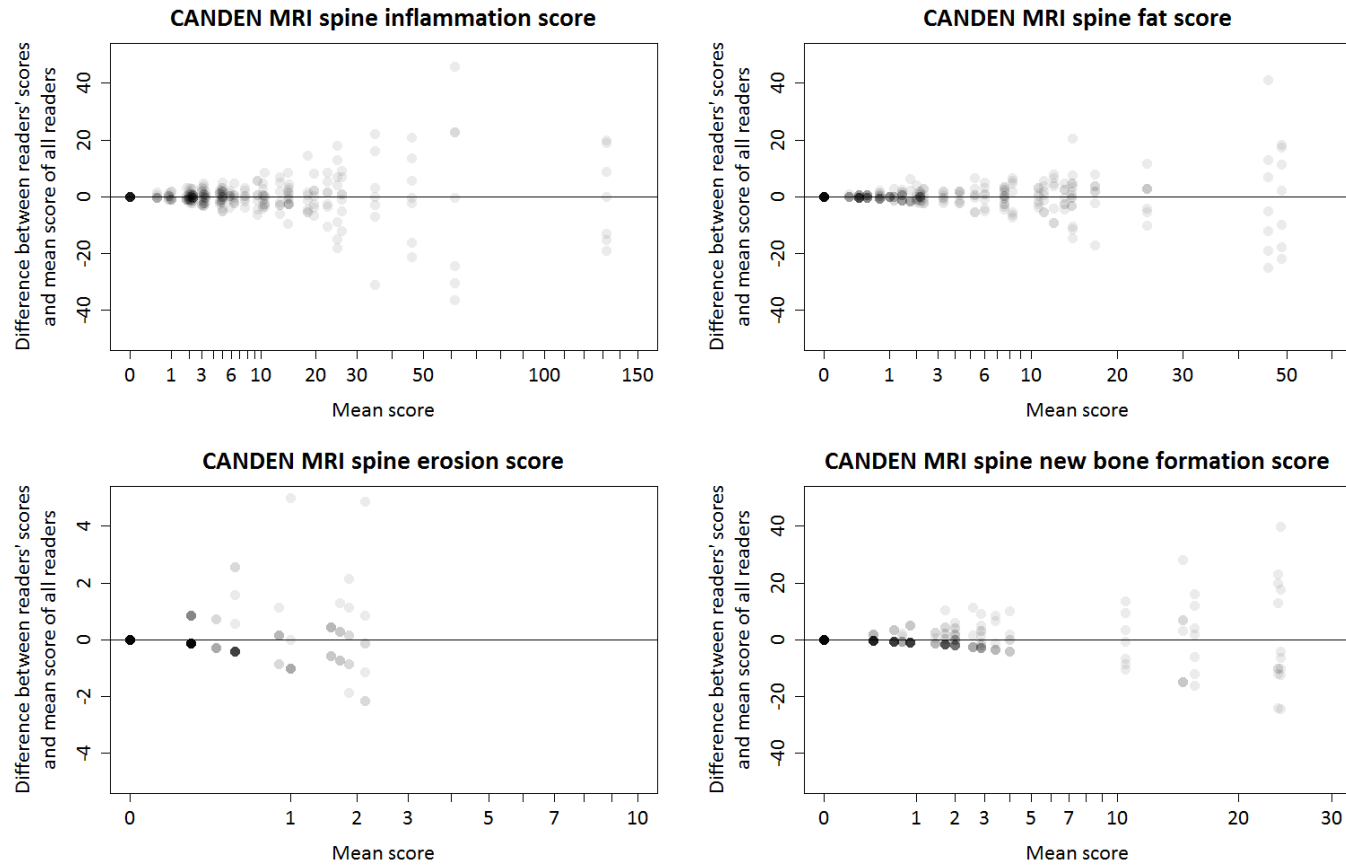


Supplementary material to “The Canada-Denmark MRI scoring system of the spine in patients with axial spondyloarthritis: updated definitions, scoring rules and inter-reader reliability in a multiple reader setting”

Supplementary Figure 1. Agreement plots with data from all 7 readers compared to the mean score of all readers (x-axes were transformed to allow better visualization of data clustering at low values using square root transformation).



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Supplementary Table 1. Distribution of scores at baseline and change as assessed by each of the 7 readers

		Reader 1	Reader 2	Reader 3	Reader 4	Reader 5	Reader 6	Reader 7
CANDEN MRI spine inflammation score, range 0-614	Baseline	14.6 (3; 1-16)	14.3 (5; 2-14)	10.8 (6; 2-9)	12.6 (4; 0-16)	14.5 (7; 2-14)	11.8 (5; 2-12)	14.0 (6; 2-15)
	Change	-12.3 (-2; -12 to 0)	-11.2 (-3; -13 to 0)	-8.6 (-3; -8 to 0)	-10.4 (-3; -12 to 0)	-12.1 (-3; -9 to 0)	-9.1 (-3; -9 to 0)	-11.9 (-4; -12 to -1)
CANDEN MRI spine fat score, range 0-510	Baseline	4.3 (0; 0-4)	9.4 (2; 0-11)	8.1 (4; 1-10)	5.0 (1; 0-8)	8.2 (3; 1-11)	5.4 (1; 0-6)	7.6 (2; 0-9)
	Change	1.1 (0; 0-1)	1.6 (1; 0-2)	1.6 (0; 0-3)	1.2 (0; 0-1)	1.6 (0; 0-3)	1.4 (1; 0-2)	1.9 (0; 0-3)
CANDEN MRI spine bone erosion score, range 0-208	Baseline	0.2 (0; 0-0)	0.6 (0; 0-1)	0.2 (0; 0-0)	0.3 (0; 0-0)	0.1 (0; 0-0)	0.3 (0; 0-0)	0.5 (0; 0-0)
	Change	-0.1 (0; 0-0)	0.0 (0; 0-0)	0.0 (0; 0-0)	0.0 (0; 0-0)	-0.1 (0; 0-0)	-0.1 (0; 0-0)	-0.3 (0; 0-0)
CANDEN MRI spine new bone formation score, range 0-460	Baseline	4.1 (0; 0-2)	5.7 (0; 0-6)	2.5 (0; 0-4)	2.4 (0; 0-2)	0.4 (0; 0-0)	3.2 (0; 0-3)	3.5 (0; 0-0)
	Change	0.0 (0; 0-0)	0.4 (0; 0-0)	0.4 (0; 0-0)	-0.1 (0; 0-0)	0.0 (0; 0-0)	0.0 (0; 0-0)	1.0 (0; 0-0)

Scores are reported as mean (median; range). CANDEN, Canada-Denmark; MRI, magnetic resonance imaging.

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Supplementary Table 2. Components of the CANDEN MRI spine inflammation score: Scores and inter-reader reliability.

	----- Baseline -----					----- Change at week 52 -----				
	Score	Percentage with score ≥ 1	Single-measure ICC	Average-measure ICC	Kappa at lesion-level	Score	Single-measure ICC	Average-measure ICC	Kappa at lesion level	Wilcoxon test, p-value
All sites	13.2 (5; 0-132)	85%	0.91	0.95	0.60	-10.8 (-3; -113 to 1)	0.88	0.94	0.47	<0.001
Vertebral body corner inflammation subscore	8.0 (3; 0-89)	80%	0.93	0.97	0.68	-6.4 (-2; -75 to 1)	0.90	0.95	0.53	<0.001
Spondylodiscitis subscore	1.8 (0; 0-25)	28%	0.84	0.91	0.64	-1.3 (0; -22 to 0)	0.82	0.90	0.48	0.003
Facet joint inflammation subscore	1.0 (0; 0-13)	20%	0.78	0.88	0.45	-0.8 (0; -13 to 2)	0.79	0.88	0.45	0.001
Posterolateral elements inflammation subscore	2.4 (0; 0-19)	35%	0.55	0.71	0.30	-2.2 (0; -18 to 1)	0.55	0.71	0.28	<0.001
Vertebral bodies subscore	10.2 (4; 0-118)	80%	0.93	0.96	0.66	-8.1 (-2; -100 to 1)	0.91	0.95	0.51	<0.001
Posterior elements subscore	3.0 (0; 0-27)	40%	0.72	0.84	0.36	-2.7 (0; -26 to 3)	0.74	0.85	0.37	<0.001
Anterior corner lesions	3.7 (2; 0-24)	75%	0.89	0.94	0.72	-2.4 (-1; -19 to 3)	0.81	0.89	0.54	<0.001
Posterior corner lesions	1.9 (0; 0-35)	33%	0.93	0.97	0.69	-1.7 (0; -32 to 0)	0.92	0.96	0.54	<0.001
Anterolateral vertebral body lesions	2.3 (0; 0-29)	30%	0.86	0.93	0.54	-2.1 (0; -24 to 0)	0.81	0.90	0.49	<0.001
Posterolateral vertebral body lesions	0.5 (0; 0-4)	20%	0.20	0.33	0.14	-0.4 (0; -3 to 0)	0.22	0.36	0.11	<0.001
Transverse process	0.7 (0; 0-6)	23%	0.47	0.64	0.40	-0.6 (0; -6 to 0)	0.47	0.64	0.39	0.002
Rib	1.1 (0; 0-8)	25%	0.44	0.62	0.28	-1.0 (0; -7 to 0)	0.46	0.63	0.27	0.002
Spinous process	0.1 (0; 0-1)	0%	0.26	0.41	0.00	0.0 (0; -1 to 0)	0.29	0.45	0.00	0.438
Soft tissue	0.2 (0; 0-4)	8%	0.36	0.53	0.16	-0.2 (0; -3 to 0)	0.39	0.57	0.12	0.004

Scores are mean (median; range) using the average score of all readers. ICCs and kappa values are reported as the median of 21 pairwise combinations of readers. Wilcoxon test for change between baseline and week 52. At baseline, agreement by unweighted kappa for corner lesion type a vs. corner lesion type b was median 0.37 (inter-quartile range 0.23-0.52) when limited to anterior or posterior corners where both readers had judged corner lesion as present. Vertebral body corner inflammation subscore is the sum of anterior and posterior corner lesions, anterolateral lesions and posterolateral vertebral body lesions (posterolateral vertebral lesions only at level T12/L1 to L5/S1). Spondylodiscitis subscore is the sum of non-corner vertebral body lesions. Facet joint inflammation subscore is the sum of facet joint lesions. Posterolateral elements inflammation subscore is the sum of rib, transverse process, spinous process, soft tissue inflammation and posterolateral vertebral body lesions (posterolateral vertebral body only at levels C7/T1 to T11/T12).

Supplementary material to “The Canada-Denmark MRI scoring system of the spine in patients with axial spondyloarthritis: updated definitions, scoring rules and inter-reader reliability in a multiple reader setting”

Supplementary Table 3. Components of the CANDEN MRI spine fat score, the CANDEN MRI spine bone erosion score, and the CANDEN MRI spine new bone formation score: Scores and inter-reader reliability.

	----- Baseline -----					----- Change at week 52 -----				
	Score	Percentage with score ≥ 1	Single-measure ICC	Average-measure ICC	Kappa at lesion level	Score	Single-measure ICC	Average-measure ICC	Kappa at lesion level	Wilcoxon test, P-value
Fat:										
All sites	6.8 (2; 0-49)	65%	0.79	0.89	0.55	1.5 (0; -4 to 11)	0.59	0.74	0.22	<0.001
Vertebral body corner fat metaplasia subscore	5.8 (2; 0-48)	63%	0.82	0.90	0.56	1.1 (0; -3 to 7)	0.54	0.70	0.24	0.002
Spondylodiscitis related fat metaplasia subscore	0.9 (0; 0-6)	28%	0.49	0.66	0.49	0.3 (0; -2 to 4)	0.57	0.72	0.48	0.131
Facet joint fat metaplasia subscore	0.1 (0; 0-2)	3%	0.00	0.00	0.00	0.0 (0; 0 to 1)	0.00	0.00	0.00	0.292
Costovertebral joint fat metaplasia subscore	0.1 (0; 0-2)	5%	0.10	0.19	0.00	0.1 (0; 0 to 1)	0.02	0.04	0.00	0.107
Vertebral bodies subscore	6.7 (2; 0-48)	65%	0.81	0.89	0.55	1.4 (0; -4 to 11)	0.59	0.74	0.23	0.001
Anterior corner lesions	2.7 (1; 0-15)	55%	0.73	0.84	0.58	0.7 (0; -3 to 5)	0.52	0.69	0.33	0.003
Posterior corner lesions	1.5 (0; 0-17)	25%	0.83	0.91	0.61	0.2 (0; -1 to 3)	0.29	0.45	0.22	0.071
Anterolateral vertebral body lesions	1.3 (0; 0-19)	18%	0.81	0.89	0.47	0.1 (0; 0 to 2)	0.11	0.20	0.09	0.043
Posterolateral vertebral body lesions	0.3 (0; 0-3)	15%	0.35	0.52	0.15	0.1 (0; 0 to 1)	0.25	0.40	0.11	0.020
Erosion:										
All sites	0.3 (0; 0-2)	13%	0.38	0.55	0.40	-0.1 (0; -1 to 0)	0.01	0.01	0.00	0.444
Vertebral bodies subscore	0.3 (0; 0-2)	10%	0.40	0.57	0.45	-0.1 (0; -1 to 0)	0.01	0.01	0.00	0.260
Anterior corner lesions	0.3 (0; 0-2)	10%	0.42	0.59	0.45	-0.1 (0; -1 to 0)	0.05	0.10	0.00	0.455
Posterior corner lesions	0.0 (0; 0-0)	0%	0.00	0.00	0.00	0.0 (0; 0 to 0)	0.00	0.00	0.00	1.000
Non-corner lesions	0.5 (0; 0-5)	15%	0.45	0.62	0.41	-0.1 (0; -1 to 0)	0.00	0.00	0.00	0.104
Anterolateral lesions	0.0 (0; 0-0)	0%	0.00	0.00	0.00	0.0 (0; 0 to 0)	0.00	0.00	0.00	1.000
Posterolateral lesions	0.0 (0; 0-0)	0%	0.00	0.00	0.00	0.0 (0; 0 to 0)	0.00	0.00	0.00	1.000
Facet joint	0.0 (0; 0-1)	0%	0.00	0.00	0.00	0.0 (0; -1 to 0)	0.00	0.00	0.00	1.000
New bone formation:										
All sites	3.1 (1; 0-24)	43%	0.39	0.56	0.28	0.2 (0; -1 to 3)	0.00	0.00	0.00	0.047
Vertebral bodies subscore	2.9 (1; 0-24)	43%	0.42	0.59	0.25	0.2 (0; -1 to 3)	0.00	0.00	0.00	0.047
Anterior corner lesions	1.8 (0; 0-15)	35%	0.57	0.72	0.39	0.2 (0; -1 to 2)	0.00	0.00	0.00	0.066
Posterior corner lesions	1.0 (0; 0-15)	13%	0.01	0.03	0.00	0.1 (0; 0 to 3)	0.00	0.00	0.00	0.174
Non-corner lesions	0.1 (0; 0-3)	3%	0.00	0.00	0.00	0.0 (0; 0 to 0)	0.00	0.00	0.00	1.000
Facet joint	0.2 (0; 0-6)	5%	0.00	0.00	0.00	0.0 (0; 0 to 0)	0.00	0.00	0.00	1.000

Scores are mean (median; range) using the average score of all readers. ICCs and kappa values are reported as the median of 21 pairwise combinations of readers. Wilcoxon test for change between baseline and week 52. Vertebral body corner fat metaplasia is the sum of anterior and posterior corner lesions, anterolateral lesions and posterolateral lesions (posterolateral lesions only at level T12/L1 to L5/S1). Spondylodiscitis related fat metaplasia subscore is the sum of non-corner vertebral body lesions. Facet joint fat metaplasia subscore is the sum of facet joint lesions. Costovertebral joint fat metaplasia subscore is the sum of posterolateral vertebral body lesions at levels C7/T1 to T11/T12. Erosion scores for vertebral bodies subscore only include anterior and posterior corner lesions, erosion scores for all sites only include anterior and posterior corner lesions and facet joints, i.e. non-corner lesions and anterolateral and posterolateral corner lesions are not included. For kappa values, anterior corner, posterior corner and non-corner ankylosis was taken to be the combination of two opposing corners with a score of 3, to allow sites with syndesmophytes with a score of 2, sites with ankylosis with a score of 3 as well as sites with no new bone formation to be combined in the analyses.