

Supplementary Materials

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Supplementary Data S1: Dataset Description

Total Cases: 92 cases, including:

- **62 cases of axial spondyloarthritis (axSpA):**
 - **32 cases of non-radiographic axial spondyloarthritis (nr-axSpA):** Bilateral sacroiliac joints DR or CT grade < II, or unilateral sacroiliac joint DR or CT grade < III.
 - **30 cases of radiographic axial spondyloarthritis (r-axSpA):** Bilateral sacroiliac joints DR or CT grade II, or unilateral sacroiliac joint DR or CT grade III.
- **30 cases in the control group:** Diagnosed with normal sacroiliac joints during clinical follow-up.

Demographics:

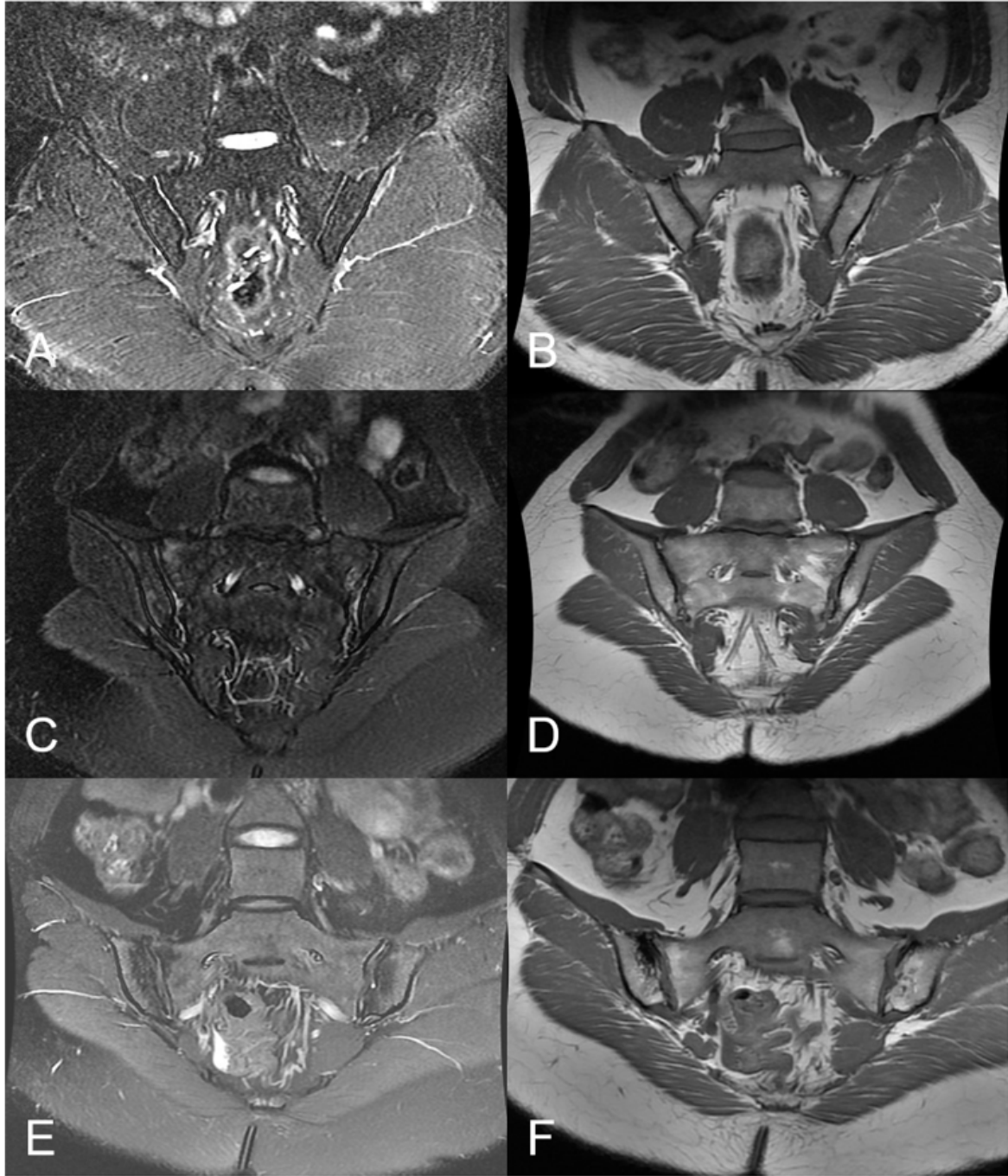
- AxSpA group: 39 males and 23 females, aged 18–44 years (mean 31.18 ± 8.80 years).
- Control group: 17 males and 13 females, aged 18–44 years (mean 31.00 ± 8.63 years).

Inclusion Criteria: The axSpA group was diagnosed based on the 2009 ASAS classification criteria, and all patients underwent 3T MRI, X-ray, and/or CT within one week of MRI.

Exclusion Criteria: Cases with unilateral or bilateral grade IV sacroiliitis, trauma, infection, prior sacroiliac joint surgery, and other confounding conditions were excluded.

Supplementary table S1: Detailed Sample-Wise Distribution of the Dataset

| Dataset | Normal (Control Group) | nr-axSpA (Patients) | r-axSpA (Patients) | Total |
|-------------------------|------------------------|---------------------|--------------------|-------|
| Cases | 30 | 32 | 30 | 92 |
| Sacroiliac Joint Images | 1180 | 1280 | 1168 | 3628 |



Supplementary Figure S1:Dataset Sample Images

(A, B) ob-FsT2WI Coronal and ob-T1WI Coronal images of the control group; (C, D) ob-FsT2WI Coronal and ob-T1WI Coronal images of nr-axSpA; (E, F) ob-FsT2WI Coronal and ob-T1WI Coronal images of r-axSpA.

Supplementary Data S2: The radiological classification standards are as follows:

X-ray classification: Grade 0: normal; Grade I: suspicious; Grade II: mild, localized joint erosion and hardening, no change in joint space; Grade III: moderate, bone erosion and hardening of the articular surface, and widening/narrowing or partial ankylosis of the joint space; Grade IV: severe, complete bony ankylosis of the joint.

CT classification: Grade 0: normal joints or slightly blurred articular surface contours; Grade I: osteoporotic joint axis, mild subchondral erosion, blurred articular surface contours, and normal joint space; Grade II: blurred articular surface contours, subchondral bone destruction, osteoporosis and joint hardening, and normal joint space; Grade III: moderate destruction of subchondral bone, diffuse sclerosis, brush-like articular surface, uneven joint space, and partial ankylosis; Grade IV: whole joint destruction, sclerosis and osteoporosis, and complete joint ankylosis.

Supplementary Data S3: Consistency Evaluation of Feature Extraction

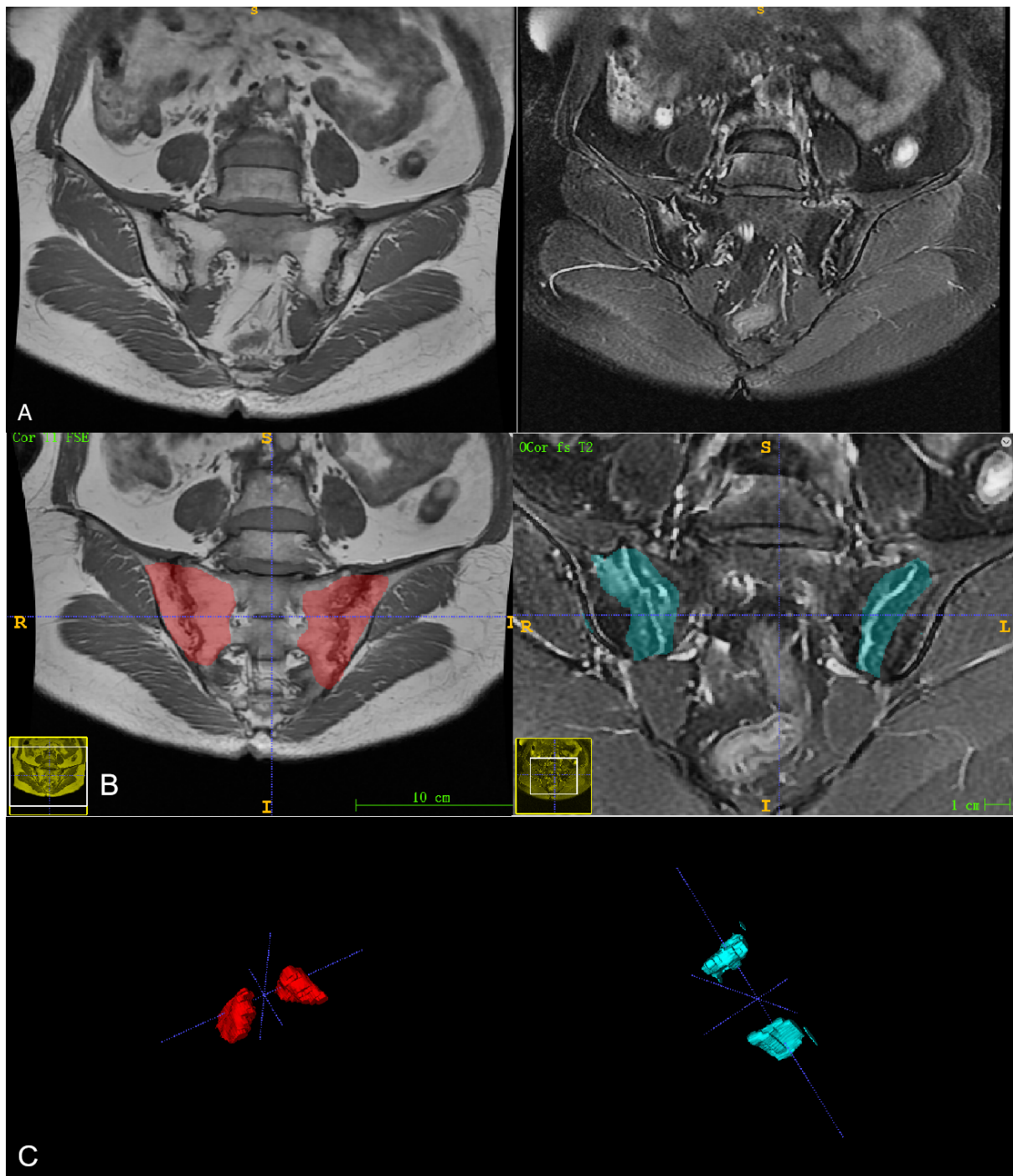
The Dice Similarity Coefficient value for the segmentations performed by the two radiologists was 0.81. Two radiologists extracted ROIs with an inter-observer ICC range of 0.73-0.92 and an intra-observer ICC range of 0.91-0.95. To ensure the reproducibility of radiomics features, both inter-observer and intra-observer ICC values were required to exceed 0.75. Features with intra-observer and inter-observer ICC values below 0.8 were excluded, leaving 96 features from T1WI images and 90 features from FsT2WI images.

Supplementary table S2: MRI Scanning Parameters

| Parameter | ob-T1WI Axial | ob-T1WI Coronal | ob-FsT2WI Axial | ob-FsT2WI Coronal |
|-----------------------------|---------------|-----------------|-----------------|-------------------|
| TR (ms) | 500 | 720 | 3920 | 3675 |
| TE (ms) | 9.8–29.5 | 7.3–22.0 | 85 | 85 |
| FOV (mm) | 432 × 432 | 456 × 456 | 320 × 224 | 320 × 224 |
| Matrix | 352 × 192 | 320 × 224 | 320 × 224 | 320 × 224 |
| Slices (n) | 20 | 21 | 19-20 | 19-20 |
| Slice Thickness (mm) | 5.0 | 4.0 | 5.0 | 4.0 |
| Slice Spacing (mm) | 1.0 | 1.0 | 1.0 | 1.0 |

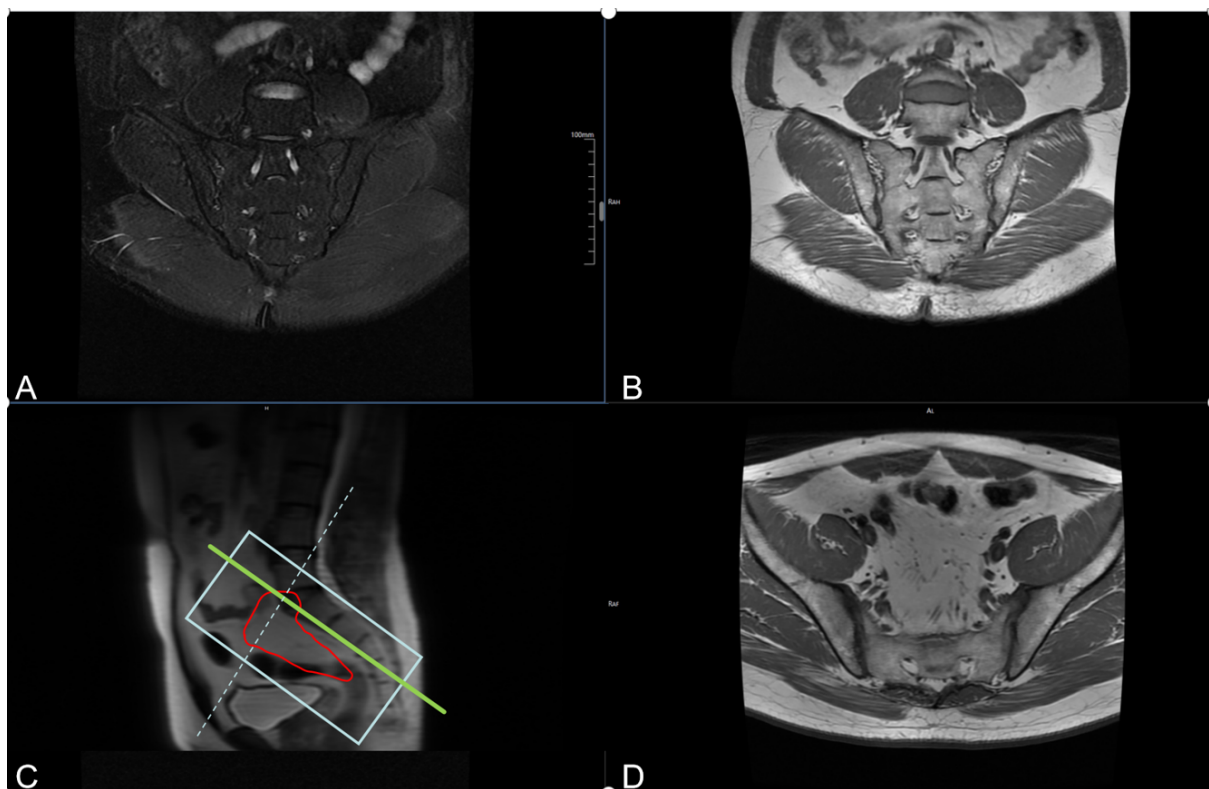
Supplementary table S3: Likert Score by the Junior Reader (#2)

| Parameter | Control Left (Right) | nr-axSpA Left (Right) | r-axSpA Left (Right) | Control vs nr-axSpA | nr-axSpA vs r-axSpA |
|---------------------------|-------------------------|--------------------------|-------------------------|------------------------|------------------------|
| BME | 15(1) 18(0) | 16(0) 11(1) | 17(1) 22(1) | 0.019 | 0.025 |
| Backfill | 16(0) 25(0) | 25(0) 20(1) | 20(1) 15(0) | 0.234 | 0.673 |
| Fat Metaplasia | 14(1) 14(1) | 15(0) 15(0) | 11(2) 11(2) | 0.003 | <0.001 |
| Erosion | 15(1) 14(0) | 17(1) 17(1) | 15(1) 12(2) | 0.002 | 0.015 |
| Sclerosis | 13(1) 12(1) | 15(1) 17(2) | 12(2) 11(1) | 0.002 | 0.013 |
| Bone Bud/Ankylosis | 18(0) 29(0) | 29(0) 30(0) | 17(1) 18(1) | 0.75 | <0.001 |
| Total Score | 16 ± 2.613 | 24.97 ± 5.682 | 26.05 ± 7.927 | <0.0001 | <0.01 |



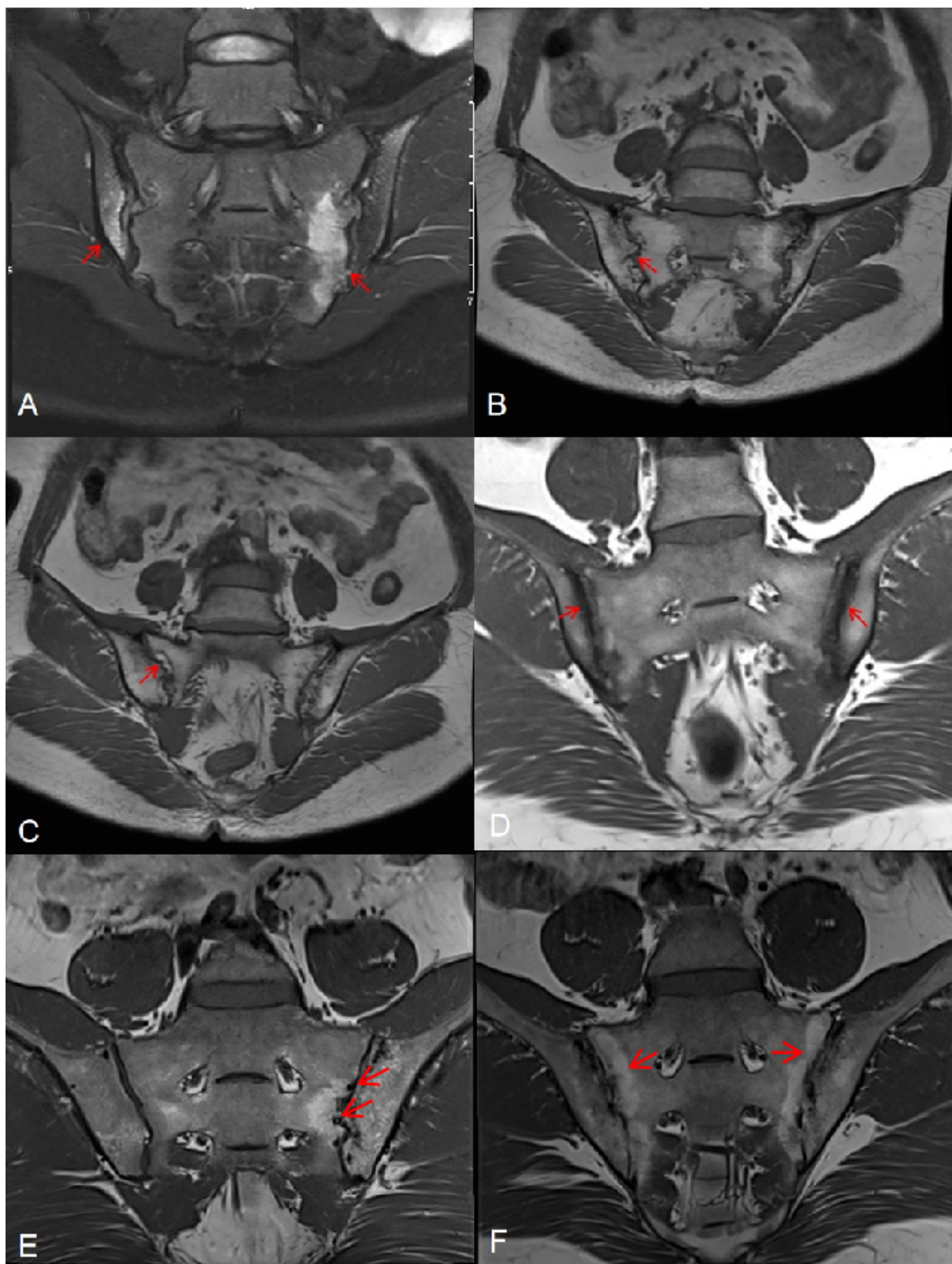
Supplementary Figure S2: Lesion Segmentation

(A) Lesion of SIJ; (B) Segmentation on the oblique coronal slice; (C) Three-dimensional volumetric reconstruction.



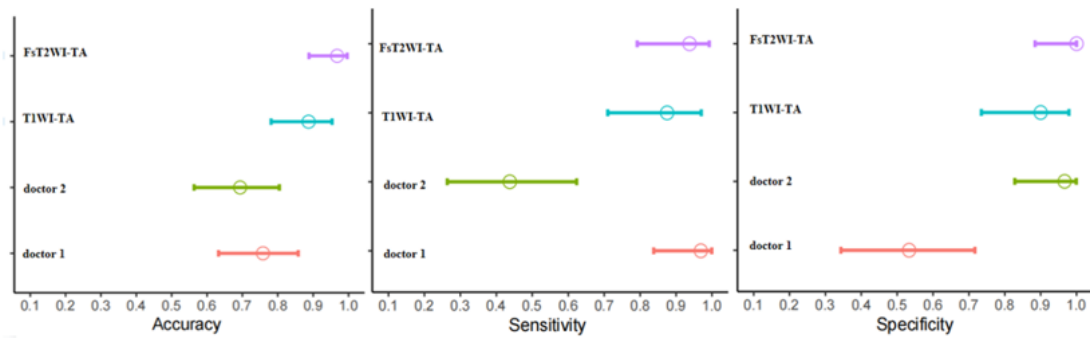
Supplementary Figure S3: Oblique Coronal Image

(A) Oblique coronal Fs-T2WI; (B) Oblique coronal T1WI; (C) Red lines: projection area of the sacroiliac joint; green lines: orientation of the oblique coronal positioning line; blue box: oblique coronal scanning range; blue dashed lines: oblique axial direction; (D) Oblique axial T1WI.

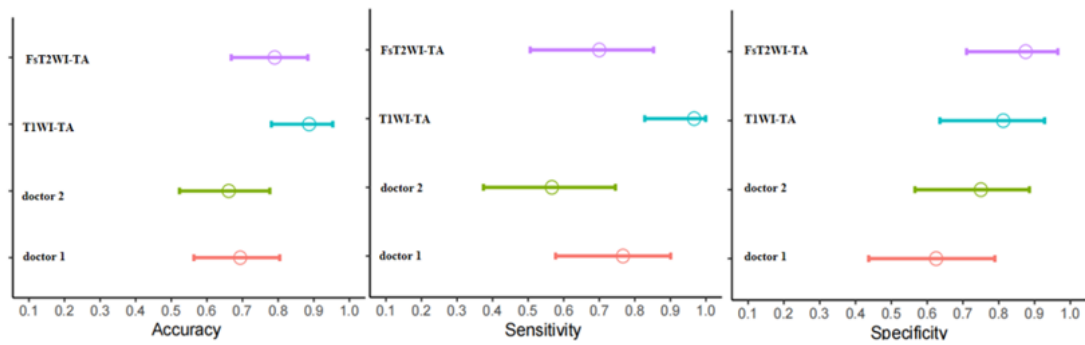


Supplementary Figure S4: Lesions of Sacroiliitis

(A) BME; (B) Bone Bud/Ankylosis; (C) Backfill; (D) Sclerosis; (E) Erosion; (F) fat metaplasia.



Control vs nr-asSpA group



nr-axSpA vs r-axSpA group

Supplementary Figure S5: Forest Plots of Diagnostic Performance

Forest plots illustrating the diagnostic performance (accuracy, sensitivity, and specificity) of the two readers (doctor 1 and doctor 2) and the texture analysis models (T1WI-TA and FST2WI-TA).