ISSN: 03875547
Volume 45, Issue 01, February, 2022

Inter-method agreement between ultrasound and MRI in assessment of ankle pain

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Keywords:
Ankle pain, MSK ultrasound, tendo-Achilles, MRI ankle

ABSTRACT

Ankle pain is one of the most common complaints patients of various age groups present with to various out-patient clinics as well as emergency department. The diagnosis of the underlying condition by clinical examination alone can be problematic in many cases raising the need for aiding diagnostic tools namely serological tests and different imaging modalities. In our study we compared the diagnostic accuracy of ultrasound examination of the ankle joint with that of the MRI in 40 patients who presented to Ain-Shams University Hospitals out-patient clinical complaining of ankle pain.

1. INTRODUCTION

Contusions, strains, ligament/tendon rips, dislocations, and anomalies caused by vascular, endocrine, and rheumatological illnesses are all common injuries to the ankle joint. Other abnormalities, such as infections and malignancies, may also be discovered [1]. In several rheumatological and orthopaedic disorders, musculoskeletal ultrasonography (MSKUS) is becoming more prominent as a diagnostic technique. It was originally used in rheumatology in 1974 to distinguish between Baker's cyst and thrombophlebitis. MSKUS has been used in the evaluation of patients with rheumatoid arthritis and the monitoring of their response to treatment for a few years now [2], [3]. Since then, the reliability and validity of MSKUS have been questioned. However, until the early years of this century, the use of ultrasonography as a diagnostic tool in the evaluation of musculoskeletal problems was still debatable, with a slew of studies being conducted to determine its diagnostic usefulness. Since then, a great deal of study has been done to look into its use and applications in various musculoskeletal disorders [4]. Because The ankle region is rich in tendons, muscles, blood vessels, nerves, and joints, MSKUS has been shown to demonstrate numerous joint, tendon, muscle, bone, and other soft tissue abnormalities, and hence has several uses in the assessment of foot diseases [5]. Ankle diseases have been evaluated using a variety of imaging modalities, including X-rays and CT scans. Ultrasound, on the other hand, has various advantages over those modalities in terms of tendons and ligaments evaluation, as well as the capacity to do dynamic assessments, which is occasionally necessary in situations of ligamentous injuries and dislocations [6]. Ultrasound is also less expensive, more widely available, and does not emit any ionising radiation [7].

Due to its capacity to represent tendons, ligaments, and joints with remarkable accuracy as well as significant sensitivity in illustrating deep soft tissue, bone marrow, and joint cartilage diseases, MRI has become widely

employed in the assessment of numerous musculoskeletal problems. MRI also provides a greater range of view and overcomes the ultrasound waves' limited penetration [8]. MSKUS, on the other hand, enables for dynamic assessment as well as compression during examination, allowing for the distinction of tendinopathy from partial tears [9]. Other benefits include the opportunity to analyse the contra-lateral side for comparative purposes, as well as the reduced cost, the absence of contra-indications such as cardiac pacemakers, and the ability to investigate areas adjacent to the metallic prosthesis.

2. FINDINGS AND DISCUSSION

Our study included 45 patients: (52.5%) females and (47.5%) males manifesting various ankle disorders with a mean age of about 37 years ± 15. They were presented by local ankle swelling = (5%), history of recent trauma to the ankle= (55%) or signs of ankle joint inflammation= (20%). The underlying pathology was classified as either tendo-ligamentous, osseous, or related to other soft tissue pathology (Table 1).

Table 1 Patients Characteristics

Variable	Value
Age (years), mean ± SD (range)	(16 to 68)
Sex, F/M	23 /22
Clinical presentation	
Local swelling	(5%)
History of recent trauma	(55%)
Signs of inflammation	(20%)

2.1 Inter-Method agreement between MRI and US in detecting ankle pathology:

Cohen's kappa coefficient test was performed to assess US and MRI agreement in detection of various ankle lesions and pathologies.

As regards the different ankle lesions, perfect agreement of 1.0 was achieved between MRI and US in detection of non-insertional tendinopathy, osteoarthritis, enthesopathy, osteochondral lesions and synovitis.

Moderate agreement was found in detection of sinus tarsi (K coefficient of 0.48). Substantial agreement between both modalities was found in detection of: Cysts (K coefficient 0.72), ligamentous sprain (K coefficient 0.93), effusion (K coefficient 0.90), partial tendon tear (K coefficient 0.79), spur/osteophyte (K coefficient 0.89), subcutaneous edema (K coefficient 0.88) and ligamentous tear (K coefficient 0.84).

No agreement between both modalities was found in detection of bone marrow edema, coalition and avulsion.

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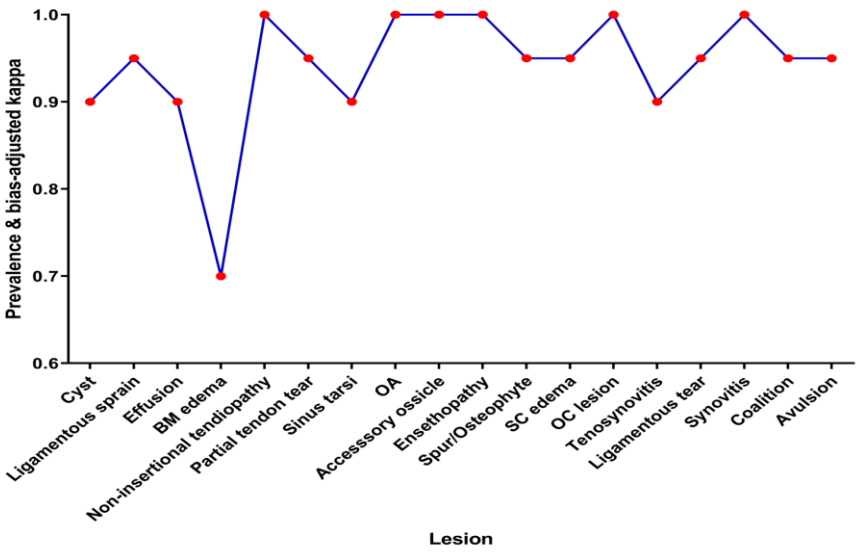

Figure 3. Agreement between US and MRI for diagnosis of various lesions.

As regards the underlying pathologies, a high inter-method agreement was noted between MRI and US in detection of tendo-ligamentous and soft tissue pathologies (K coefficient 0.87 and 0.80 respectively). While moderate agreement was found between both modalities is detection of osseous pathologies (K coefficient 0.57).

2.2 Constraint

While our study supported the used of US as an accurate diagnostic tool for detecting tendo-ligamentous and soft tissue related ankle lesions, we couldn't state that US could ultimately replace the need for the more costly, time-consuming MRI in detecting ankle joint abnormality. This is obviously much needed to elevate a great health burden, and allow easier accessibility for patients to get more timely, less expensive, and less tiring imaging experience.

3. Conclusion

According to the findings of our investigation, MRI detected more lesions around the ankle joint than US. This was particularly true for osseous pathological lesions such bone marrow edoema, coalition, and avulsion fracture. However, lesions such as varicosities, calcifications, and contra-lateral planter faciitis could only be seen with US. This disparity between US and MRI could be ascribed to both modalities' fundamental technical qualities, with US having more restrictions when it comes to diagnosing bone lesions that are not related to the cortical surface. So, with the exception of osteophytes/spurs, which appear as projections on the cortical surface of the affected bone, US waves are unable to penetrate further into bone tissue to detect fractures or other abnormalities [10].

A paucity of studies had been performed to assess inter-method agreement between MRI and US in detecting ankle joint abnormalities. In our study we performed this analysis which puts more weight into our concluded results by framing it with an overall assumption of how close the findings noted in MRI and US were as regards assessing the ankle joint. As regards this matter, our study found that a high inter-method agreement was noted between MRI and US in detection of tendo-ligamentous and soft tissue pathologies. While moderate agreement was found between both modalities is detection of osseous pathologies [11].

US has a good diagnosis accuracy for tendo-ligamentous and soft-tissue associated ankle pathologies, but it

has a lower diagnostic accuracy for osseous linked ankle pathologies. Although MRI remains the dominant technique for diagnosing bone abnormalities, US may be the only instrument capable of diagnosing specific ankle lesions, with accuracy results comparable to MRI in diagnosing other lesions. We believe it is still too early to declare that US can completely replace MRI in the detection of ankle lesions; nonetheless, for the majority of regularly encountered ankle pathologies, US can be sufficient for diagnosing and monitoring tendinous, ligamentous, and soft tissue lesions [12].

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