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ROLE OF HIGH RESOLUTION ULTRASOUND IN THE DISORDERS OF ACHILLES TENDON.

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Abstract

Background: The Achilles tendon is the most common tendon that can get injured. The tendon can get affected in a wide variety of conditions and present with varied clinical manifestations. A detailed knowledge of the conditions affecting this tendon, their clinical manifestations and their appearance in imaging studies will help narrow down the diagnosis and provide precise treatment.

Aim: Aim of the study was to identify the most common pathologies that affect the Achilles tendon and to correlate the clinical presentation with the high resolution ultrasound appearance.

Settings and design: This was a prospective study

Methods and Material: 52 patients with suspected Achilles tendon pathology were evaluated. After taking a detailed clinical history and performing a clinical examination, HRUS was performed on all the patients. The disorders affecting the patients were characterised based on clinical presentation and ultrasound examination. Correlation was done between the clinical and HRUS presentation of these cases.

Results

The most common symptom at the time of presentation was pain which was present in 41 patients (78.9%). Other symptoms included loss of plantar flexion seen in 20 patients (38.4%), swelling in 36 patients (69%) and stiffness seen in 12 patients (23%).

Tears in the tendon were the most common type of pathology noted in 25 patients (48.07%),18 patients (34.6%) presented with complete tears and 5 patients (13.4%) with partial tears. Complete tears occurred more frequently at a site 3-4 cm from the calcaneal insertion while partial tears were most commonly insertional.

10 (19.2%) patients had findings suggestive of tendinopathy and their most common complaint was chronic pain and swelling.

5 patients (9.62%) had features of enthesitis. Among them 3 had psoriatric arthropathy and 2 had ankylosing spondylitis.

Conclusion

The spectrum of disorders involving the Achilles tendon are diverse and the clinical examination maybe imprecise, especially in acute conditions. HRUS offers a highly accurate tool that can diagnose these conditions and guide the management.

Keywords: Tendoachilles, Achilles tendon, Paratendinopathy, Tendinopathy, Tears, High resolution ultrasound

Introduction

The Achilles tendon is a conjoint tendon found on the posterior surface of the leg that connects the calf muscles to the heel bone. It is a fibrous band of connective tissue formed from the gastrocnemius and soleus muscles and inserts on the posterior calcaneal tuberosity. It is the thickest and the strongest tendon in the human body. (1, 2).

The Achilles tendon is surrounded by a paratenon instead of a synovial sheath (2). The paratenon reduces friction and allows free gliding against the surrounding tissues. Inflammation of this layer leads to paratenonitis, a common condition in acute overuse of the tendon.

Disorders of the tendon present as heel pain, loss of plantar flexion of the foot and stiffness along the course of the tendon. They may be associated with swelling and tenderness. They occur most commonly due to either overuse or trauma. Achilles tendon injuries are some of the most common sports related injuries. They are said to be insertional when they occur at the site of insertion and non-insertional when they occur anywhere else along the course of the tendon.

Clinical examination of the Achilles tendon is imprecise especially in acute cases where tenderness may limit the evaluation. Imaging can precisely categorize the disorder and aid in diagnosis. Radiographs, high resolution ultrasound (HRUS) and magnetic resonance imaging are the commonly used imaging tools in the evaluation of the Achilles tendon. Due to the ease of access of the tendon due to its superficial location, HRUS is an excellent and accurate tool for evaluation. HRUS is cost effective, widely available and offers the ability to dynamically evaluate the Achilles tendon.

In this study we evaluated 52 cases with symptoms suggestive of Achilles tendon disorder and tried to classify them based on the etiology and pathology with a special emphasis on tears.

Methods:

This study was a prospective study conducted on patients with clinical suspicion of tendoachilles pathology. Ethical committee clearance was waived. The aim was to identify the most common pathologies that affect this tendon and the clinical correlation.

It included 52 cases (38 males and 14 females) with suspected disorder of the Achilles tendon between January and August 2019. After taking informed consent from the patient, a detailed history and clinical examination was conducted. HRUS examination was performed in the Department of Radiology at Nizam's Institute of Medical sciences on ESOATE MY LAB SEVEN^{TM} using 3-13 MHz high resolution linear array transducer. Real time grey-scale, power Doppler and dynamic examination of the Achilles tendon was performed.

Patient was positioned in prone position with foot hanging over the edge of the bed. A rolled up sheet was placed under the ankle to allow mild elevation and dorsiflexion of the foot.

Grey scale ultrasound is performed using a high frequency transducer. The transducer was first placed in the transverse plane and the tendon traced from the myotendinous junction to its insertion at calcaneal tuberosity. The transducer was then turned perpendicular and the process is repeated. Power Doppler was used to evaluate both intra and peritendinous vascularity. Dynamic evaluation was performed by gentle passive dorsiflexion of the foot. This manoeuvre allows the evaluating radiologist to demonstrate the gap between torn ends of the tendon, which is often filled with fluid, debris or granulation tissue.

Copious amount of jelly was used throughout the procedure to ensure that there is minimal transducer pressure.

HRUS of a normal Achilles tendon in the longitudinal plane reveals a hyperechoic structure of uniform thickness with homogenous fibrillar echopattern. In the transverse plane, the tendon shows a convex posterior margin and a flat or concave anterior margin. The paratenon appears as a thin nearly imperceptible hyperchoic line around the tendon. The retrocalcaneal bursa may contain a sliver of fluid, up to 3 mm in thickness (2) **[Fig 1]**.

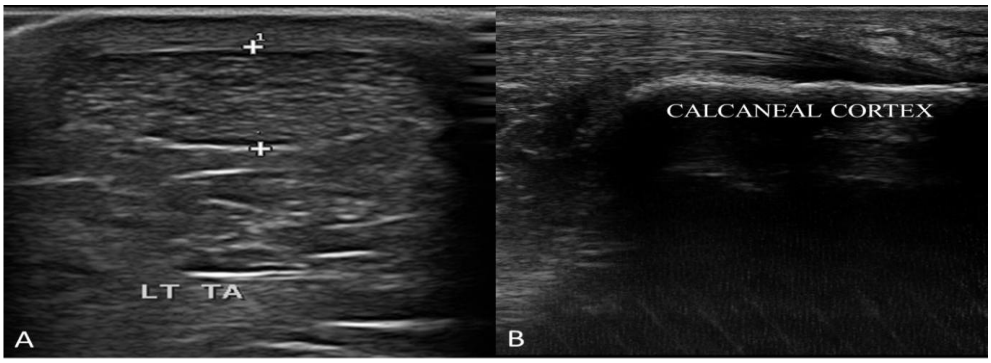

Figure 1: HRUS of a normal Achilles tendon. (A) Transverse grey scale image showing a convex posterior margin and a flat or concave anterior margin. The paratenon appears as a thin nearly imperceptible hyperchoic line delineating the anterior and posterior aspects of the tendon (white calliper cursors). (B) Longitudinal grey scale image showing hyperechoic structure of uniform thickness with homogenous fibrillar echopattern.

The common disorders affecting the Achilles tendon and their sonological appearance is as follows:

Tendinosis occurs due to overuse of the tendon. On ultrasound, it is seen as a focal area of fusiform thickening and hypoechogenicity without disruption of fibres within the tendon. On power Doppler, there may be focal increased vascularity. Chronic cases may show foci of dystrophic intratendinous calcification (2–4). **[Fig 2 and 3]**

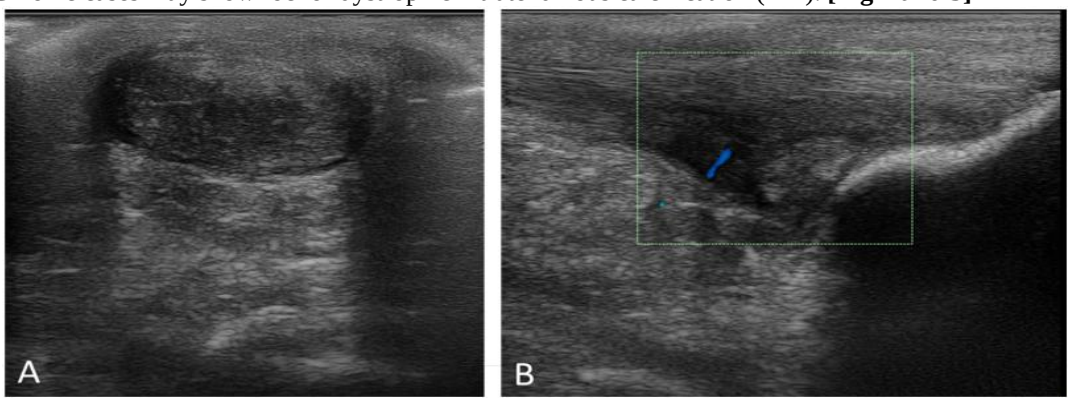

Figure 2: HRUS of tendinosis of Achilles tendon. (A) Transverse grey scale image showing a focal area of and hypoechogenicity without disruption of fibres in posterior aspect of tendon. (B) Longitudinal image showing fusiform thickening of tendoachilles at its insertion. On power Doppler, there is focal increased vascularity. There is no evidence of intratendinous calcification.

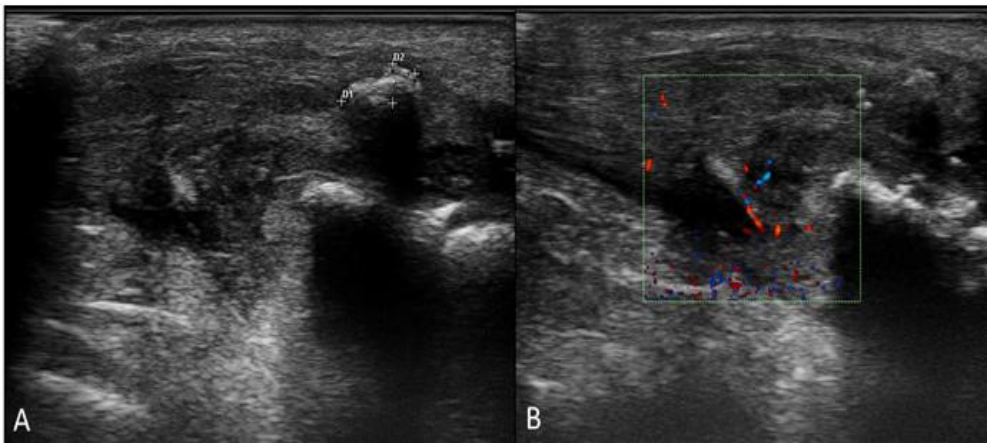

Figure 3: HRUS of chronic calcific tendinosis of Achilles tendon. (A) Longitudinal grey scale image showing fusiform thickening and hypoechogenicity of tendoachilles at its insertion. A focus of intratendinous calcification (white calliper cursors) (B) Longitudinal power Doppler image showing increased vascularity.

Tears - The Achilles tendon is the most commonly torn tendon (5).. On HRUS, a tear is seen as a focal area of partial or complete anechoic or hypoechoic cleft with disruption of tendon fibres **[Fig 4]**. In partial tears there can be focal enlargement of tendon >10 mm (2). In complete tears there can be retraction of fibres with fluid, debris, granulation tissue or Kager's fat pad filling the site of disruption. The retracted torn ends are swollen and may show posterior acoustic shadowing (2, 4) [**Fig 5]**.

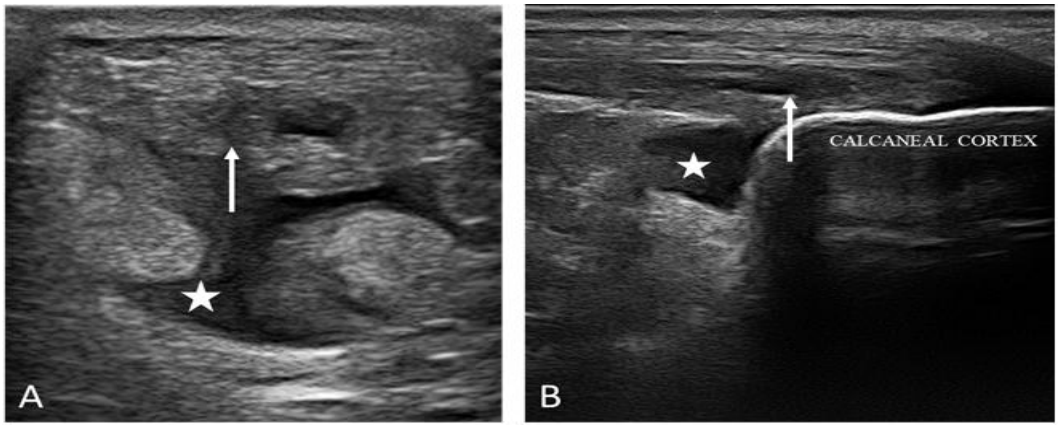

Figure 4: HRUS of partial tear of Achilles tendon. (A)Transverse and (B) Longitudinal images showing a focal hypoechoic fluid filled cleft with partial disruption of tendon fibres in the posterior aspect of the Achilles tendon (white arrow). This cleft is communicating with the retrocalcaneal bursa (white star).

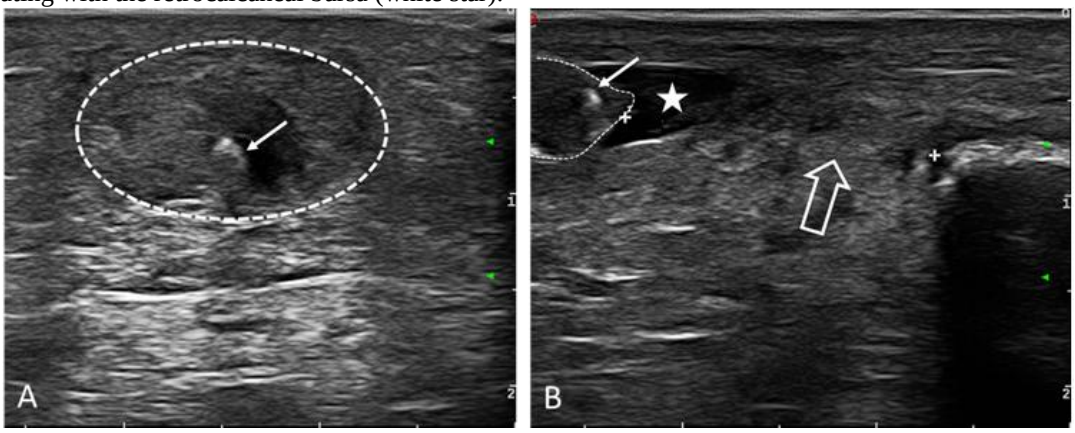

Figure 5: HRUS of complete tear of Achilles tendon. (A)Transverse and (B)Longitudinal images showing a complete tear of the Achilles tendon (dashed outline) with retracted enlarged proximal stump. A small focus of calcification (white arrow) seen in the retracted stump with adjacent fluid and Kager's fat pad filling the site of disruption.

Enthesitis is the inflammation of the enthesis and is considered a characteristic feature of peripheral spondyloarthropathy (6). It is seen as a focal area of tendon thickening, hypoehogenicity with or without power Doppler signal within 2 mm of the bony cortex (4, 7) [**Fig 6]**

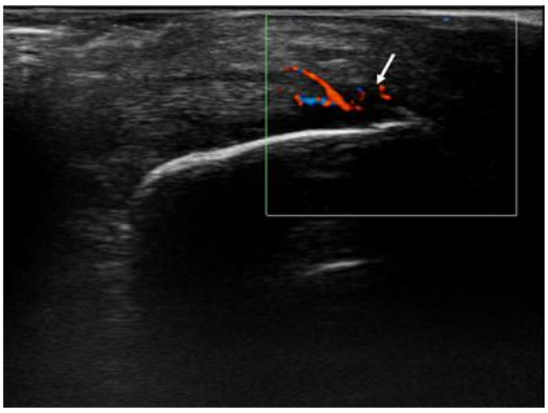

Figure 6: HRUS in Enthesitis. Longitudinal image showing a focal area of tendon thickening, hypoehogenicity with power Doppler signal within 2 mm of the bony cortex (white arrow).

Paratenonitis results due to overuse or microtrauma. It is seen as an iso or hypoechoic soft tissue thickening around Achilles tendon. On power Doppler it may show increased vascularity (2, 4, 8). **[Fig 7]**

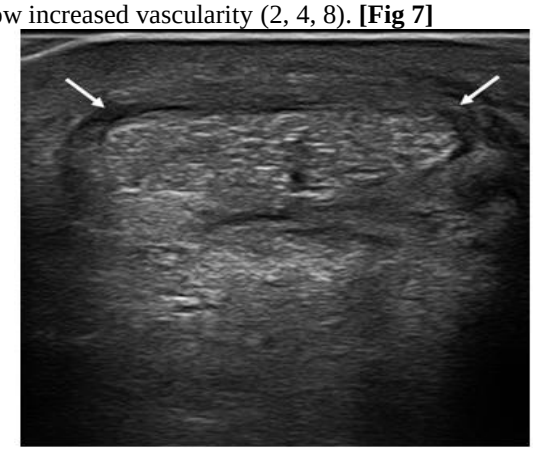

Figure 7: HRUS in Paratenonitis. Transverse image showing an isoechoic soft tissue thickening around the distal Achilles tendon (white arrows).

Retrocalceaneal bursitis can be seen in inflammatory arthropathies or can be seen when there is injury to the adjacent Achilles tendon. It diagnosed when there is hypoechoic thickening of bursa with > 3mm fluid (2, 3) [**Fig 8**].

Haglund syndrome is thought to occur due to chronic pressure by rigid shoes. It is a conglomeration of tendinopathy, retrocalcaneal bursitis and osseous protruberance in posterior superior calcaneum (2, 9). [**Fig 8]**

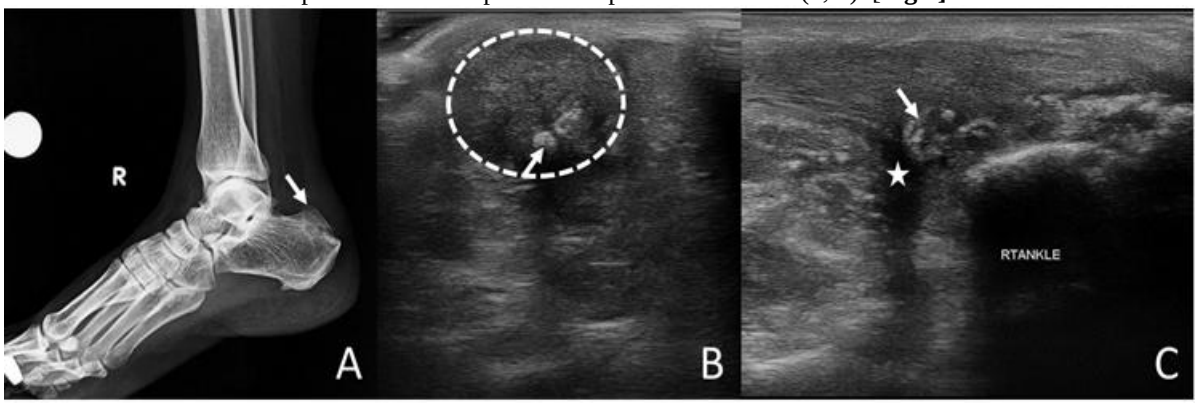

Figure 8: HRUS in Haglund syndrome. (A) Lateral radiograph of Ankle, showing an osseous protruberance in posterior superior calcaneum (white arrow). (B)Transverse and (C) Longitudinal HRUS image showing calcific tendinopathy (white outline and arrow) and retrocalcaneal bursitis (white star).

Statistics

The data obtained was compiled, tabulated and statistically analysed using Microsoft Excel 2016 ™ and Statistical Package for Social Sciences (SPSS v 21.0) Software. Categorical data was expressed in terms of percentages. Quantitative data was expressed in terms of mean.

Results

Our study included 52 patients of which 38 were males (73%) and 14 females (27%). The disorder occurred most commonly in the 4th to 6th decade of life (69.2%). The tendon on the right side (39 patients, 75%) was more frequently involved when compared to the left side.

Table 1: Sex distribution

PATIENT SEX DISTRIBUTION	NUMBER OF PATIENTS	PERCENTAGE
MALE	38	73.0
FEMALE	14	26.9

Table 2: Age distribution

PATIENT AGE DISTRUBITION	NUMBER OF PATIENTS	PERCENTAGE
20-30	04	7.6
31-40	06	11.5
41-50	14	26.9
51-60	22	42.3
61-70	06	11.5

The symptoms were acute in nature in 20 patients (38.4%) with 16 patients giving history of blunt trauma while the symptoms were chronic in nature in 32 patients (61.6%) with only 3 patients giving history of trauma.

The most common symptom at the time of presentation was pain which was present in 41 patients (78.9%). Other symptoms included loss of plantar flexion seen in 20 patients (38.4%), swelling in 36 patients (69%) and stiffness seen in 12 patients (23%).

Table 3: Spectrum of disorder.

SPECTRUM OF DISORDERS OBSERVED IN ACHILLES TENDON ON HRUS (n=52)		
DISORDER	NUMBER OF PATIENTS	PERCENTAGE
TENDINOPATHY	10	19.2
PARTIAL TEAR	07	13.4
COMPLETE TEAR	18	34.6
PARATENONITIS	03	5
ENTHESITIS	05	9.6
HAGLUND SYNDROME	04	7.6
RETROCALCANEAL BURSITIS	04	7.6
PERITENDINOUS HEMATOMA	01	1.9

Table 4: Distance of complete tear from Calcaneal insertion.

DISTANCE OF COMPLETE TEAR OF ACHILLES TENDON FROM CALCANEAL INSERTION (N=18)		
	NUMBER	PERCENTAGE
INSERTIONAL	3	16
2-3 cm	2	11
3-4 cm	7	38.9
4-5 cm	3	16
5-6 cm	3	16
6-7 cm	0	0

Tears in the tendon were the most common type of pathology noted in 25 patients (48.07%),18 patients (34.6%) presented with complete tears and 5 patients (13.4%) with partial tears. Complete tears occurred more frequently at a site 3-4 cm from the calcaneal insertion while partial tears were most commonly insertional.

Table 5: Distance of partial tear from Calcaneal insertion.

DISTANCE OF PARITAL TEAR OF ACHILLES TENDON FROM CALCANEAL INSERTION (N=5)		
	NUMBER	PERCENTAGE
INSERTIONAL	3	60
2-3 cm	0	0
3-4 cm	0	0
4-5 cm	2	40
5-6 cm	0	0
6-7 cm	0	0

10 (19.2%) patients had findings suggestive of tendinopathy and their most common complaint was chronic pain and swelling.
5 patients (9.62%) had features of enthesitis. Among them 3 had psoriatric arthropathy and 2 had ankylosing spondylitis. Other findings of paratenonitis (3 patients), retrocalcaneal bursitis (4 patients), Haglund's syndrome (4 patients) and peritendinous haematoma (1 patient) were also noted.
Mean distance between torn ends in a complete tear is 2.5 cm. [Range 0.6-7 cm]

Discussion

The Achilles tendon is one of the most commonly injured tendons in the body. It can get affected in a number of overuse or traumatic conditions and present with a similar clinical presentation though pain and limitation of movement may be seen in most of the conditions. In this study we included 52 patients who presented to our hospital with clinical suspicion of tendoachilles pathology.

There was a significant difference in the gender of the patients affected with a male preponderance. The disorders were more common in between the 4^{th} to 6^{th} decade of life. The lesions were more commonly seen involving the dominant side with right side being affected in 75% of the cases.

The symptoms were acute in nature in 20 patients (38.4%) with 16 patients giving history of blunt trauma while the symptoms were chronic in nature in 32 patients (61.6%) with only 3 patients giving history of trauma. Among patients giving history of trauma tears (complete or partial) were found in 19 cases while one case had features of peritendinous hematoma.

The most common symptom at the time of presentation was pain which was present in 41 patients (78.9%). All patients with tears had varying degree of pain on presentation. Other symptoms included swelling in 36 patients (69%), loss of plantar flexion seen in 20 patients (38.4%)and stiffness around the heel joint seen in 12 patients (23%).

Tears in the tendon were the most common type of pathology noted in 25 patients (48.07%),18 patients (34.6%) presented with complete tears and 5 patients (13.4%) with partial tears. This high percentage of patients in our study could be attributed to the rural background of many of the individuals, where access specialists and specialised healthcare services are limited. Complete tears occurred more frequently at a site 3-4 cm from the calcaneal insertion while partial tears were most commonly insertional. This finding coincides with the study done by Ibrahim et al (8) and this site corresponds to zone of relative hypovascularity.

10 (19.2%) patients had findings suggestive of tendinopathy and the most common complaint was chronic pain and swelling. None of these patients had history of acute trauma however most (8) had history suggestive of overuse.

5 patients (9.62%) had features of enthesitis. All of them were diagnosed cases of inflammatory arthropathies. Among them 3 had psoriatric arthropathy and 2 had ankylosing spondylitis. Pain and swelling was the most common complaint in these patients.

Other findings of paratenonitis (3 patients), retrocalcaneal bursitis (4 patients), Haglund's syndrome (4 patients) and peritendinous haematoma (1 patient) were also noted.

Conclusion

The spectrum of disorders involving the Achilles tendon are diverse and the clinical examination maybe imprecise, especially in acute conditions. HRUS offers a highly accurate tool that can diagnose these conditions and guide the management.

References

1. Järvinen TA, Kannus P, Paavola M, Järvinen TL, Józsa L, Järvinen M. Achilles tendon injuries. Curr Opin Rheumatol 2001; 13(2):150–5.
2. Dong Q, Fessell DP. Achilles tendon ultrasound technique. AJR Am J Roentgenol 2009; 193(3):W173.
3. Borg M, El-Essawy S, El Sallab R, Ezzat A, Abd El-Khalek A. Role of ultrasonography in the evaluation of Achilles tendon disorders. Benha Med J 2016; 33(1):54.
4. Paavola M, Paakkala T, Kannus P, Järvinen M. Ultrasonography in the differential diagnosis of Achilles tendon injuries and related disorders. A comparison between pre-operative ultrasonography and surgical findings. Acta Radiol 1998; 39(6):612–9.
5. Mansur NSB, Fonseca LF, Matsunaga FT, Baumfeld DS, Nery CAdS, Tamaoki MJS. Achilles Tendon Lesions - Part 2: Ruptures. Rev Bras Ortop (Sao Paulo) 2020; 55(6):665–72.
6. Sudoł-Szopińska I, Zaniewicz-Kaniewska K, Kwiatkowska B. Spectrum of ultrasound pathologies of achilles tendon, plantar aponeurosis and flexor digiti brevis tendon heel entheses in patients with clinically suspected enthesitis. Pol J Radiol 2014; 79:402–8.
7. Michelsen B, Diamantopoulos AP, Soldal DM, Hammer HB, Kavanaugh A, Haugeberg G. Achilles enthesitis defined by ultrasound is not associated with clinical enthesitis in patients with psoriatic arthritis. RMD Open 2017; 3(2):e000486.
8. Ibrahim NMA, Elsaeed HH. Lesions of the Achilles tendon: Evaluation with ultrasonography and magnetic resonance imaging. The Egyptian Journal of Radiology and Nuclear Medicine 2013; 44(3):581–7.
9. F M Kainberger, A Engel, P Barton, P Huebsch, A Neuhold, and E Salomonowitz. Injury of the Achilles tendon: diagnosis with sonography.