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## Development of the CT Syndesmophyte Score (CTSS) in patients with ankylosing spondylitis: data from the SIAS cohort

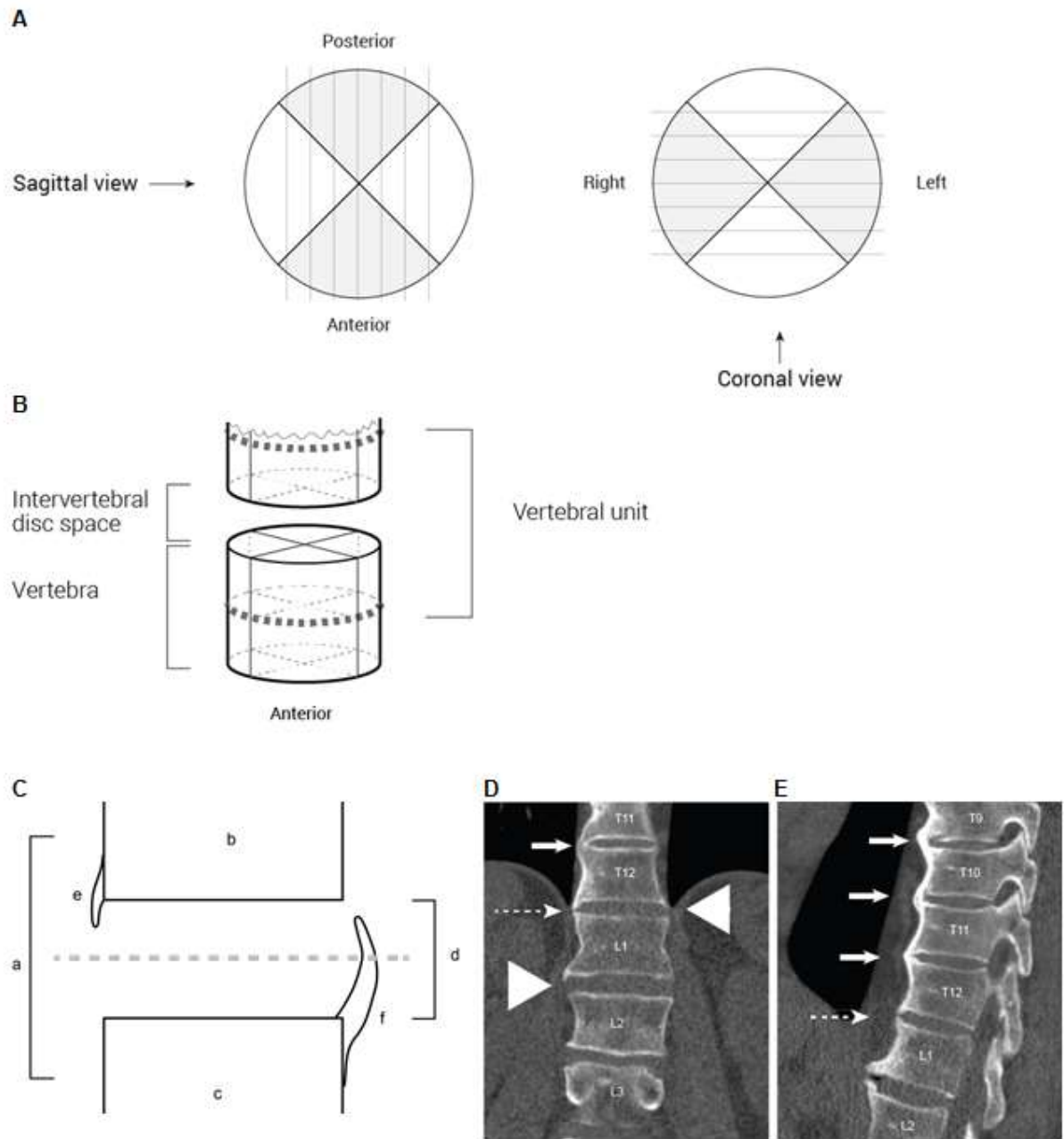
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**Figure 1. Schematic view of the views on IdCT, of a vertebral unit and of a syndesmophyte and accompanying scores according to the CTSS.**

*A: In the sagittal view, the anterior and posterior rim of a vertebra can be assessed. In the coronal view the left and right rim of a vertebra can be assessed. In both views, multiple sections per vertebrae can be assessed.*

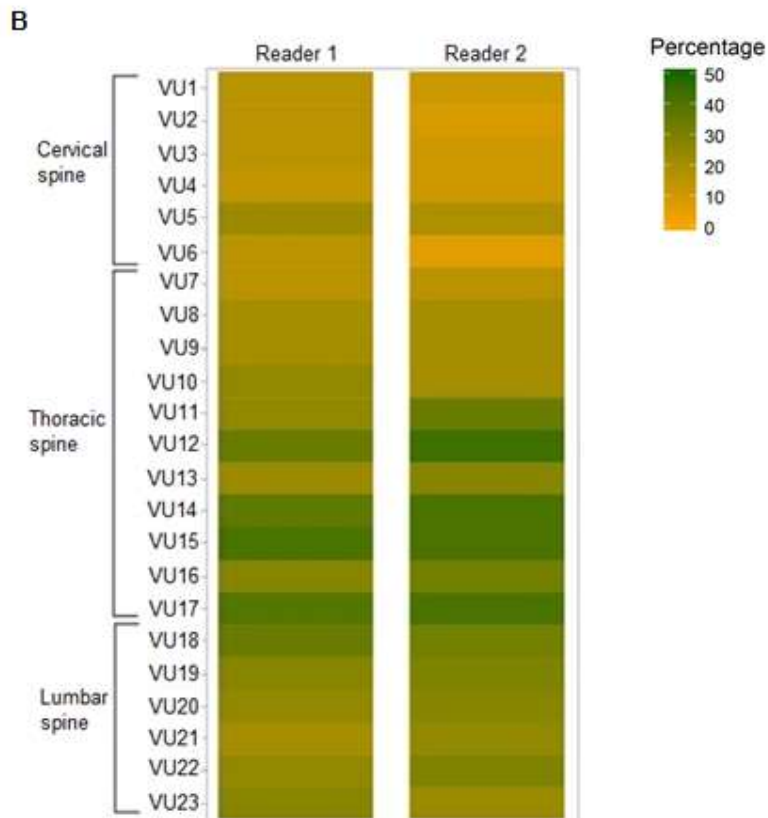
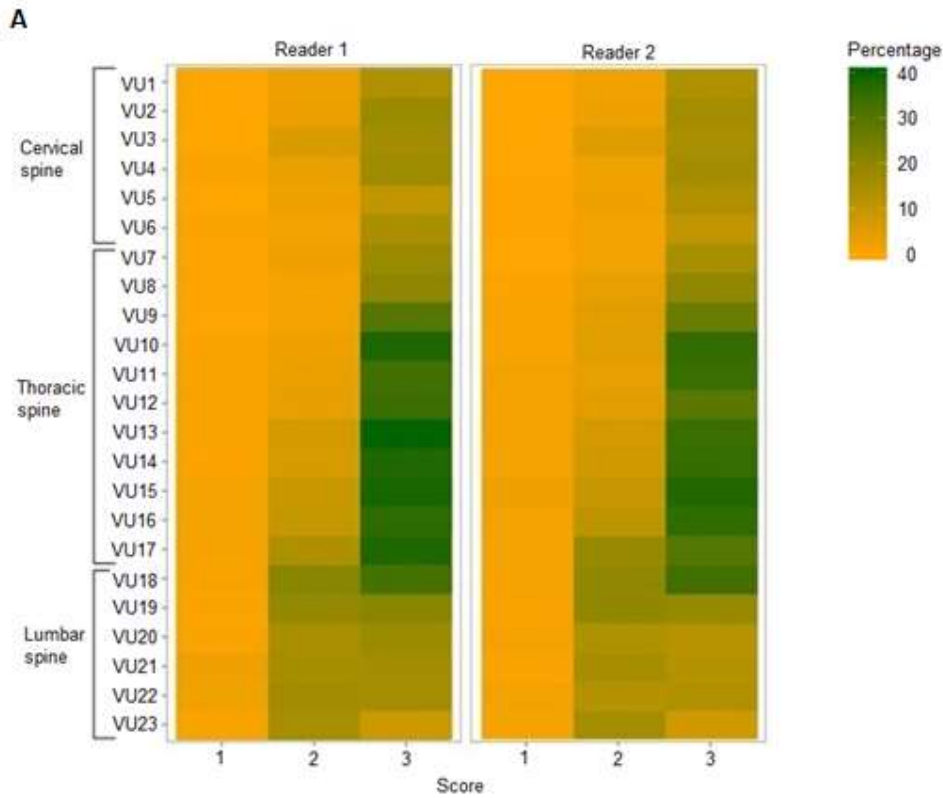
*B: A vertebral unit consists of the bottom half of a vertebra, the intervertebral disc space (with the intervertebral disc) and the superior half of the next vertebra.*

*C: Schematic view of a vertebral unit with a syndesmophyte. Depicted here is a vertebral unit (a), with the top (b) and bottom (c) vertebral bodies and the IDS (d). The grey, dotted line indicates the middle of the intervertebral disc space. The syndesmophyte originating from the top left corner (e) does not reach the middle of the IDS and is given a score of 1. The syndesmophyte originating from the bottom right corner (f) extends beyond the middle, and is given a score of 2.*

*D: Coronal CT image of the lower thoracic and lumbar spine. At T11-T12 (white arrow), a bridging syndesmophyte or ankylosis is seen. Since a bridging syndesmophyte is always scored on both sides, a score of 3 is given for both the lower right corner of T11 and the upper right corner of T12. At the right corner of T12-L1 (dashed arrow), a syndesmophyte originating from T12 extends beyond the middle of the IDS and is given a score of 2. There is no syndesmophyte at the opposing corner. At the left side of T12-L1 (arrow head), a syndesmophyte is growing from the lower corner of T12, but does not reach the middle of the IDS and is given a score of 1. The same is true for the right corner of L1-L2 (arrow head).*

*E: Sagittal CT image of the lower thoracic and upper lumbar spine. At the anterior side of the VUs T9-T10 down to T11-T12 (white arrows) bridging syndesmophytes are seen. At the anterior side of T12-L1 (dashed arrow), a*

*syndesmophyte is growing from both the T12 corner and the L1 corner without reaching the middle of the IDS (both corners a score of 1). On the posterior side of the spine, no syndesmophytes are present.*  
*ldCT: low-dose Computed Tomography, CTSS: CT syndesmophyte score, IDS: intervertebral disc space, T: thoracic, VU: vertebral unit.*

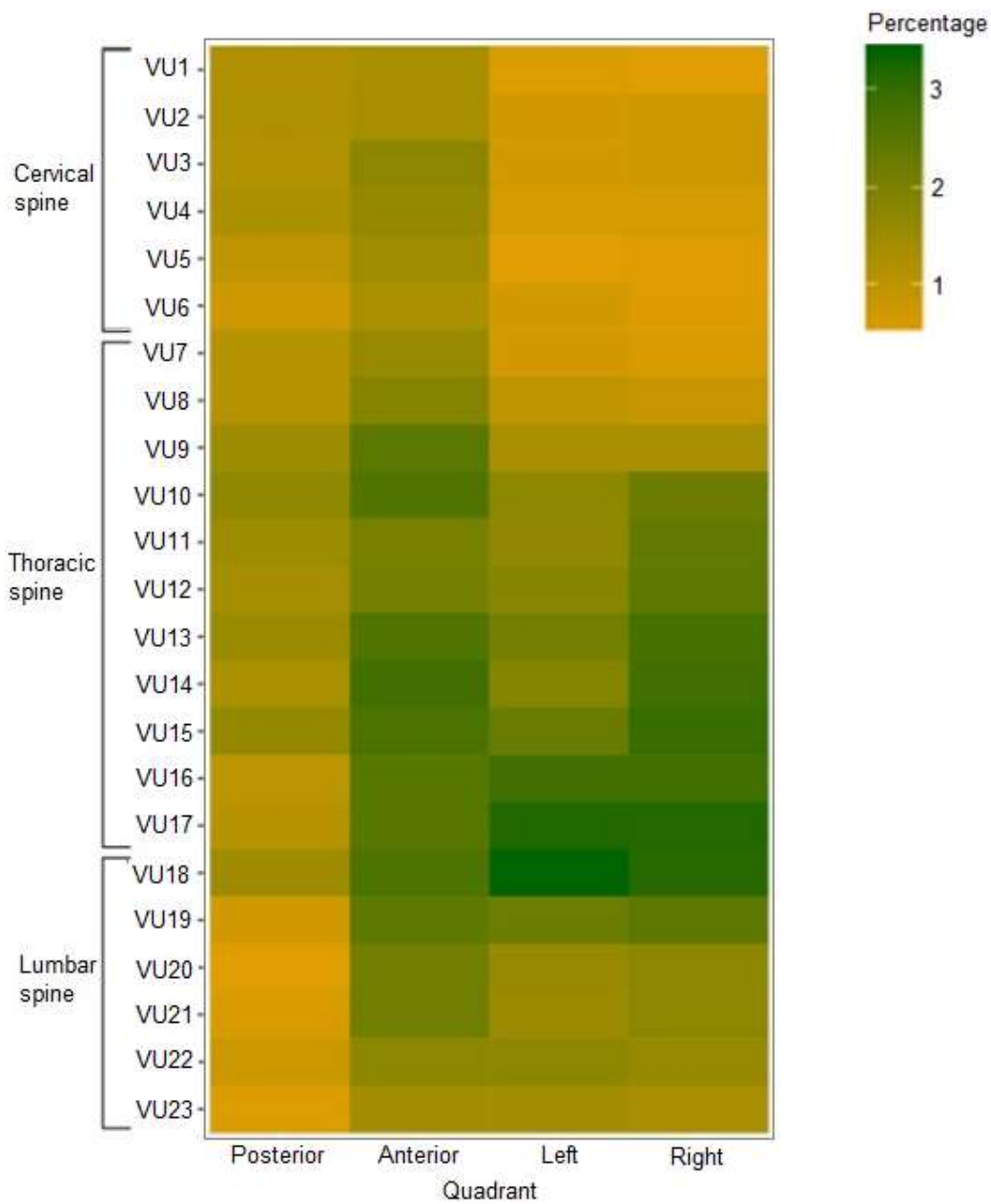


**Figure 2. The distribution pattern of CTSS scores 1, 2 and 3 in the spine at baseline and the percentage of VUs with progression, for individual readers.**

*A: The percentage of quadrants with a score of 1, 2 or 3 is given for all assessed levels for individual readers. The percentage was calculated by dividing the number of quadrants with a score of 1, 2 or 3 per VU by the total number of quadrants in that VU for all patients combined.*

*B: The percentage of VUs with progression is calculated by dividing the number of VUs with progression by the total number of VUs for all patients combined.*

*CTSS: CT Syndesmophyte Score, VU: vertebral unit*



**Figure 3. Distribution pattern of syndesmophytes at baseline on the four sides of a vertebral unit in the spine per vertebral unit**

*The percentage of quadrants per side of a vertebral unit (posterior, anterior, left or right) affected by syndesmophytes relative to the total number of quadrants per side for all vertebral units and all patients combined.*

*VU: vertebral unit*

**Table 1. Baseline characteristics of patients included in the analyses (n=49)**

	<b>Patients n=49 (%)</b>
Age at inclusion (mean (SD))	50 (9.8)
Male	41 (84)
HLA-B27 positive	42 (88)
Uveitis	15 (31)
Psoriasis	5 (10)
IBD	4 (8)
Enthesitis	10 (20)
Dactylitis	5 (10)
Peripheral arthritis	12 (24)
Elevated CRP (mg/L)	18 (37)
BASDAI (mean (SD))	3.6 (2.2)
ASDAS (mean (SD))	2.5 (1.2)
Physician global (mean (SD))	3.8 (2.0)
Number of syndesmophytes on CR reader 1 (mean (SD))	5.7 (4.4)
Number of syndesmophytes on CR reader 2 (mean (SD))	6.3 (5.1)
NSAID use	30 (61)
csDMARD use	13 (27)
TNF use	11 (22)

*Results are presented in number (%) unless otherwise specified.*

*At two years 26 patients used NSAIDs, 9 csDMARDs and 10 TNF-alpha blockers*

*HLA-B27: Human Leukocyte Antigen B27, IBD: inflammatory bowel disease, CRP: C reactive protein, BASDAI: Bath Ankylosing Spondylitis Disease Activity Index, ASDAS: Ankylosing Spondylitis Disease Activity Score, CR: conventional radiography of lateral cervical and lumbar spine; NSAID: Non-Steroidal Anti-Inflammatory Drugs, csDMARD: conventional synthetic Disease Modifying Anti-rheumatic drugs, TNF: TNF-alpha blocker therapy.*

**Table 2. Status scores, change scores and ICC of baseline and two years for the whole spine and segments of the spine for the 49 patients included in the analysis.**

Timepoint		Reader 1	Reader 2	ICC
Whole spine (max score 552)				
Baseline	Mean (SD)	163 (126)	158 (124)	0.99 (0.98 - 0.99)
	Median (range)	127 (11 - 428)	115 (5 - 445)	
2 years	Mean (SD)	180 (130)	175 (130)	0.99 (0.98 - 0.99)
	Median (range)	157 (14 - 455)	125 (7 - 459)	
Change score	Mean (SD)	16 (21)	17 (21)	0.77 (0.63 - 0.86)
	Median (range)	10 (-11 - 96)	10 (-6 - 106)	
Cervical spine (max score 144)				
Baseline	Mean (SD)	30 (41)	28 (37)	0.98 (0.96 - 0.99)
	Median (range)	8 (0 - 140)	8 (0 - 134)	
2 years	Mean (SD)	32 (42)	32 (40)	0.95 (0.92 - 0.97)
	Median (range)	12 (0 - 140)	10 (0 - 135)	
Change score	Mean (SD)	2 (7)	4 (8)	0.57 (0.35 - 0.73)
	Median (range)	0 (-12 - 39)	0 (-9 - 39)	
Thoracic spine (max score 264)				
Baseline	Mean (SD)	97 (77)	95 (77)	0.98 (0.96 - 0.99)
	Median (range)	77 (1 - 253)	72 (0 - 264)	
2 years	Mean (SD)	109 (80)	106 (81)	0.99 (0.98 - 0.99)
	Median (range)	85 (1 - 256)	78 (0 - 264)	
Change score	Mean (SD)	12 (18)	10 (18)	0.75 (0.60 - 0.85)
	Median (range)	6 (-6 - 97)	6 (-12 - 93)	
Lumbar spine (max score 144)				
Baseline	Mean (SD)	36 (36)	35 (35)	0.97 (0.95 - 0.98)
	Median (range)	24 (0 - 140)	22 (0 - 140)	
2 years	Mean (SD)	39 (38)	38 (36)	0.96 (0.93 - 0.98)
	Median (range)	26 (0 - 144)	29 (0 - 144)	
Change score	Mean (SD)	3 (4)	3 (4)	0.32 (0.04 - 0.55)
	Median (range)	2 (-7 - 13)	1 (-5 - 15)	

*SD: standard deviation, ICC: intraclass correlation coefficient*

**Table 3. Number of patients with progression between baseline and two years for the whole spine and segments of the spine for the 49 patients included in the analysis.**

	SDC		Reader 1 n(%)	Reader 2 n(%)
<b>Whole spine</b>				
Change > 0.0		Positive	37 (76)	41 (84)
		Negative	7 (14)	3 (6)
		Net	30 (61)	38 (76)
Change > 0.5		Positive	37 (76)	41 (84)
		Negative	7 (14)	3 (6)
		Net	30 (61)	38 (76)
Change > SDC	14.4	Positive	21 (43)	18 (37)
		Negative	0 (0)	0 (0)
		Net	21 (43)	18 (37)
<b>Cervical spine</b>				
Change > 0.0		Positive	28 (57)	23 (47)
		Negative	4 (8)	4 (8)
		Net	24 (49)	19 (39)
Change > 0.5		Positive	21 (43)	21 (43)
		Negative	4 (8)	4 (8)
		Net	17 (35)	17 (35)
Change > SDC	9.3	Positive	3 (6)	10 (20)
		Negative	2 (4)	0 (0)
		Net	1 (2)	10 (20)
<b>Thoracic spine</b>				
Change > 0.0		Positive	37 (76)	36 (73)
		Negative	6 (12)	4 (8)
		Net	31 (63)	32 (65)
Change > 0.5		Positive	36 (73)	36 (73)
		Negative	6 (12)	4 (8)
		Net	30 (61)	32 (65)
Change > SDC	12.5	Positive	17 (35)	14 (29)
		Negative	0 (0)	0 (0)
		Net	17 (35)	14 (29)
<b>Lumbar spine</b>				
Change > 0.0		Positive	32 (65)	29 (59)
		Negative	5 (10)	3 (6)
		Net	27 (55)	26 (53)
Change > 0.5		Positive	31 (63)	28 (57)
		Negative	5 (10)	3 (6)
		Net	26 (53)	25 (51)
Change > SDC	4.7	Positive	12 (24)	11 (22)
		Negative	1 (2)	1 (2)
		Net	11 (22)	10 (20)

*SDC: smallest detectable change*