



ROLE OF HIGH RESOLUTION ULTRASOUND IN EVALUATION OF ACHILLES TENDON PATHOLOGY.

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ABSTRACT **Objective:** - This research aimed to determine how useful high-resolution ultrasonography is for diagnosing Achilles tendinopathy. **Methodology:** - 35 consecutive patients and 50 healthy volunteers made up the study's case-control, cross-sectional design. The thickness, echogenicity, fibrillar pattern, and presence of calcifications of tendons were evaluated by ultrasound. The vascularity of the tendons was measured by power Doppler imaging. **Results:** - Cross-sectional area and anteroposterior diameter were both greater in tendinopathic tendons compared to healthy tendons. More often than not, patients' ultrasounds would reveal hypoechoic regions inside the tendon. Fibrillar pattern disruption, increased tendon vascularity, and heightened echogenicity in the Kager's fat pad were seen in patients. Because of the inflammation and irritation caused by Achilles tendinopathy, the tendon swells, especially in the middle and end regions, and the fibrillar pattern is disrupted, and the vascularity of the tendon increases. Increased echogenicity of Kager's fat pad, tendon calcification, alterations in retrocalcaneal bursae, and calcaneal shape are other symptoms. **Conclusion:** - Our research shows that the most prominent sonographic features of Achilles tendinopathy are an enlarged mid and distal tendon, a disrupted fibrillar pattern, and an increase in tendon vascularity.

KEYWORDS : Achilles Tendinopathy, Kager's fat pad, Sonography

INTRODUCTION

The calcaneal tendon, more frequently referred to as the Achilles tendon, is the largest and strongest tendon in the human body. Due to its high biomechanical stress and limited vascularity, it is also one of the most often damaged tendons [1]. Fibers from the gastrocnemius and soleus muscles join to generate the tendon that inserts into the calcaneus's posterosuperior region (the calcaneal tendon). Overuse and persistent stress on the achilles tendon often lead to the pathological alterations known collectively as "tendinopathy." It is not limited to sportsmen but may be seen in the general population as well. In addition to having a significant impact on professional athletes' ability to perform, Achilles tendinopathies may be so painful that they preclude non-athletes from engaging in even the most basic of daily activities. [2] In the clinical arena, ultrasonography and magnetic resonance imaging (MRI) of tendons have been used to aid in the diagnosis of tendinopathy, monitor the effectiveness of therapies, and evaluate the risk of developing symptoms.

Sonography is a noninvasive, simple, almost universal, inexpensive, accurate, repeatable, specific, and sensitive method for the early diagnosis of Achilles tendinopathies. [3-4]. Moreover, its broad application to the analysis of musculoskeletal illnesses has enabled its indications and limits to be firmly established [5, 6, 7].

METHODOLOGY

This research is a case-control cross-sectional study. Thirty-five patients who presented for achilles tendon HRUSG at the postgraduate department of orthopaedics, Government medical college srinagar between January 2020 and February 2022 were included in the research. There were 20 men and 15 females in the sample, with a median age of 39. (range, 20–60). The age- and sex-matched control group included 50 people (22 males, 28 females; [range, 20–65years]). Subjects in the control group had no outward symptoms of Achilles tendinopathy. Those involved were mostly volunteers, including medical students and hospital staff. Controls subjects had their Achilles tendons clinically examined on both sides.

The same radiologist who had previously assessed the patient's condition oversaw all of the sonographic evaluations. The patient was examined while laying prone with their feet dangling off the edge of the exam table, using a Samsung sonoace R7 USG equipment equipped with a linear transducer (LN5-12). Both transverse and

longitudinal imaging of tendons and associated structures was common practise. Paratenon features (subcutaneous tissue, paratenon, Kager's fat pad, retrocalcaneal and precalcaneal bursae, calcaneal cortical outline), as well as the size, echogenicity, echotexture, and presence of calcifications of the tendon, were evaluated. Maximum anteroposterior diameter (calibre) of the Achilles tendon was assessed at three points: the musculotendinous junction, immediately proximal to the calcaneal insertion, and in the middle of these two points. Two-tailed Student t-tests and nonparametric tests were used to compare the control group with the Achilles tendinopathy group. The SPSS software was used for the statistical analysis. P values and confidence intervals were computed, and results were deemed significant when the p value was less than 0.05.

RESULTS

Control participants' longitudinal sonograms of the achilles tendon exhibited a uniformly fibrillate sonographic structure, with a thickness of 4-7 mm and more echoic, even boundaries. Without any intratendinous hyper-, hypo-, or anechoic regions or peritendinous effusion, the transverse slice reveals an oblong shape lying obliquely in postero-anterior and lateromedial directions. The triangle of Kager is often echoic (Figs. 1, 2). Tendinosis is shown on sonography by a larger fusiform hypoechoic region in the tendon's longitudinal section. The tendon's thickness ranges from 5 to 15 millimetres (with 10 millimetres being the norm), and its edges are often imperceptible. Degeneration or, in chronic forms, calcification and microcalcification cause the structure to be dishomogeneous, with hypoechoic and hyperechoic patches alternating with one another. The tendon's rounded appearance cross-sectionally is further evidence of its hypoechoic nature. It seems that Kager's triangle has a low echo. In cases of tendinopathy, tendon antero-posterior diameters were consistently bigger than those of healthy individuals (fig. 3and4). The diameter in antero-posterior direction was statistically significant. Twenty (57.1%) of the 35 tendinopathic tendons had localised areas of hypoechoic signal, ten (28%) had more diffuse hypoechoic to the point where a normal fibrillar pattern could not be identified, and three (8%), located in the midportion and one at the calcaneal insertions, had localised calcification (figure 5 and 6). In 15 cases (42.8%), there was vascularity inside the tendon itself. Color Doppler imaging showed hyperemia in 3 of 12 (34% of all instances) tendons with increased Kager's fat pad echogenicity and paratenon thickness.

Fifteen tendonitis cases (42.8%) were linked to fluid in the retrocalcaneal bursa (3 mm thick). Although tendinopathic tendons were more likely to have bursal distension than normal tendons, this difference did not reach statistical significance. The calcaneal insertion was smooth in 5 (14%), irregular in 10(28%), and contained calcaneal spurs in 20(58%).

Table 1. Various Measurements of Achilles tendon

Measurement of Achilles tendon	CASES	CONTROLS
MYOTENDINIOUS JUNCTION	11mm $\pm$ 1.7mm	4.4mm $\pm$ 0.05mm
MID PORTION	11.5mm $\pm$ 1.5mm	4.1mm $\pm$ 0.04mm
AT CALCANEAL INSERTION	10mm $\pm$ 1.7mm	4.0mm $\pm$ 0.03mm



Fig. 1



Fig. 2

Figure 1,2 Longitudinal and Transverse ultrasound images of a normal Achilles tendon.

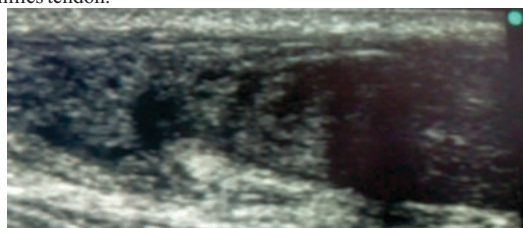


Fig.3

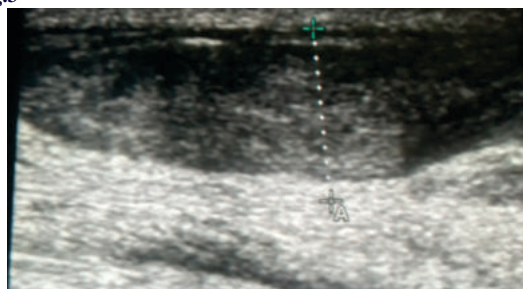


Fig.4

Figure 3,4. Transverse ultrasonographic image of an Achilles tendinopathy. The tendon is thickened, heterogeneous, and hypoechoic

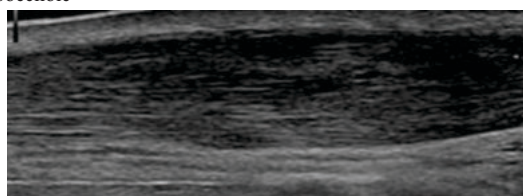


Fig. 5

Fig. 5 Longitudinal extended field of view ultrasonography image of Achilles tendinopathy demonstrating fusiform thickening of the Achilles tendon .

DISCUSSION

As a fast, safe, and reliable method of establishing the size and localization of tendinous lesions, as well as assessing their severity, sonography is finding growing application in the study of illnesses of the musculoskeletal system, especially those affecting the tendons (8). Technology advancements such as higher frequency transducers (7-15 MHz), smaller footprint probes (9), power Doppler, increased field of view capabilities, 3D imaging, and tissue harmonics [10] have contributed to this rising need. When compared to MRI, MSK US (Musculoskeletal Ultrasonography) provides a number of significant benefits, including being easily assessable, having a short scan time, and being more patient-friendly. Contralateral comparison is also made simple with MSK US (11-18). Our findings corroborate those of prior studies indicating a reduction in antero-posterior diameter and an increase in radial width of the tendon in normal persons just before its insertion into the calcaneus (19). Increase in tendon diameter, changed fibrillar echotexture, and increased tendon vascularity are all sonographic signs that may imply a diagnosis of tendinopathy in clinical practise today. [20,21] Midtendon and calcaneal insertion sizes of tendinopathic tendons were substantially larger compared to healthy subjects. Most instances of tendinopathy were characterised by focal or generalised thickening of the Achilles tendon. Similar to earlier studies (13,24), the tendon thickness of individuals with a clinical diagnosis of tendinopathy varied from 7 mm to 16 mm. It has been shown that the typical human Achilles tendon has a flat to concave anterior surface and an AP (Antero-posterior) diameter of 4 mm to 7 mm. (12,25,26) Comparatively, Zanetti et al. [21] showed tendon vascularity in 30/55 (54.5%) painful tendons, which is consistent with our findings. Calcification of a tendon is a somewhat unusual occurrence. (22,23). In 34% of instances with Achilles tendinopathy, paratenon thickening and enhanced echogenicity of the Kager's fat pad were seen, but in normal participants, none of these findings was present. Regularities in the calcaneus's shape and the presence of retrocalcaneal bursal fluid are frequent observations in Achilles tendinopathy. Sonography indicates early peritendinous abnormalities in the inflammatory stages of Achilles tendinopathies. A tendon's natural anatomical shape is lost in chronic forms with intratendinous degeneration, with the volume increasing and the tendon taking on a rounded spindle-like appearance, with the characteristic oval shape in transverse section being lost.

One of our study's flaws is that we didn't check for any correlations to surgery or pathology. Second we did not include tendon ruptures in our analysis. Finally, since all exams were done by the same radiologist, interobserver reliability could not be determined.

CONCLUSION

The achilles tendon seems to respond well to high resolution ultrasound (HRUS), suggesting that this modality is a great way to learn about the tendon's internal architecture. The sonographic image is a perfect match with the clinical one. Our research shows that the most prominent sonographic features of Achilles tendinopathy are an enlarged mid and distal tendon, a disrupted fibrillar pattern, and an increase in tendon vascularity.

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