ESMRMB 2013
European Society for Magnetic Resonance in Medicine and Biology
30th Annual Scientific Meeting, October 3–5, Toulouse/FR

Magnetic resonance imaging in chronic ankle inversion trauma

e-Poster: 457

Congress: ESMRMB 2013

Type: Scientific Paper

Topic: Clinical Application / Musculoskeletal / Imaging

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MeSH:

Lateral Ligament, Ankle [A02.513.514.162.500]

Ankle Injuries [C21.866.558.100]

Keywords: MRI, Ankle, Inversion injury, Chronic trauma

1. Purpose

Due to a numerous combinations of movements in a moment of ankle inversion trauma, different types of injures can develop. We present the pattern of injuries in chronic ankle inversion trauma and show the relations between them and injured ankle ligaments and tendons.

2. Material and Methods

Analysis of complex clinical, radiographic and magnetic resonance investigations of 76 patients (male – 47, female – 29, average age – 39,7 years) with acute inversion trauma was undertaken. All the patients had gone through routine ankle radiography to rule out fracture. MR imaging was performed on 1,5 T scanners, employing routine imaging protocols that included 5 basic sequences: sagittal T1-weighted (TR - 427 ms; TE -13 ms; averages - 2; matrix - 320x256; slice thickness - 3 mm; dist. factor – 0; FOV – 16x16 cm), sagittal PD-weighted with fat saturation (TR – 2,700 ms; TE - 15 ms; averages - 2; matrix, 320x256; slice thickness - 3 mm; dist. factor – 0; FOV – 16x16 cm), axial PD-weighted with fat saturation (TR -3,930 ms; TE - 15 ms; averages - 2; matrix - 384x192; slice thickness – 2,5 mm; FOV – 10x19,9 cm), coronal PD-weighted with fat saturation (TR -4,150 ms; TE - 21 ms; averages - 2; matrix, 320x134; slice thickness – 2,5 mm; FOV – 9,2x16,4 cm), oblique coronal 3D-CISS (Constructive Interference in Steady State sequence) (TR – 12,8 ms; TE – 6,4 ms; averages - 2; matrix, 384x208; slice thickness – 1,2 mm; FOV – 9,8x18 cm). MR imaging interpretation of the ankle inversion injures was performed by consensus by two musculoskeletal radiologists.

3. Results

The pathologic findings revealed in chronic inversion trauma on MRI were: chronic ATFL (anterior talofibular ligament) tear - n=62, 76,5%; chronic CFL (calcaneofibular ligament) tear - n=70, 86,4%; chronic PTFL (posterior talofibular ligament) tear - n=1, 1,2%; PBT (peroneus brevis tendon) tendinosis - n=41, 50,6%; PLT (peroneus longus tendon) tendinosis - n=32, 39,5%; peroneal tendons tenosynovitis - n=40, 49,4%; osteoarthritis of the ankle joint - n=15,18,5% in different combinations (Table 1).

Table 1. The isolated and associated pathologic findings revealed on MRI in chronic ankle inversion injury.

Pathologic changes and its combinations	Number of patients	
	Abs.	%
Anterolateral ankle impingement	7	8,6
Anterolateral ankle impingement, degenerative changes of CFL	5	6,1
Anterolateral ankle impingement, PT tendinosis, degenerative changes of CFL	4	4,9
Anterolateral ankle impingement, posterior ankle impingement, degenerative changes of CFL	1	1,3
Anterolateral ankle impingement, STS, PT tendinosis, degenerative changes of CFL	1	1,3
Anterolateral ankle impingement, STS, PT tendinosis, degenerative changes of CFL, PTFL, deltoid ligament	1	1,3
Posterior ankle impingement, degenerative changes of CFL	2	2,6
STS, PT tendinosis, degenerative changes of CFL	10	12,4
STS, PT tendinosis, degenerative changes of ATFL and CFL	7	8,6
STS, degenerative changes of ATFL and CFL	7	8,6
STS, OLT, PT tendinosis, degenerative changes of CFL, PTFL, deltoid ligament	1	1,3
OLT, degenerative changes of ATFL	4	4,9
OLT, degenerative changes of ATFL and CFL	7	8,6
OLT, PT tendinosis, degenerative changes of ATFL and CFL	4	4,9
PT tendinosis, degenerative changes of CFL	7	8,6
PT tendinosis, degenerative changes of ATFL and CFL	13	16,0
Total	81	100

Abbreviations: ATFL - anterior talofibular ligament; CFL - calcaneofibular ligament; PTFL - posterior talofibular ligament; PT - peroneal tendons; OLT - osteochondral lesion of the talar dome; DL - deltoid ligament, STS - sinus tarsi sindrome.

The most often pathologic changes to be revealed were peroneal tendon abnormalities (Fig. 1) (59,2%), sinus tarsi syndrome (Fig.2) (33,3%), anterolateral impingement syndrome (Fig.3) (23,5%), osteochondral lesion of the talus (19,8%) in different combinations with lateral ligament injures.

Logical dependence of STS and CFL chronic tear (X^2=30,896; p<0,001), STS and peroneal tendons

abnormalities (X^2=27,38; p<0,001), peroneal tendons abnormalities and CFL chronic tear (X^2=30,9; p<0,001) were ascertained. Thus, it can be concluded that there is a strong anatomic and functional relationship between structures of sinus tarsi, peroneal tendons and calcaneofibular ligament.

4. Conclusion

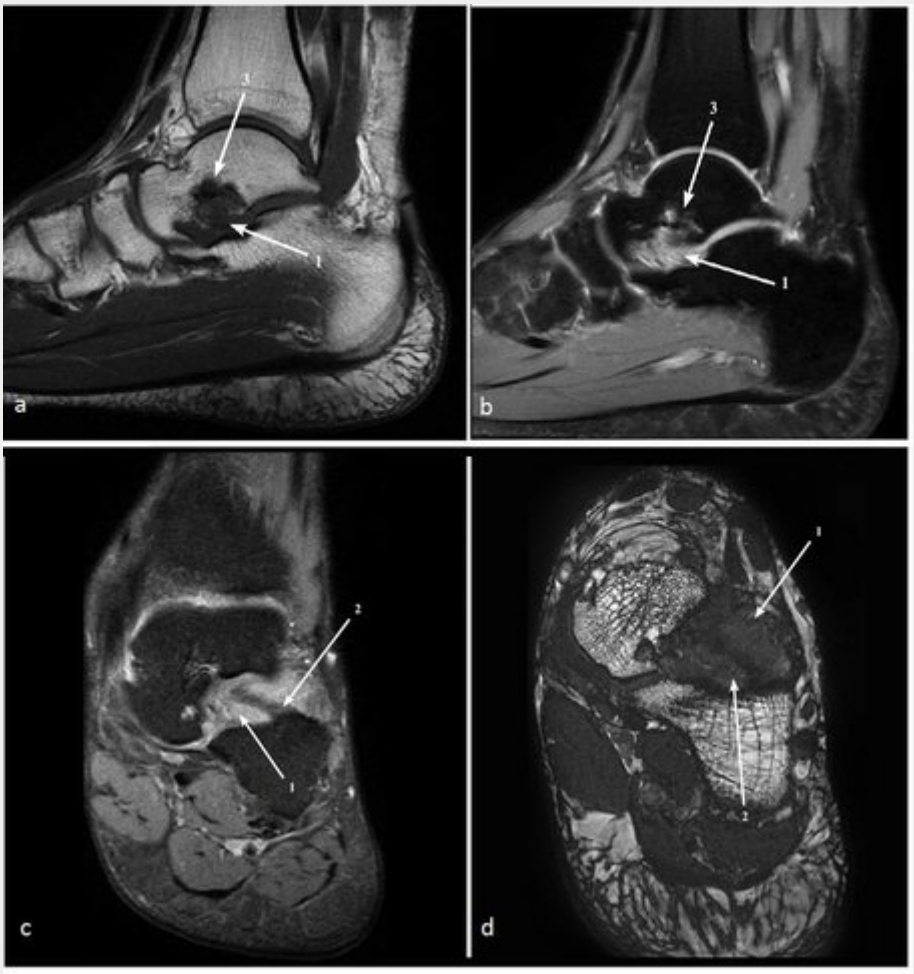
Different types of pathologic conditions can occur in chronic ankle inversion trauma. Most of them were associated with lateral ligament chronic tears. As the logical dependence of STS, CFL chronic tear and peroneal tendon abnormalities were ascertained, one can assume that there can be the anatomical and pathophysiological relations between injures of these structures.

5. Mediafiles

Figure 1. Peroneal tendons tendinosis.

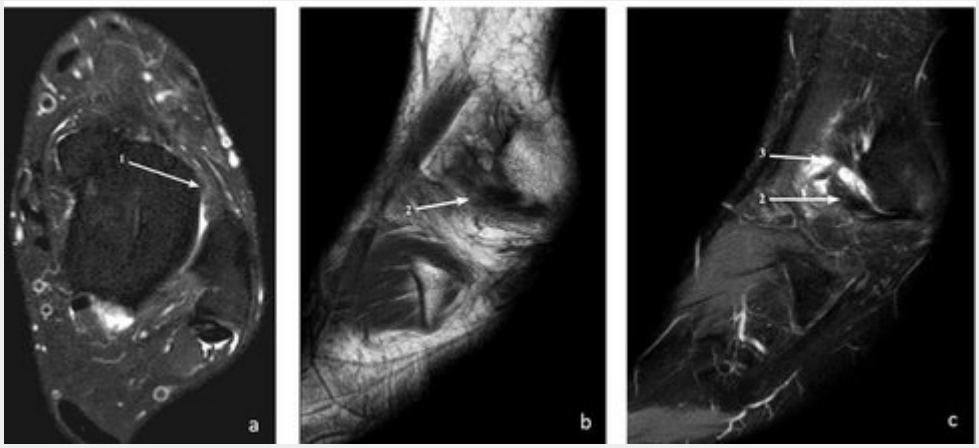
a. PD FS, axial plane. b. PD FS, oblique coronal plane. c. T1, sagittal plane. d. T2 CISS, coronal plane. The longitudinal split of peroneus brevis tendon (1) at the level of retromalleolar groove (2); peroneal tendons tenosynovitis (3); the structure of peroneus longus tendon (4) is normal.

Figure 2. Sinus tarsi syndrome.



a. T1, sagittal plane. b. PD FS, sagittal plane. c. PD FS, coronal plane. d. T2 CISS, oblique coronal plane. Fibrosis of the synovial recess fat (1); poor defined degenerative cervical ligament (2); multiple subcortical erosions of the sinus tarsi roof (3).

Figure 3. Anterolateral ankle impingement syndrome.



a. PD FS, axial plane. b. T1, sagittal plane. c. PD FS, sagittal plane. Soft tissue thickening in the anterolateral gutter of the ankle joint (1); degenerative changes of the anterior talofibular ligament (2) and Bassett's ligament (3).