## UNIVERSITY OF LEEDS

This is a repository copy of *Development and reliability of a preliminary Foot Osteoarthritis Magnetic Resonance Imaging Score*.

White Rose Research Online URL for this paper: http://eprints.whiterose.ac.uk/113779/

Version: Accepted Version

## Article:

Halstead, J, Martín-Hervás, C, Hensor, EMA et al. (4 more authors) (2017) Development and reliability of a preliminary Foot Osteoarthritis Magnetic Resonance Imaging Score. Journal of Rheumatology, 44 (8). pp. 1257-1264. ISSN 0315-162X

https://doi.org/10.3899/jrheum.160617

© 2017. This is a pre-copy-editing, author-produced PDF of an article accepted for publication in The Journal of Rheumatology following peer review. The definitive publisher-authenticated version Halstead, J, Martín-Hervás, C, Hensor, EMA et al. (4 more authors) (2017) Development and reliability of a preliminary Foot Osteoarthritis Magnetic Resonance Imaging Score. Journal of Rheumatology, 44 (8). pp. 1257-1264 is available online at: http://dx.doi.org/10.3899/jrheum.160617

## Reuse

Items deposited in White Rose Research Online are protected by copyright, with all rights reserved unless indicated otherwise. They may be downloaded and/or printed for private study, or other acts as permitted by national copyright laws. The publisher or other rights holders may allow further reproduction and re-use of the full text version. This is indicated by the licence information on the White Rose Research Online record for the item.

## Takedown

If you consider content in White Rose Research Online to be in breach of UK law, please notify us by emailing eprints@whiterose.ac.uk including the URL of the record and the reason for the withdrawal request.



eprints@whiterose.ac.uk https://eprints.whiterose.ac.uk/ Table 1 Definitions of each MRI feature and semi-quantitative score

MRI Feature and anatomical location	Definition	Score
Joint space narrowing (JSN)	Increased signal in T2-weighted	JSN was scored as 0 to 3:
All the joints of the hindfoot, tarsus,	sequences (fat suppressed or inversion	0 = Normal thickness and signal
midfoot and metatarsophalangeal joints.	recovery sequences) and or loss of joint	1 = Increased signal
	space as a partial or complete loss on T1-	2 = Partial-thickness focal loss
	weighted images and or gradient echo	3 = Full thickness loss of joint space
	sequence. Visible in two planes.	(>=75% of the region)
Osteophytes	Abnormal bone formation in the	Osteophytes were scored as 0 to 3:
All of the joints of the hindfoot, tarsus,	periarticular region on T1-weighted	0 = None, 1 = Mild, 2 = Moderate,
midfoot and metatarsophalangeal joints	images.	3 = Large
Effusion/synovitis	The presence of increased intra articular	Effusion/synovitis was scored as 0 to 1:
All of the joints of the hindfoot, tarsus,	fluid, demonstrated as high signal	0 = Absent and 1 = Present
midfoot and metatarsophalangeal joints	intensity on T2-weighted sequences (fat	
	suppressed or inversion recovery	
	sequences). Visible in two planes: coronal	

	and sagittal.	
Subchondral cyst	A sharply marginated subchondral bone	Cysts were scored as 0 to1:
All of the joints of the hindfoot, tarsus,	lesion that showed increased signal	0 = Absent and 1 = Present
midfoot and metatarsophalangeal joints	intensity on T2-weighted images (fat	
	supressed or inversion recovery	
	sequences). Visible in two planes, without	
	a cortical break.	
Bone marrow lesion (BML)	An area of ill delineated signal within the	BML was scored as 0 to 3, according to
All bones of the hindfoot, tarsus, midfoot	trabecular bone that shows decreased	the proportion of bone with abnormal
and metatarsals.	signal intensity_on T1-weighted images	signal:
	and increased signal intensity onT2-	0 = None, 1 = 1%–33%, 2 = 34%–66%,
	weighted images (fat suppressed or	3 = 67%–100%
	inversion recovery sequences). Visible in	
	at least in two planes.	Except in the long bones of the
		metatarsals, where the BML was scored
		in three regions per bone:

		(i) At the proximal joint, the base (up to
		the epiphysis and metaphysis) was
		included in the tarsometatarsal and
		scored 0-3.
		(ii) At the central region, metatarsal shaft
		(diaphysis) was divided into proximal,
		central and distal in one third increments
		(33%) on a bone level and scored 0-3.
		(iii) At the distal region the head (to the
		epiphysis and metaphysis) was included
		in the metatarsophalangeal joint and
		scored 0-3.
Bone erosion	A bone defect in the cortical and juxta-	Erosions were scored from 0 to 3:
All bones of the hindfoot, tarsus, midfoot	cortical region, with sharp margins visible	according to the volume of the erosion as
and metatarsals.	on T1-weighted images and with a loss of	a proportion of the joint margin.
	normal low signal intensity of cortical bone	0 = No erosion; 1 = 1%–33%,

	and loss of normal high signal intensity of	2 = 34%–66%, 3 = 67%–100%
	marrow fat. Visible in two planes with a	
	cortical break seen in at least one plane.	
Enthesopathy	A BML pattern, where altered signal	Enthesopathy scored as 0 to 1:
Locations at the insertion of the tendons:	intensity within the bone was adjacent to	0 = Absent and 1 = Present
posterior tibial, anterior tibial, flexor	insertions of anatomically defined	
digitorum, flexor hallucis, extensor	ligaments and/or tendons of the foot.	
digitorum, extensor hallucis, peroneus	Visible in at least two planes.	
longus and peroneus brevis;		
Sites at the attachments of the Lisfranc		
and intertarsal ligament complex.		
Sub-tendon BML (functional enthesopathy)	A BML pattern where increased signal	Sub-tendon BML was scored as 0 to 1:
All bones of the hindfoot, tarsus, midfoot	intensity within the bone was adjacent to	0 = Absent and 1 = Present
and metatarsals adjacent to the course of	the course of a tendon and away from an	
a tendon at the medial (posterior tibial, and	articular surface. Shown as hyperintensity	

anterior tibial tendons), lateral (peroneus	on T2 weighted sequences and	
longus and peroneus brevis), plantar	decreased signal intensity on T1-weighted	
(flexor digitorum and flexor hallucis longus	images. Visible in at least two planes.	
tendons) and dorsal (extensor digitorum		
and extensor hallucis longus tendons)		
regions.		
Tenosynovitis	Decreased signal intensity on T1-	Tenosynovitis was scored 0 to 3:
Tendon locations: Posterior tibial, anterior	weighted images and increased signal on	0 = Normal
tibial, flexor digitorum, flexor hallucis,	T2-weighted (fat supressed or inversion	1 = <2 mm peritendinous effusion.
extensor digitorum, extensor hallucis,	recovery sequences) in a region of the	2 = > 2 and <5 mm peritendinous effusion
peroneus longus and peroneus brevis	tendon with an enclosing tendon sheath.	and/or thickening and high intra-tendinous
	Visible in at least two planes.	signal intensity on T2-weighted
		sequences.
		3 = > 5 mm peritendinous effusion and/or
		higher thickening and high intra-tendinous
		signal intensity.

Ligament abnormality	Thickening and high signal intensity seen	Ligament abnormality was scored 0 to 1:
Ligament locations: Lisfranc and inter-	on T2-weighted images (fat suppressed or	0 = Absent and 1 = Present
tarsal ligament complex.	inversion recovery sequences) with or	
	without disruption. Visible in at least two	
	planes: axial and coronal.	