



MONASH University

Medicine, Nursing and Health Sciences

# Year in review: Imaging



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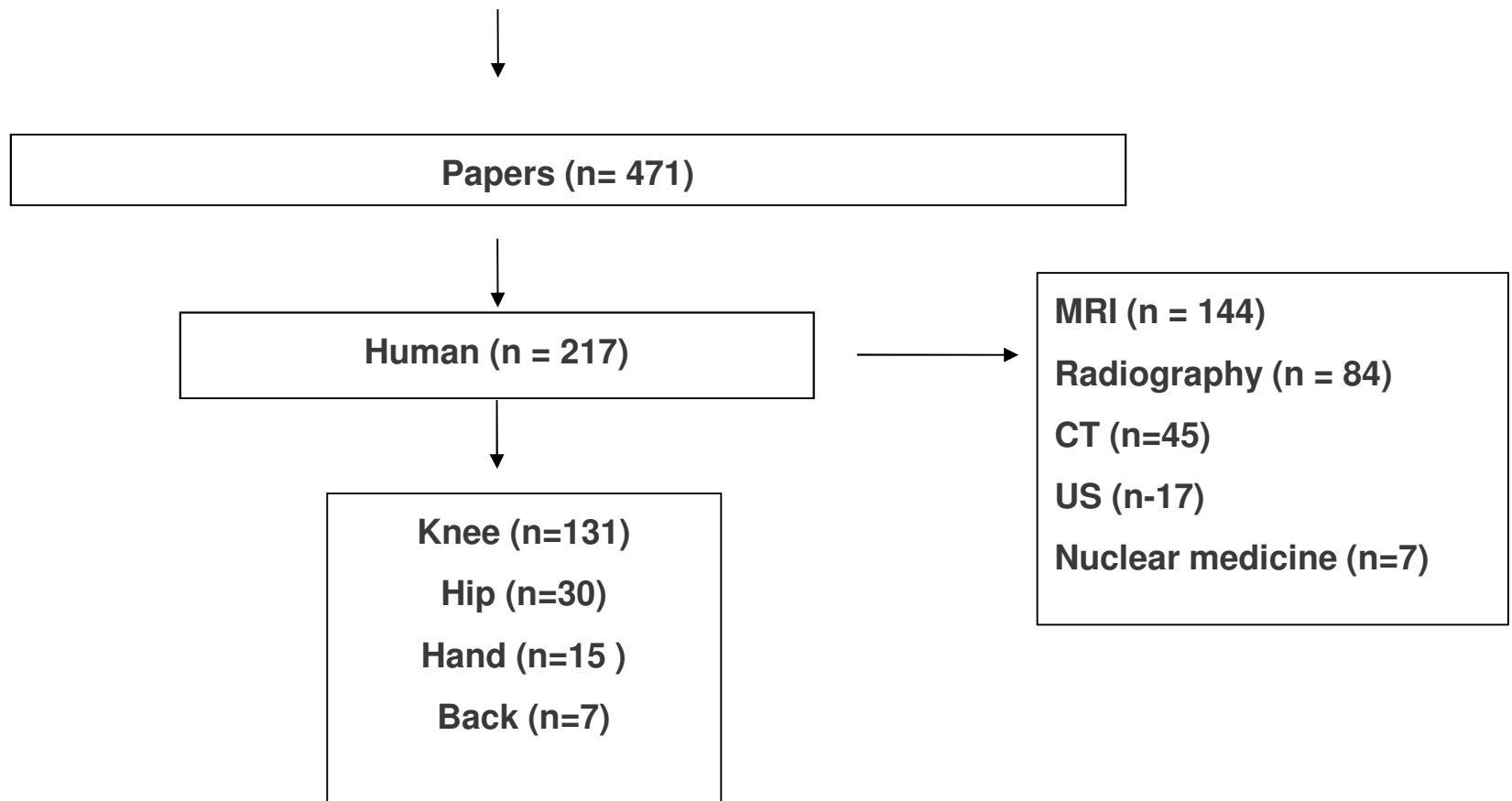
# Declarations

- None

**Search Medline/PubMed/Cochrane databases.**

**April 2014 to April 2015**

**Search terms “osteoarthritis” + either “radiography”, “MRI”, “ultrasound”, “computed tomography”, or “nuclear medicine.”**



## This talk

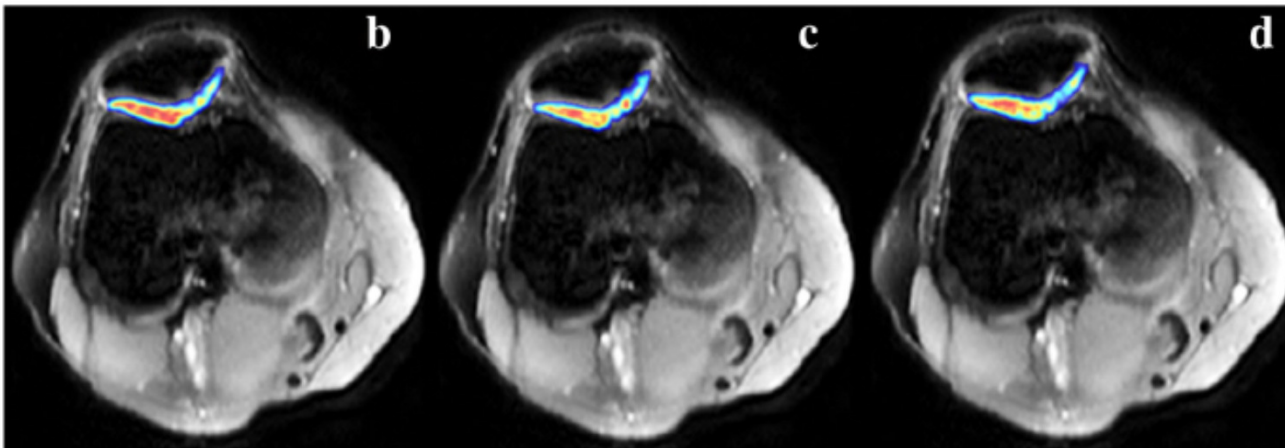
- Cartilage composition : MRI and other modalities
- Cartilage quality as a predictor of outcome
- Assessment other structures: Muscle
- MRI and phenotyping of patients with OA
- What about other joints?
  - Hip
  - Back
  - Hands



# **Cartilage composition : MRI and other modalities**

# Glycosaminoglycan Chemical Exchange Saturation Transfer

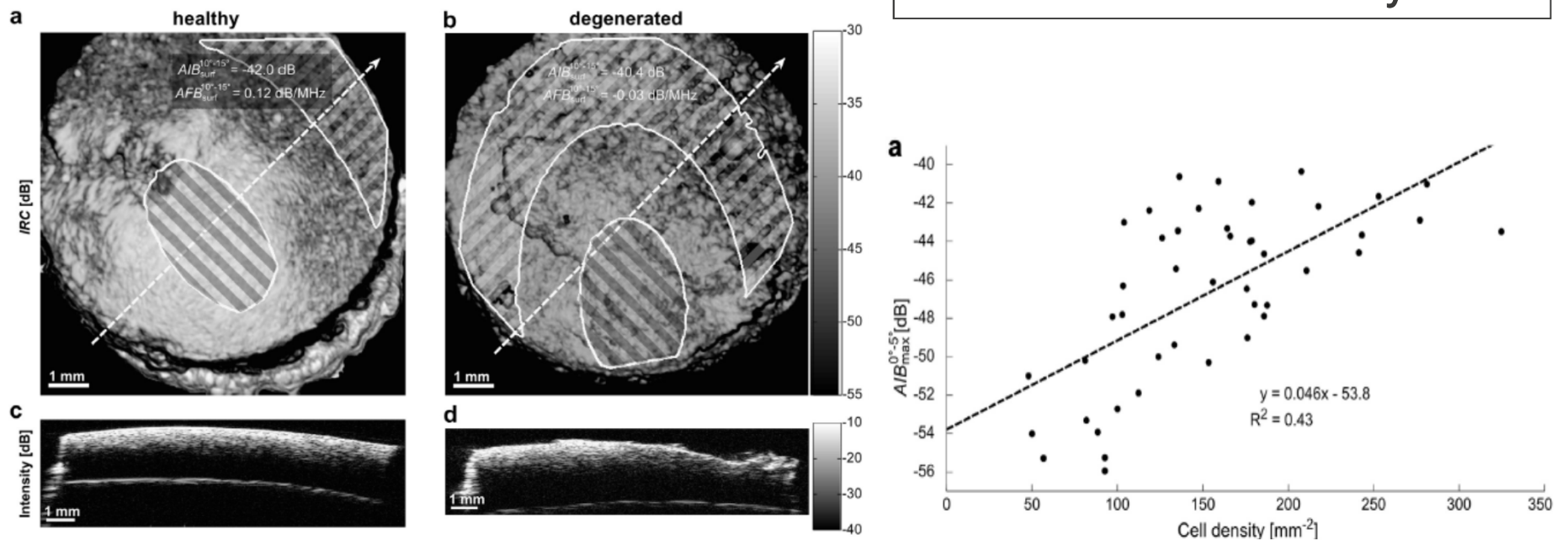
- Molecular MRI method for assessing changes in GAG
- cf dGEMERIC: quicker time, no contrast
- But highly sensitive to magnetic field inhomogeneities
- This paper describes corrections with gradient echo method



# 3-D High frequency US backscatter analysis of human cartilage

Surface maps

Scatter patterns correlate with cell density

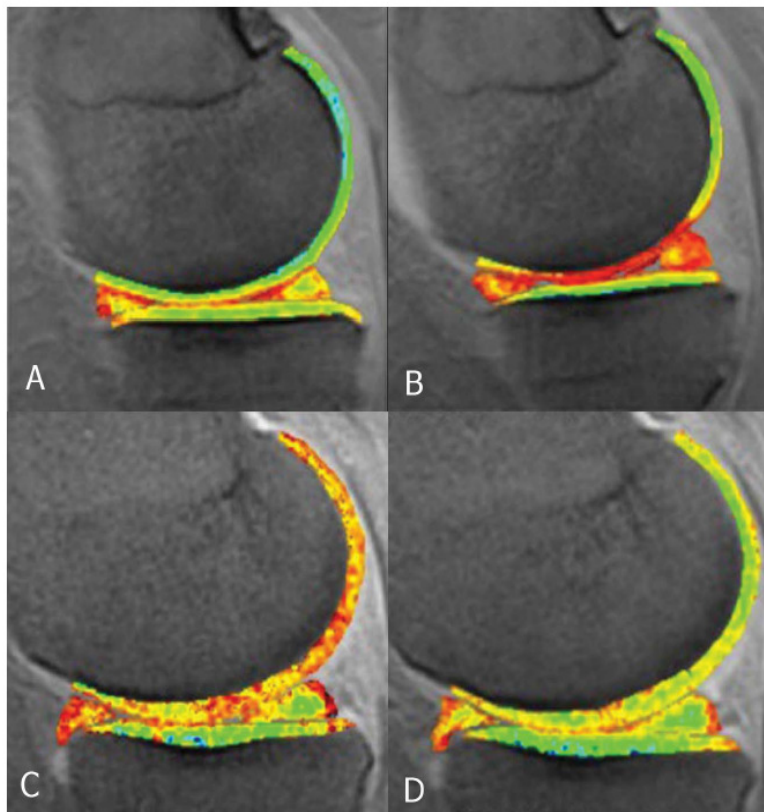




# Cartilage quality as a predictor of outcome



# Importance of considering cartilage quality



- ↓ dGEMRIC associated with ↑ cartilage thickness in medial TF compartment
- ? swelling of cartilage in early stages of degeneration

# Cartilage signal intensity on T1-weighted MRI

↓ mean signal associated with:

- ↑ cartilage defects
- ↓ CTX-II
- ↓ cartilage thickness over 2.9 years

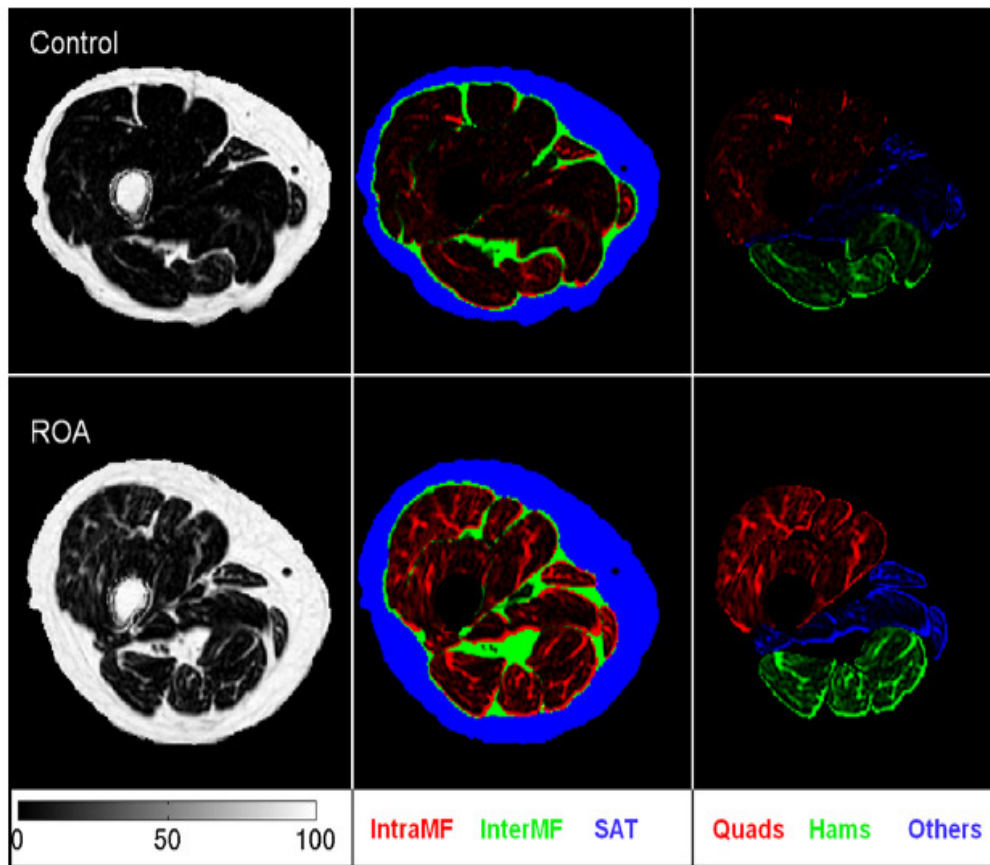
→ low cartilage signal intensity reflects early OA





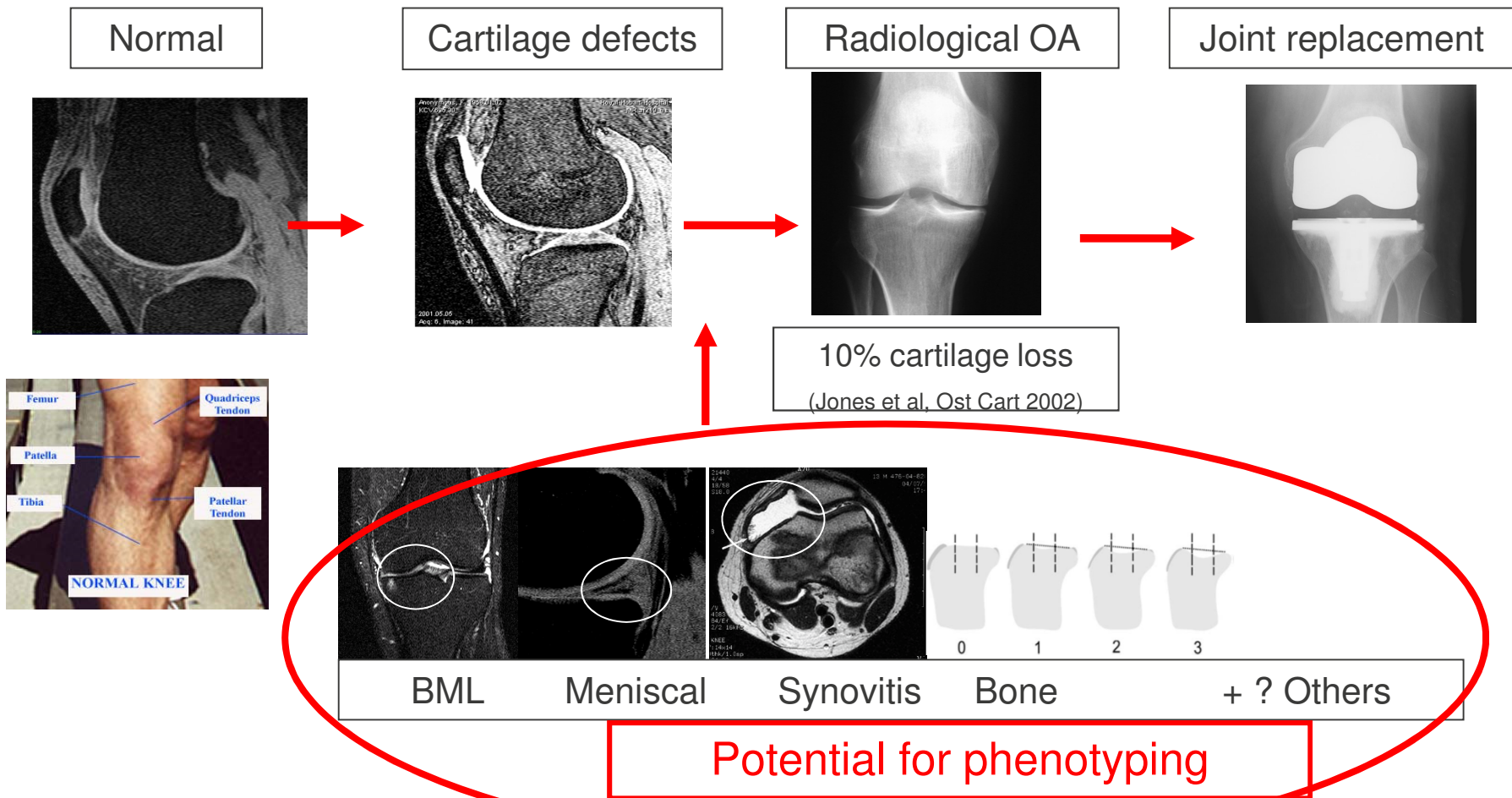
# Assessment other structures: Muscle

# Intramuscular fat

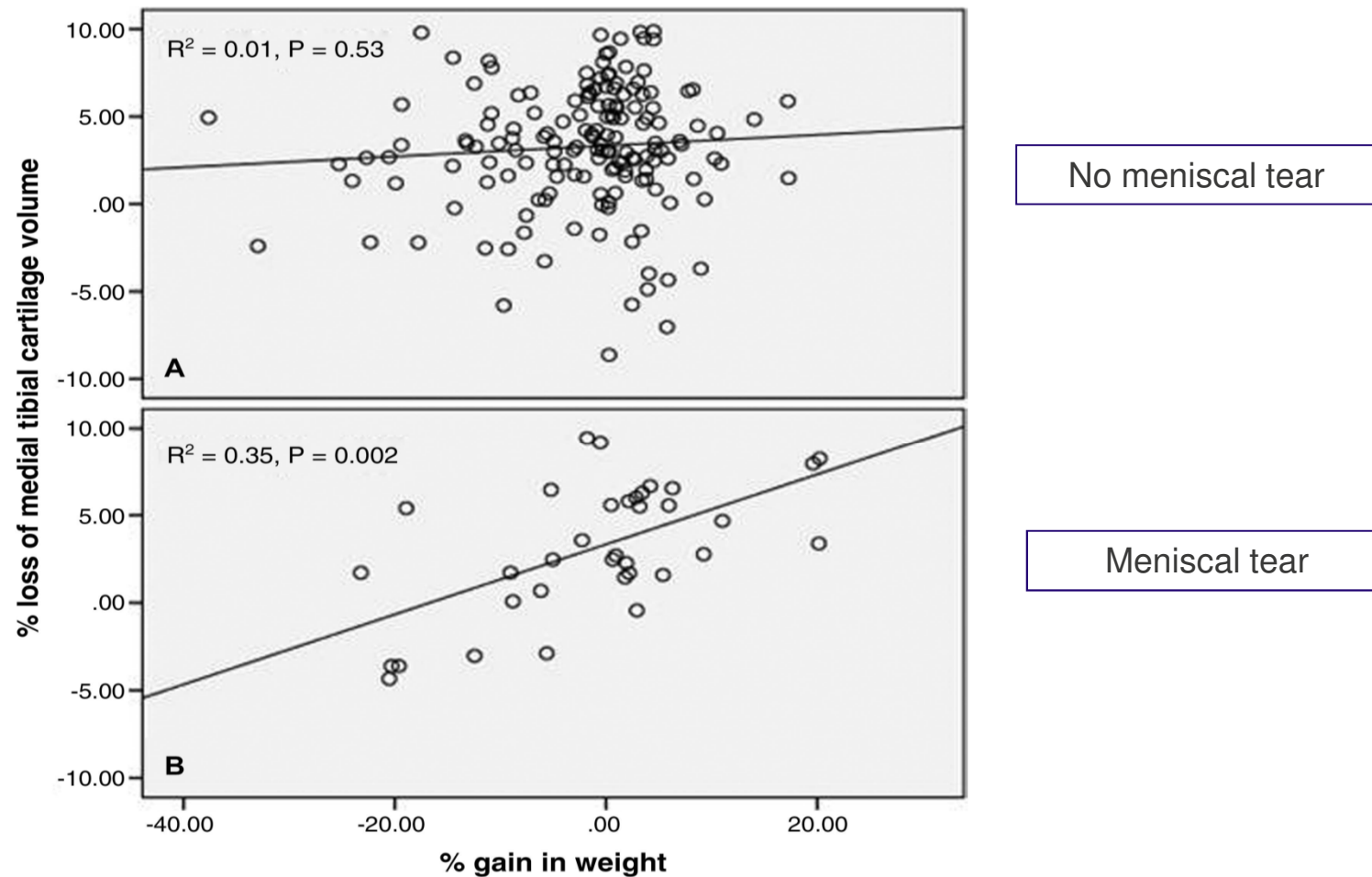


- 3-T MRI of the thigh muscles using chemical shift-based water/fat MRI
- Quadriceps intramuscular fat fraction associated with knee OA
- Illustrates importance of measuring fat infiltration as well as muscle size

# MRI and phenotyping of patients with OA



# Effect of wt change on structure +/- meniscal pathology in community population



## Effect of MTX in OA with synovitis

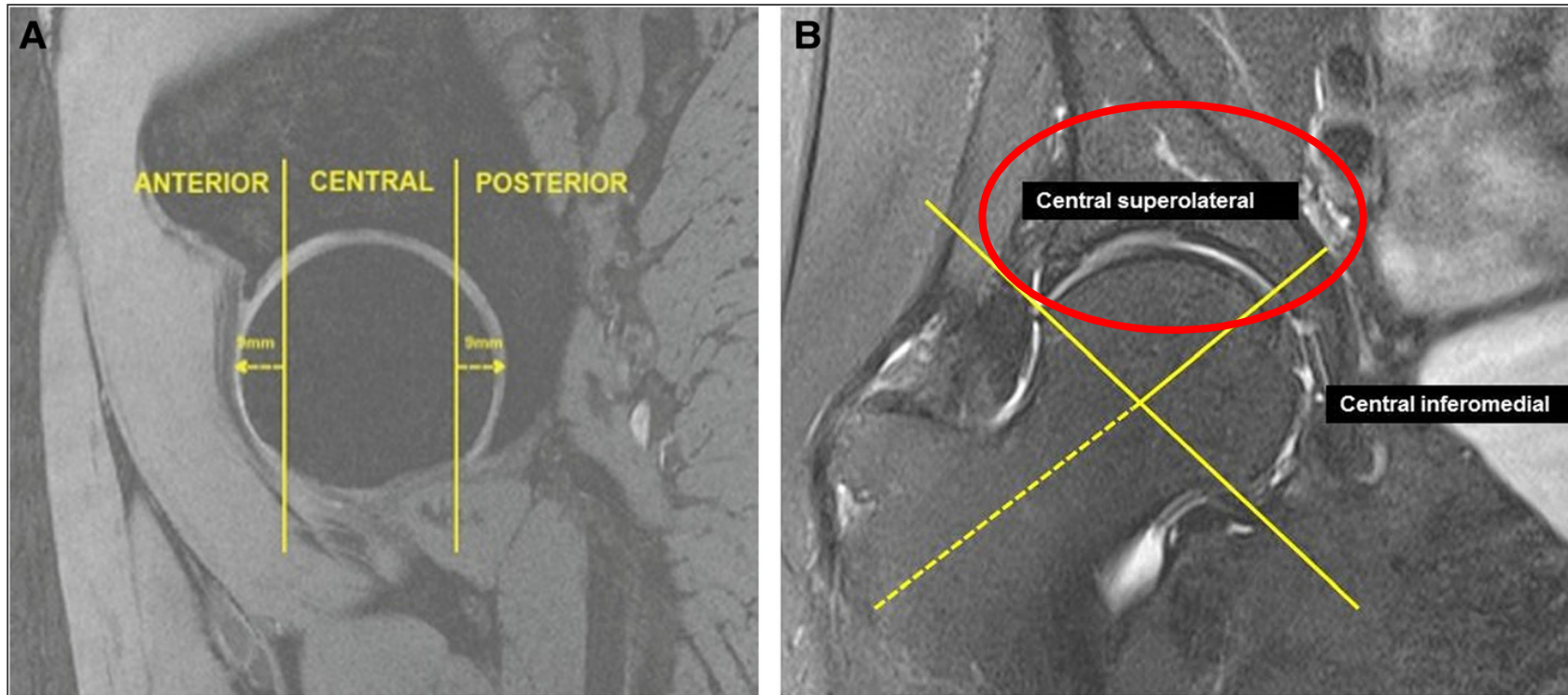
	<b>Methotrexate (n = 72)</b>	<b>Placebo (n = 72)</b>	<b>Mean difference in change</b>	
VAS (0-100 mm)	-26.2	-14.8	11.4 (2.8, 20.0)	p=0.009
WOMAC pain (0-20)	-3.3	-1.4	1.9 (0.7, 3.1)	p=0.002
WOMAC function (0-68)	-12.2	-4.0	9.5 (3.7, 15.3)	p=0.001
WOMAC stiffness (0-8)	-2.1	-0.7	1.4 (0.5, 2.3)	p=0.002
Synovial thickness (mm)	-1.4	-0.4	1.0 (0.4, 1.6)	p<0.001



# What about other joints?



# Hip remains a challenge

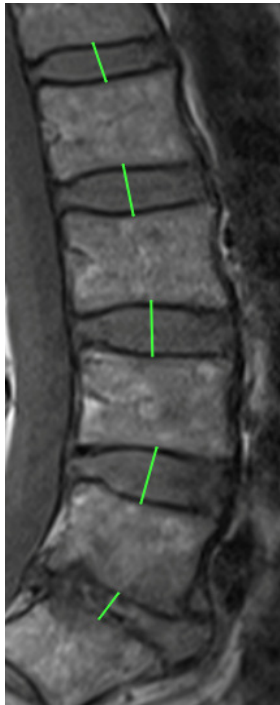


Heavy lifting (18 to 30 yrs): BMI **central SL** OR 3.9 (1.6 to 9.8)

Persistent heavy lifting: ↑ cartilage defects **central SL** OR 1.6 ( 1.0 to 2.5)

# Structure and back pain: Does it matter?

## Disk height



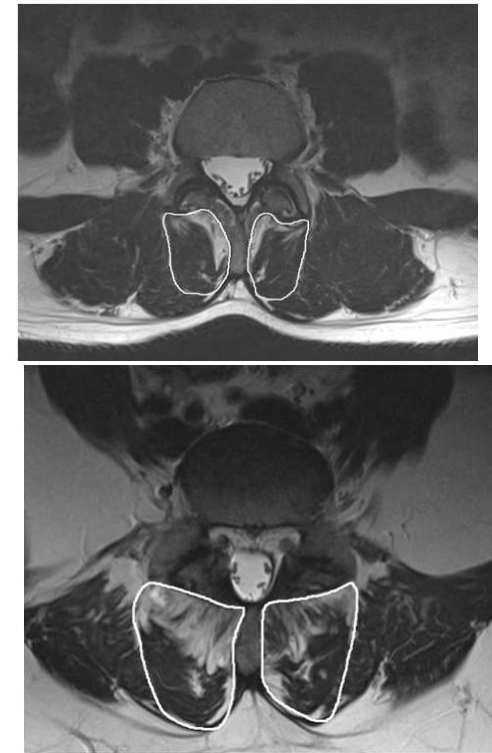
SPINE Volume 39, 16 ,  
pp E962 - E966

## Modic changes



PLOS ONE; :10.1371/jDec 15, 2014

## Fat infiltration in paraspinal muscles



Spine J. 2015 Mar 27.  
S1529-9430

# Hand OA

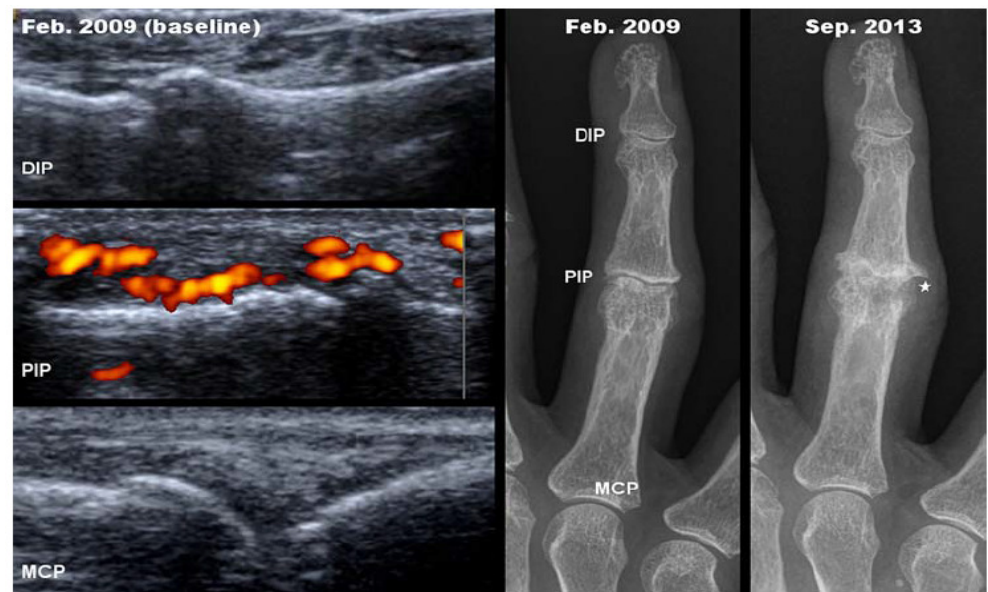
Incident joint tenderness and :

- Synovitis (OR=2.66 (1.38 to 5.11), BMLs (OR=2.85 (1.23 to 6.58))

Haugen IK, et al. Ann Rheum Dis 2015

US-detected inflammation predicts radiographic progression in hand OA after 5 yrs

Mathiessen A, et al. Ann Rheum Dis 2015



# Summary

- Significant work continues at the knee, particular MRI
- Also focus on cartilage quality
- MRI being increasingly used as an outcome measure but important role of other imaging modalities ie US
- Phenotyping of patients with OA will be very important
- ↑ Work into other joints

