

Radiographic Joint Space Narrowing Predicts MR-Based Cartilage Loss – Data from the Osteoarthritis Initiative (OAI)


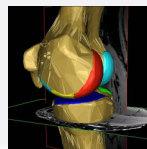
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Background – Osteoarthritis Initiative (OAI)

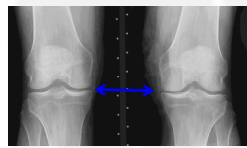
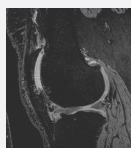
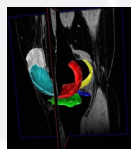
- Multi-center, prospective cohort study of knee OA
- Goal - To identify reliable and sensitive (imaging) biomarkers of knee OA onset and progression using 3Tesla MRI (Siemens Trio)
- Baseline & Year 1 data available for both knees of the first ½ of the cohort (n = 2678) (1.2.1 Clinical Data set and 1.B.1 Imaging Data set)

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OBJECTIVES

- Examine progression (MR-based cartilage loss) in participants with “early” radiographic OA (i.e., definite osteophyte [OP] only) in one knee and “more advanced” OA (i.e., OP and joint space narrowing [JSN]) in the other knee
- Identify whether OA knees with JSN have a higher rate of progression than contra-lateral OA knees without JSN

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Study Design / Patient Selection

Original Inclusion Criteria:

- Chronic frequent pain (grade 2) in both knees
- Medial JSN (OARSI 1/2) & no lateral JSN in one knee
- No medial or lateral JSN in contralateral knee
- Definite osteophyte (OP) in contralateral knee
- BMI > 30

→ Of the 160 cases from the progression subcohort with central readings of fixed-flexion knee x-rays available

- 9 (nine) cases (5.6%) fulfilled ALL of these criteria
- If criteria applied to all 2678 → 5.6% = 150 cases
- BUT only approx. 700 from progression subcohort
- Therefore: <40 cases that fulfilled ALL of the above

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Study Design / Patient Selection

Modified Inclusion Criteria:

- Chronic frequent pain (grade 2) in both knees, or grade 1 in less affected knee, if def. OP (n = 2)
- Medial JSN (gr. 1/2) in one knee or grade 3 (n = 8)
- No lateral JSN in this knee, or < med JSN (n = 3)
- No JSN in contralateral knee, or less med JSN (n = 7)
- OP in contralateral knee (not present in n = 34)
- BMI >25

→ 160 cases (progression subcohort with central X-ray)

- 19 cases fulfilled these criteria
- Identified 96 addit. cases from 2678 (site readings)
- Performed central X-ray readings in these (A.G.)
- Identified 61 additional cases (TOTAL n = 80)

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Participants


N = 80 (from OAI public-use 1.B.1. imaging data set)

- ✓ Sex: 32 men, 48 women
- ✓ Age: 60.6 ± 9.1 yrs
- ✓ BMI: 31.1 ± 4.0 yrs

X-ray of those with more advanced knee OA:

- 47 JSN 1
- 25 JSN 2
- 8 JSN 3

Central Reading (A.G.) OARSI grade JSN and osteophyte



X-ray of those with less advanced knee OA:

- 73 JSN 0
- 7 JSN 1

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Cartilage Segmentation of Knee MR

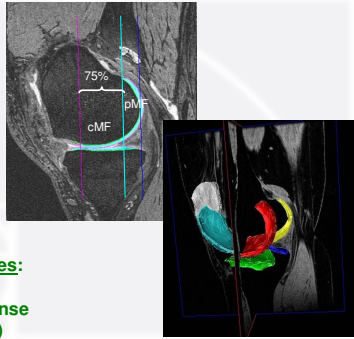
Sagittal DESS
0.7 mm sections

Medial FTC analyzed
@ baseline & year 1
follow up (blinded)
by 7 expert readers
(QC by S.M.)

→ MT, cMF, pMF
→ ThCtAB.Me

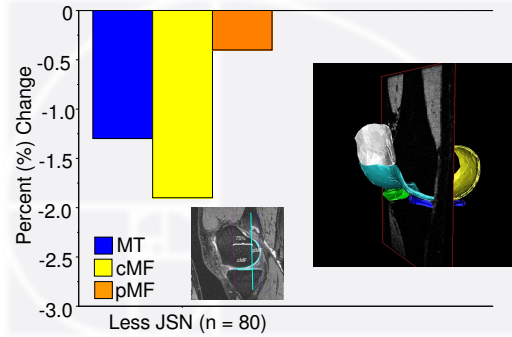
Compare between sides:

- Mean change (MC)
- Standardized response mean (SRM = MC/SD)



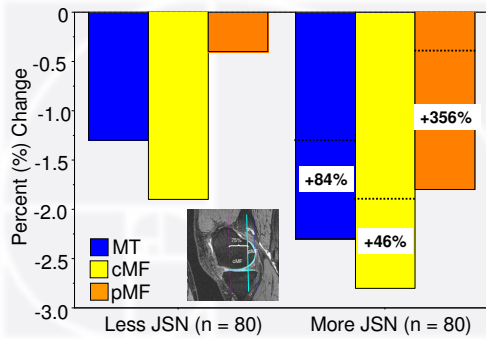
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MC (%) in Knees with Less & More JSN



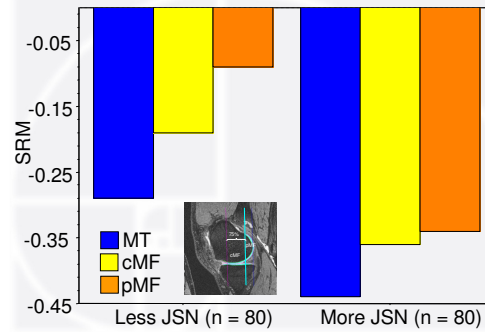
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MC (%) in Knees with Less & More JSN



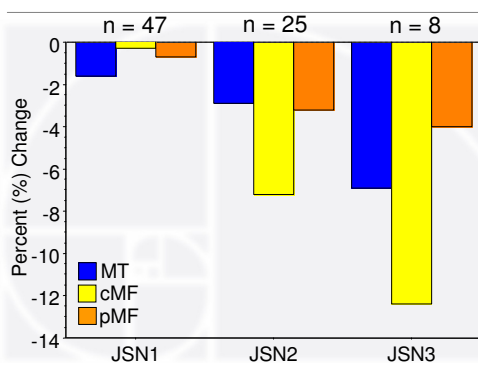
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SRM in Knees with Less and More JSN



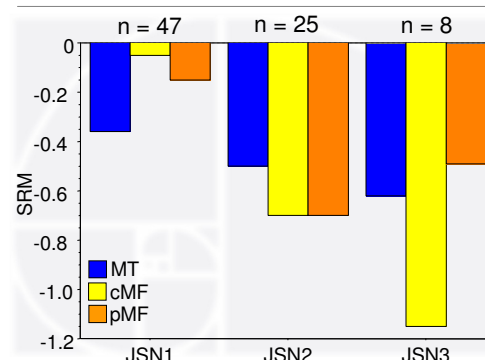
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MC (%) in Knees with More JSN

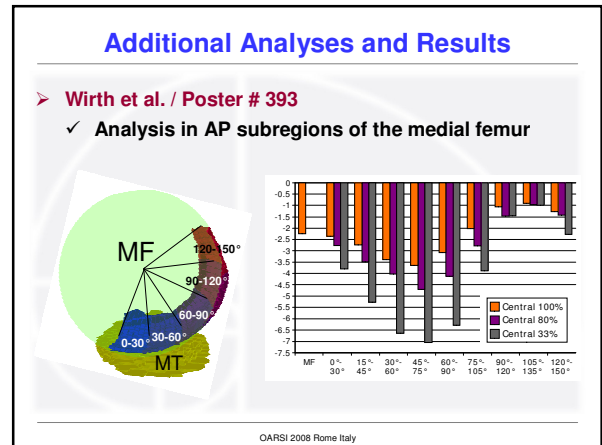
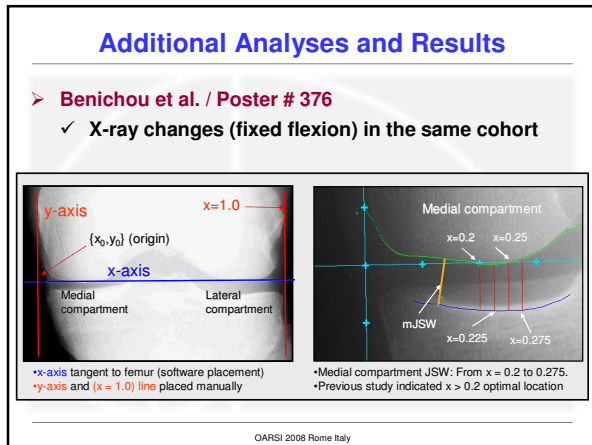
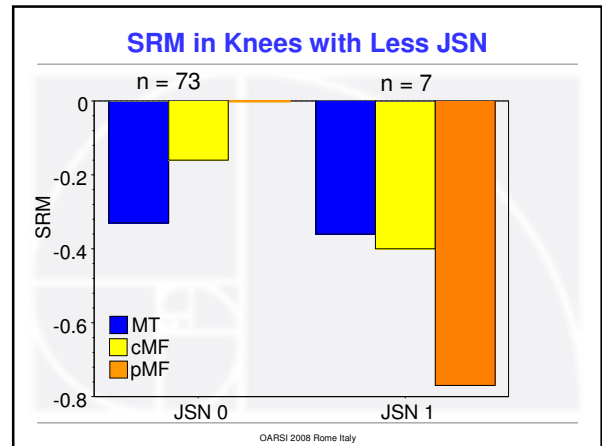
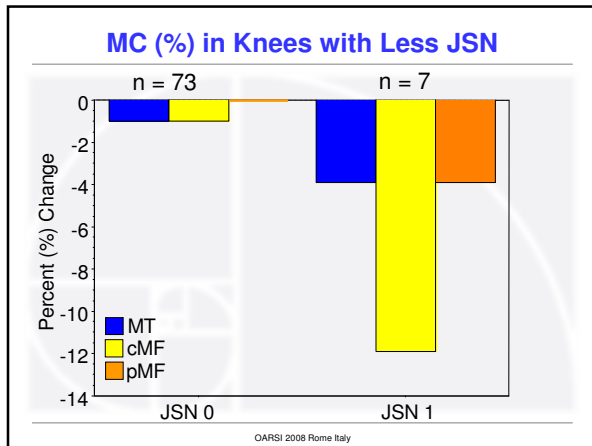


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SRM in Knees with More JSN



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Conclusions

- JSN at baseline is a strong predictor of cartilage loss, measured with qMRI
- The more advanced the JSN, the higher the rate of and sensitivity to change (ThCIAB.Me)
- MRI-based measures of cartilage loss are particularly responsive at advanced stages of radiographic OA
- Responsiveness varies by area and amount of JSN
 - pMF generally less responsive (<) than cMF
 - SRM cMF > MT with more advanced JSN (2 or 3)
 - SRM MT > cMF with less advanced JSN (0 or 1)

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