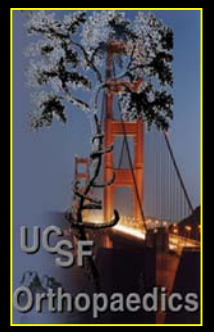

Comparison of Cartilage T1rho MRI Values Between ACL-Reconstructed Knees and Contralateral Uninjured Knees One Year After Surgical Repair

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Anterior cruciate ligament injuries

- Common and severe knee injuries
- High risk factor of osteoarthritis (OA)
  - 50-70% patients develop OA 10-15 years after ACL injury, even with ACL reconstruction[1,2]
  - Multifactorial mechanisms responsible for OA
    - Abnormal kinematics[3]
    - Biochemically changes during and after initial injuries[4,5]
    - Does meniscus injury increase the risk?
- Symptoms of OA preceded by proteoglycan (PG)/ ECM degradation
- How to detect early PG/ECM loss?

[1]Lohmander et al, Arthritis Rheum, 2004;
[2]von Porat A et al, Ann Rheum Dis, 2004
[3]Andriacchi T, Ann Biomed Eng. 2004;
[4]Lohmander et al, Arthritis Rheum, 2003
[5]Price et al, Arthritis Theum 1999

$T_{1\rho}$ in the ACL-reconstructed knee

- MRI widely applied for imaging acute knee injury[1]
- T1ρ MRI
  - Values correlated with proteoglycans[2]

    INCREASED T1ρ ~ DECREASED PG
  - Able to predict early cartilage matrix injury in OA[3,4]
  - Previous studies: changes of the weight-bearing medial femorotibial cartilage matrix detected as early as 1-year after ACL-reconstruction compared to age-matched, healthy control subjects[5].

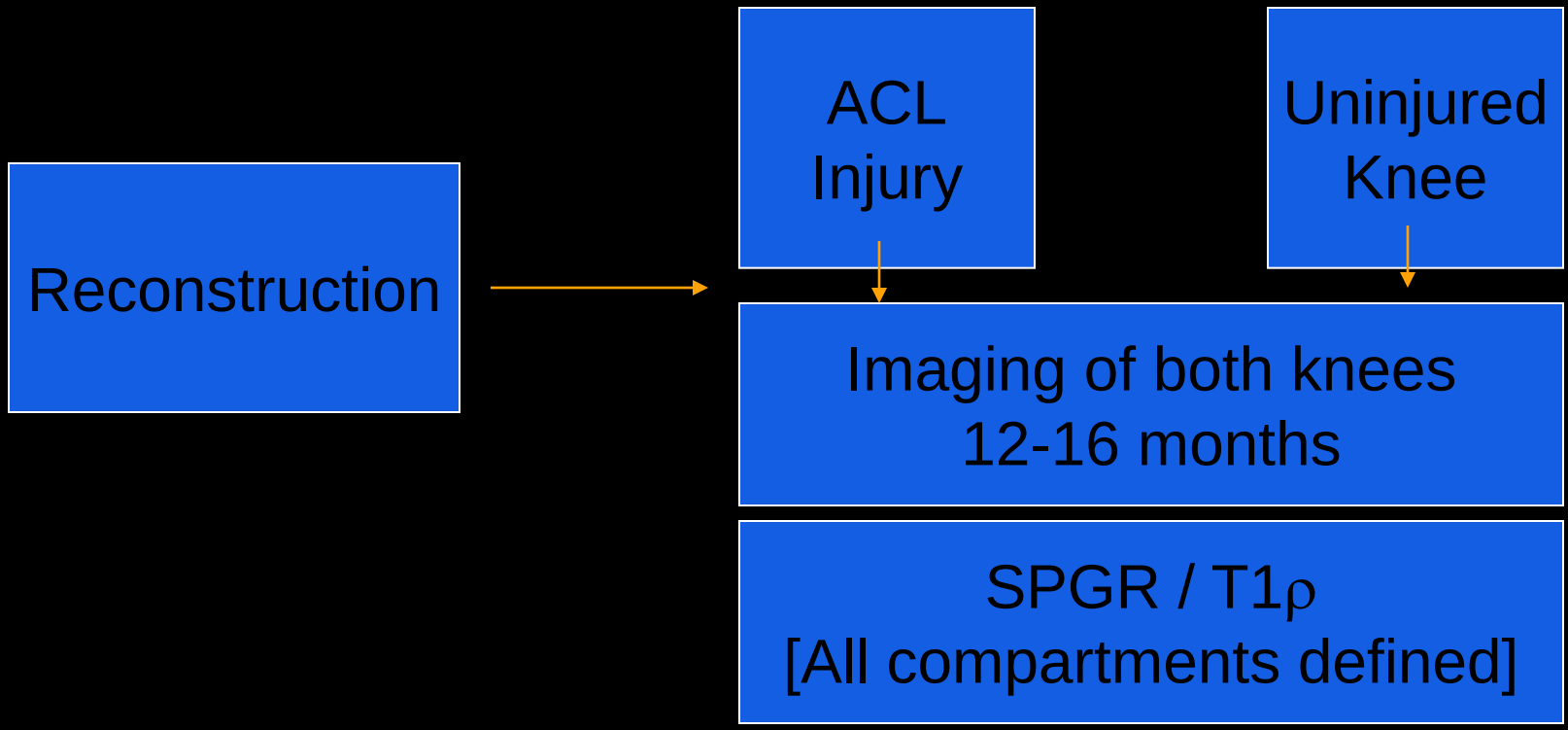
[1]*Klass D et al, Knee 2007*
[2]*Duvvuri et al, Magn Reson Med 1997*
[3]*Regatte et al, Acad Radiol 2004*
[4]*Li et al, Osteoarthritis and Cartilage 2006*
[5]*Li et al, Radiology 2010*

Objectives

- Analyze and compare cartilage $T_{1\rho}$ values in ACL-reconstructed knees and the patient's own contralateral knee at 12 to 16 months after ACL-reconstructions.

- To explore a potential effect of meniscal tears at time of injury on cartilage $T_{1\rho}$ at 1-year after ACL reconstruction.

Study Overview



Results

Subjects

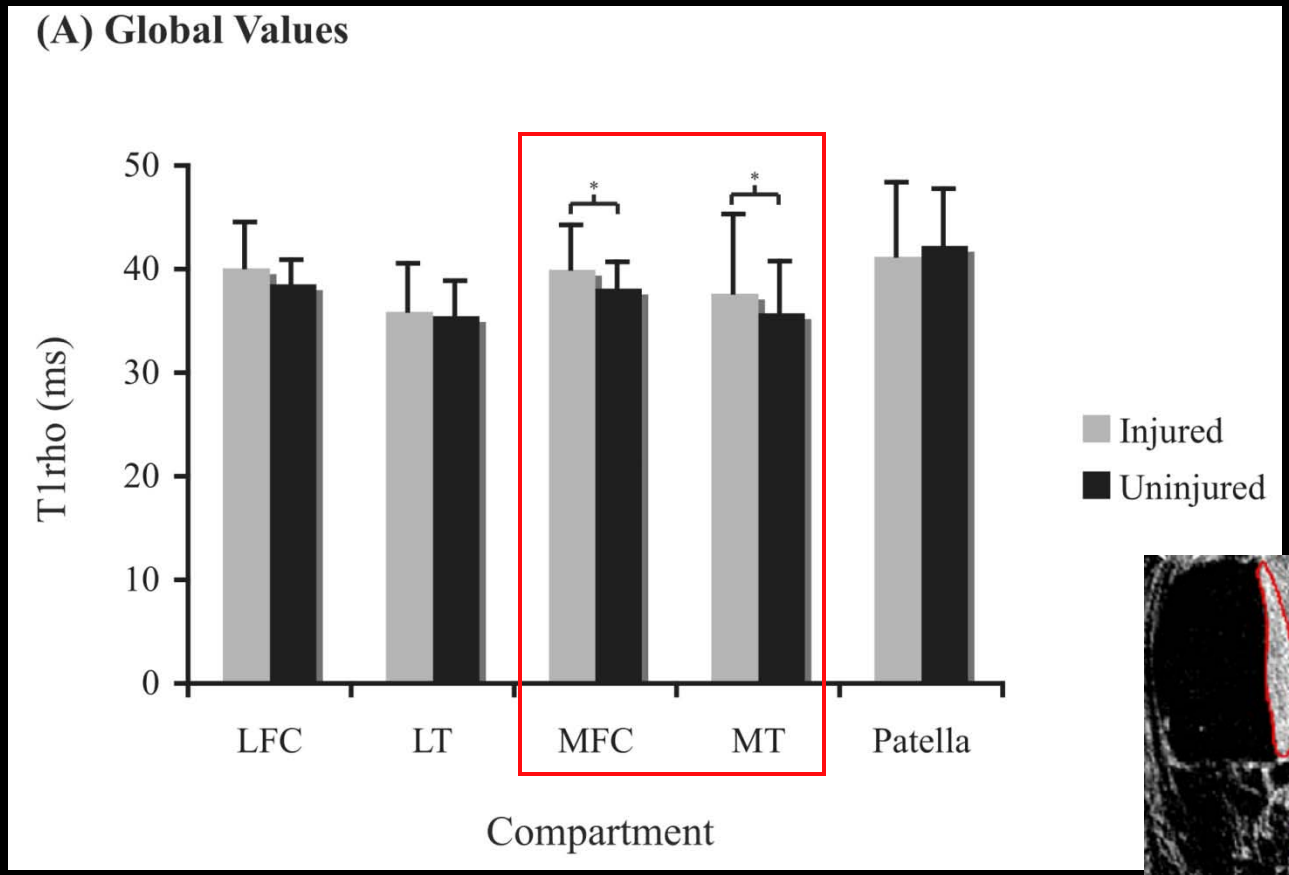
- Eighteen patients
  - 10 F, 8 M, Mean age = 38.3 ± 7.75 years; range = 28 - 53 yrs

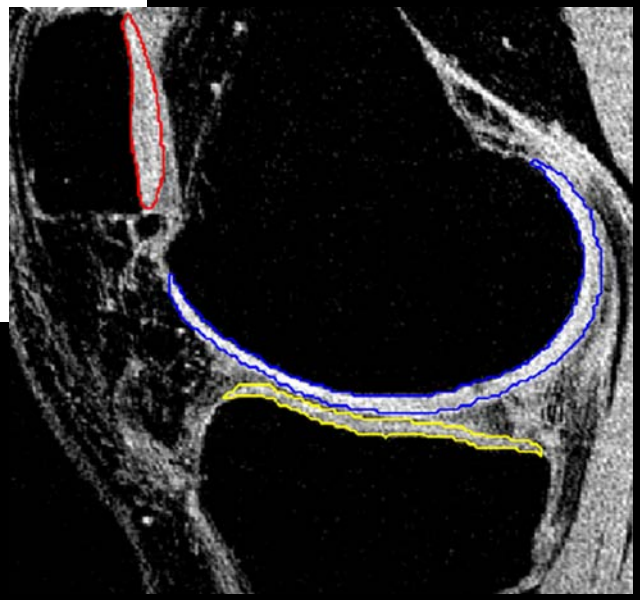
- 10 patients with meniscal tears at time of ACL reconstruction; diagnosed by arthroscopy

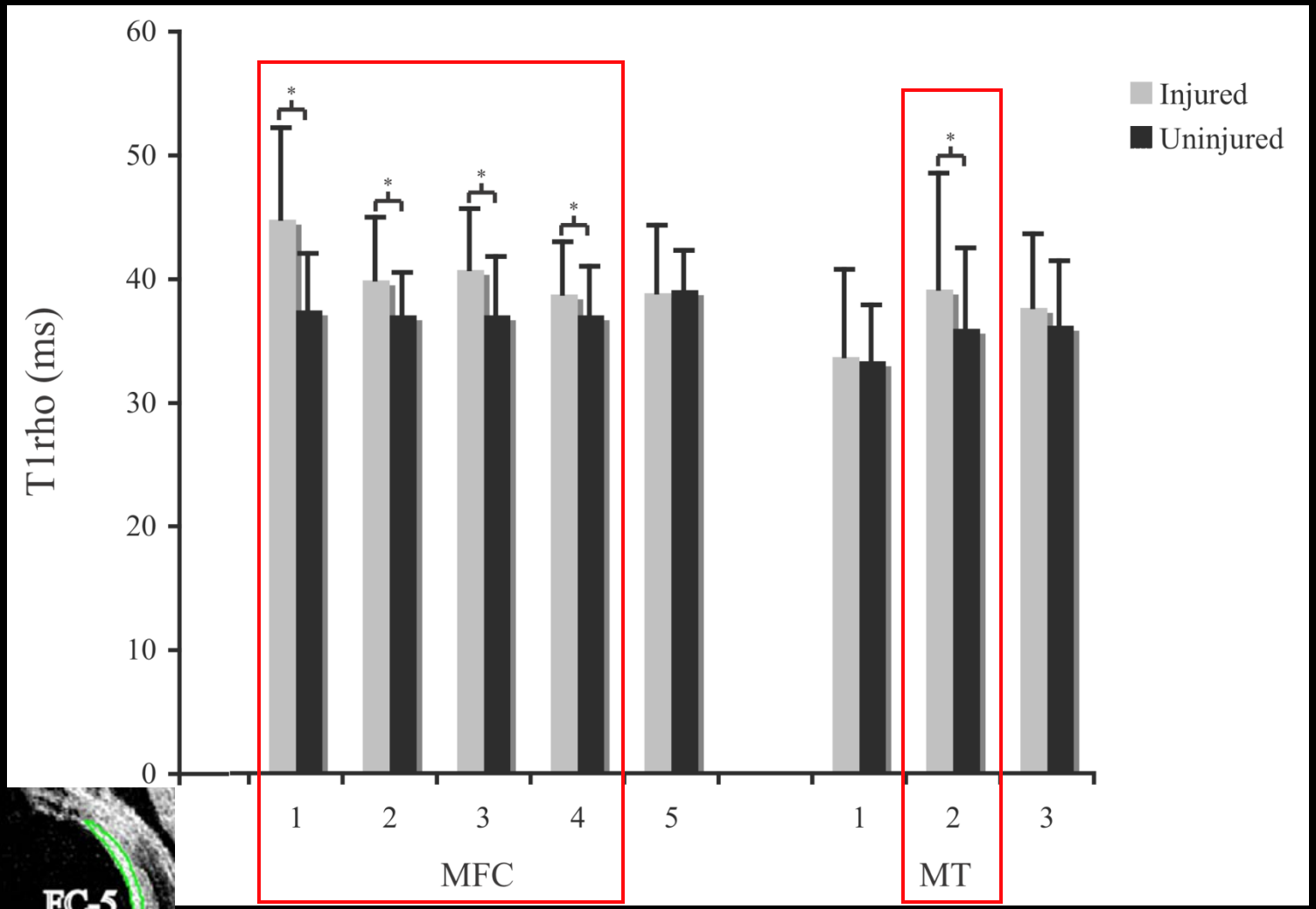
Lateral Meniscus Tear	Medial Meniscal Tear	Medial + Lateral Meniscal Tear
3	2	5

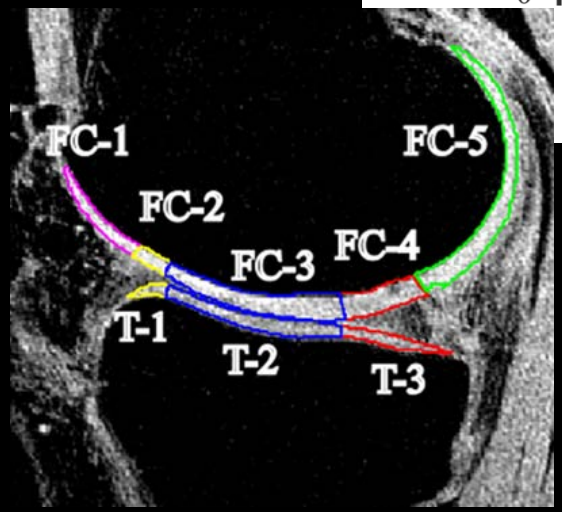
* All meniscal tears located in the posterior horns of the medial and lateral menisci
* No meniscal tears on MRIs in contralateral knees.

Global T1ρ Values

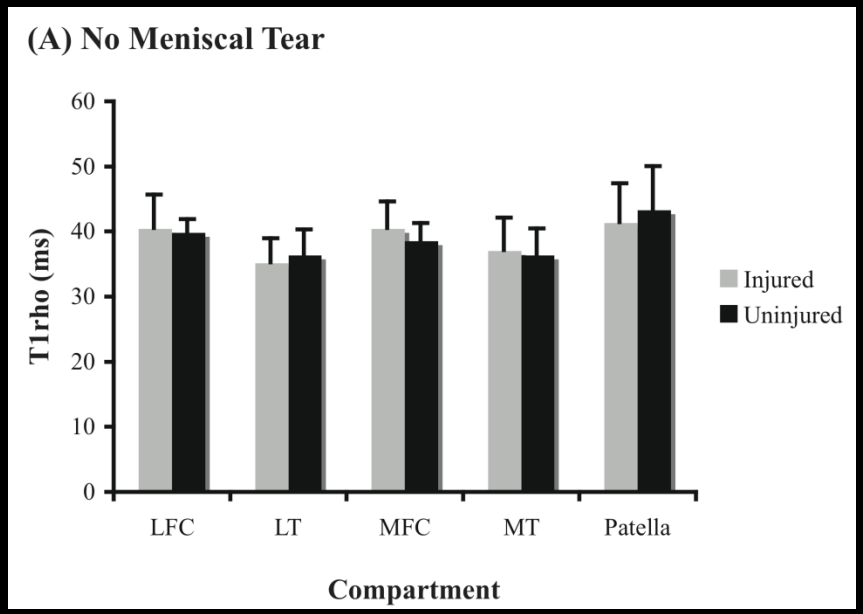


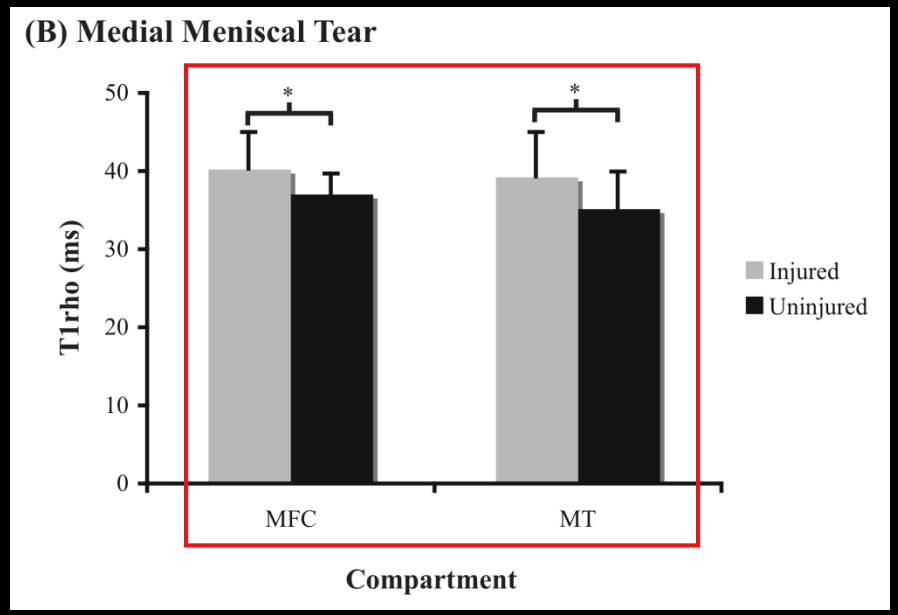


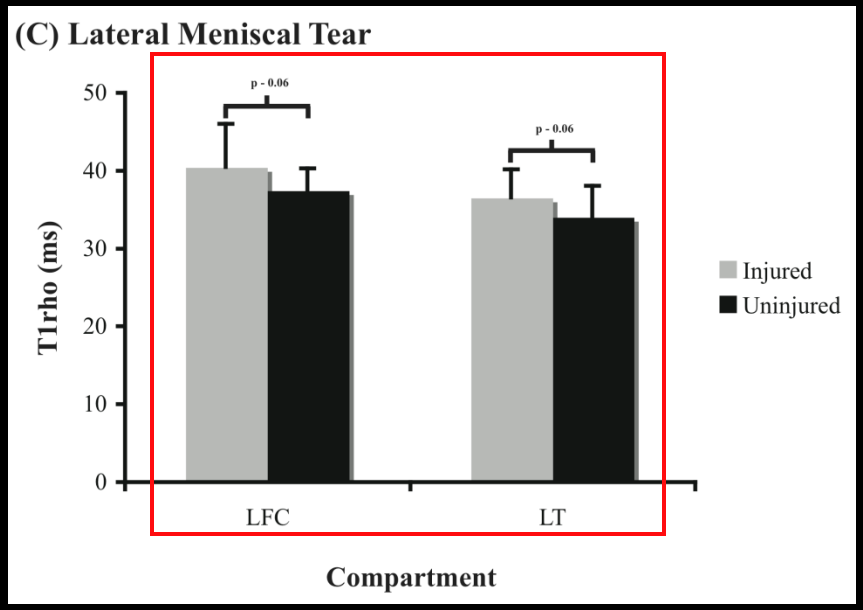

60
50
40
30
20
10
0
T1rho (ms)
Injured
Uninjured
*
1
2
3
4
5
1
2
3
MFC
MT

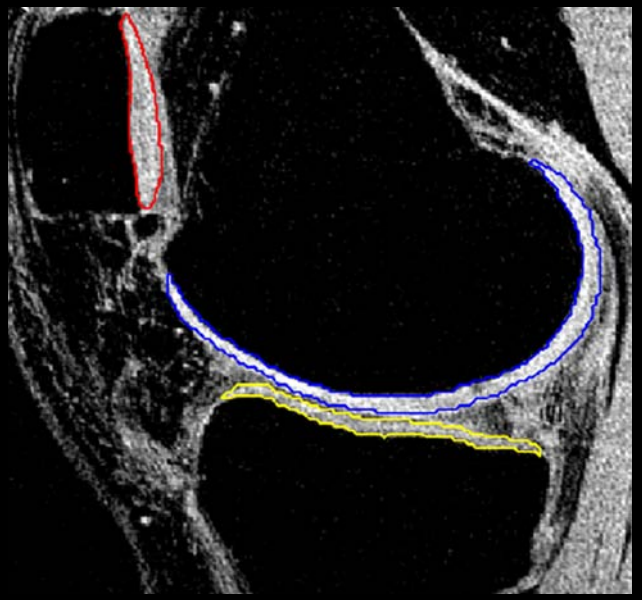

FC-1
FC-2
FC-3
FC-4
FC-5
T-1
T-2
T-3

Meniscal Tear Subanalysis









Conclusions

- ACL-reconstructed knees' medial compartments are at risk of cartilage matrix damage as early as 12 months after surgery, which is detectable by MRI

- The presence of meniscal damage at the time of ACL surgery is a significant risk factor for cartilage degeneration in the femorotibial compartments on the side of the injured meniscus.

- $T_{1\rho}$ MRI holds great potential as a modality for detection of early cartilage damage in ACL-reconstructed knees.

Future Studies

- Longer follow-up
- Larger cohorts
- Longitudinal study
- Kinematics

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