory ossicles can only be diagnosed by MRI .So this makes MRI indispensable in such cases .

The significant role of MRI is finding the exact etiology behind pain and thereby helping clinicians to individualised the treatment and focus on that cause only .

MRI removes doubt among clinicians regarding etiology and save a lot of time and effort and give patient a one time satisfactory explanation for chronic pain .

Ultimately MRI leads to rapid initiation of appropriate treatment which leads to rapid healing .

So the crux is MR imaging is the modality of choice for optimal detection of most soft-tissue disorders of the tendons, ligaments, and other soft-tissue structures of the ankle .

REFERENCES :

1. John R. Haaga (2008): CT and MRI of the whole body-5 edition Philadelphia ,Mosby 2008.
2. Ahmadi ME, Morrison WB, Carrino JA, et al: Neuropathic arthropathy of the foot with and without superimposed osteomyelitis: MR imaging characteristics. Radiology 238:622631, 2006.
3. Rosenberg ZS: Chronic rupture of the posterior tibial tendon. MRI Clin North Am 2:79-87, 1994.
4. Finlay K, Friedman L: Ultrasonography of the lower extremity. Orthop Clin North Am 37:245-275, 2006.
5. Henry AK: Extensile Exposure, 2nd ed. Edinburgh, E&S Livingstone, 1957, p 304.
6. Claudia Sadro, M.D. and Murray Dalinka, M.D Magnetic Resonance Imaging of the Tendons of the Ankle and Foot http://upoj.org/wp-content/uploads/v13/v13_04.pdf .
7. Bencardino J: MR imaging of dislocation of the posterior tibial tendon. AJR Am J Roentgenol 169:1109-1112, 1997.
8. Bernaerts F.M. VanhoenackerS. Van de PerreA.M. De SchepperP.M. Parizel . Accessory navicular bone: not such a normal variant <http://www.ncbi.nlm.nih.gov/pubmed/15587565>
9. Adriana Martins Rios1, Zehava Sadka Rosenberg2, bone marrow edema patterns in ankle and hind foot :Distinguishing features in MRI <http://www.ajronline.org/doi/full/10.2214/AJR.10.588>
10. S.M. Ajoy1 , Bheemsingh Samorekar2 , Sharath Soman3, Mohan Jadhav4 A case report : Isolated Tuberculous Peroneal Tenosynovitis:[http://www.jcdr.net/articles/PDF/6212/14081_CE\(RA1\)_F\(T\)_PF1\(VSUAK\)_PFA\(AK\)_PF2\(PAG\).pdf](http://www.jcdr.net/articles/PDF/6212/14081_CE(RA1)_F(T)_PF1(VSUAK)_PFA(AK)_PF2(PAG).pdf)
11. Kapoor A1, Page S, Lavalley M, Gale DR, Felson DT: Magnetic resonance imaging for diagnosing foot osteomyelitis: a meta-analysis <http://www.bumc.bu.edu/gim/files/2007/08/2007-publications.pdf>