MRI BONE WINDOW IMAGING FOLLOWING OCD FIXATION WITH BONE GRAFTING

Cole J Homer, BBmE[1]; Jutta Ellermann, MD[2,3]; Abdul Wahed Kajabi, PhD; and Marc Tompkins, MD[1,4,5]

[1]Department of Orthopedic Surgery, University of Minnesota – Twin Cities, Minneapolis, MN, USA
[2]Department of Radiology, University of Minnesota – Twin Cities, Minneapolis, MN, USA
[3]Center for Magnetic Resonance Research, University of Minnesota – Twin Cities, Minneapolis, MN, USA
[4]TRIA Orthopedic Center, Minneapolis, MN, USA
[5]Gillette Children's Specialty Healthcare, St. Paul, MN, USA

Faculty Disclosure

- The presenters do not have a financial interest or other relationship with a commercial company or institution related to this presentation.

Background

- Osteochondritis Dissecans (OCD) lesions of the knee are subchondral defects that can injure or destabilize overlying cartilage
- Unhealed lesions can cause pain, dysfunction, knee instability, and premature osteoarthritis
- We have utilized an advanced MRI protocol that provides a CT-like bone window to evaluate healing of unstable OCD lesions following open bone grafting and fixation[1,2]

Purpose

Evaluate the clinical and MRI-based healing following open bone grafting and fixation of unstable OCD lesions.

Methods

- Patients were identified with an OCD lesion utilizing short echo time (TE = 2.6 ms) gradient-recalled echo (GRE) T2* mapping sequence (repetition time = 1150 ms, resolution = 0.43×0.43×2 mm^3)
- MRI findings were evaluated on the short TE GRE images with inverted CT-like bone window and were correlated with clinical symptoms to make a diagnosis

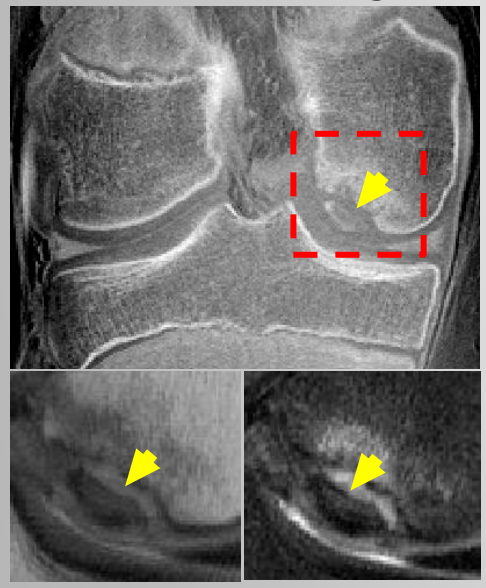
Methods

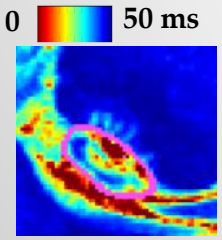
- Patients were treated surgically with open reduction internal fixation (ORIF) with proximal tibial bone grafting of the OCD
  - all patients underwent open debridement and curettage of both progeny and base of the lesion followed by cancellous bone grafting and fixation
- Post-operative MRI with bone windows were obtained
- Post-operative images were interpreted by a musculoskeletal radiologist as healing/healed or non-healing, and the radiographic healing was correlated with clinical assessment

T2* Mapping Sequence MR Images

TRIA ORTHOPAEDIC CENTER

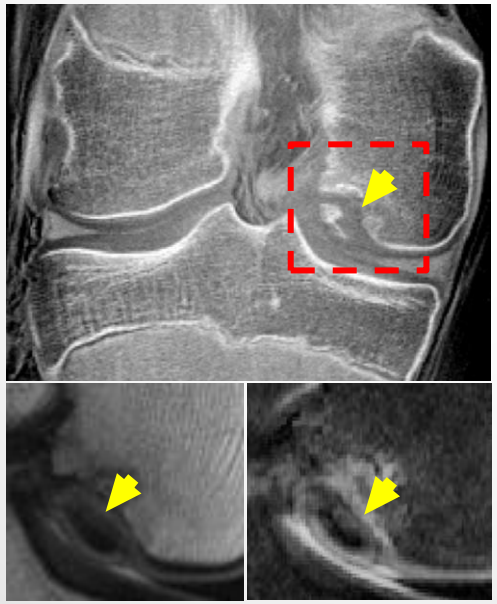
2.5 years prior to surgery (stage II)

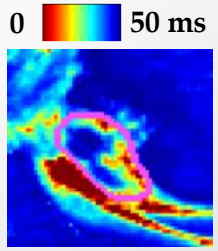




Mean T2* = 21.2 ms
STD = 12.2

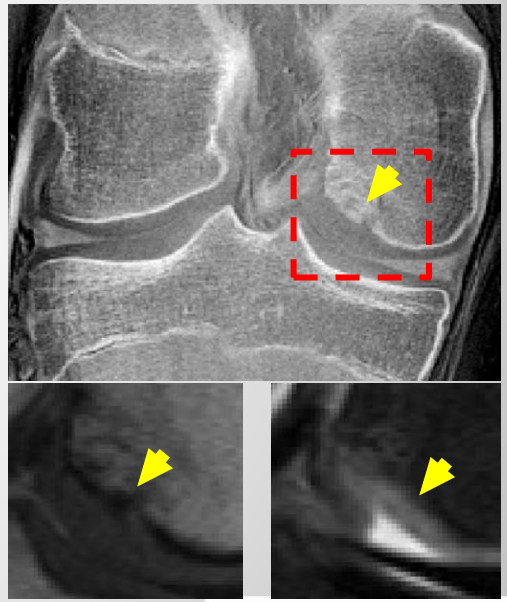
4 months prior to surgery (stage II)

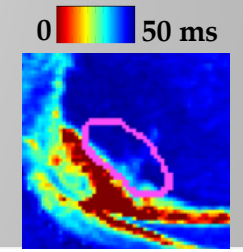




Mean T2* = 23.3 ms
STD = 15.1

6 months after surgery (PS)





Mean T2* = 6.2 ms
STD = 5.7

Gillette Children's Specialty Healthcare

Results

- **MRI findings**
- Post-operative complete or ongoing healing was observed in 15/16 knees
- Mean time from surgery to post-operative MRI was 12.2 months

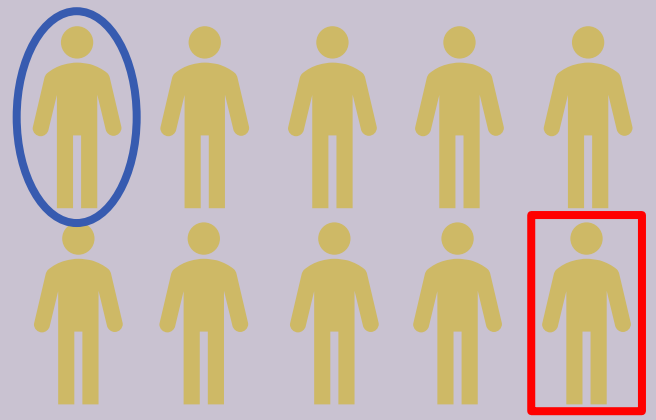
Results

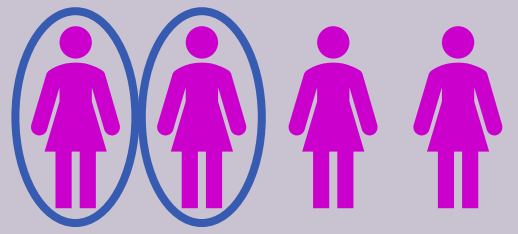
- **<u>Clinical findings</u>**
- All knees had no swelling, pain, or other symptoms prior to hardware removal
- All OCD lesions were found to be healed at the time of hardware removal, except for one which demonstrated healing of 60-70% of lesion
- No patients have required revision surgery following ORIF of OCD lesion

Results

Total Knees: 16

Total Patients: 14





ORIF was revision of surgery from a separate provider (all others were 1º surgeries)

No healing determined on radiographic evaluation

Mean age at time of surgery: 16.6 years (range 10-23 years)

Conclusions

- The short echo time GRE sequence is a useful, non-invasive tool in assessing healing of OCD lesions
- 93.75% of patients demonstrated complete or ongoing healing on MRI evaluation
  - Important to note that all patients underwent open debridement and curettage of both progeny and base of the lesion followed by cancellous bone grafting and fixation

Conclusions

- 100% of patients demonstrated sufficient clinical healing to warrant hardware removal
- This patient cohort demonstrates that surgical intervention with ORIF and proximal tibial bone grafting provides predictable clinical and radiographic healing of unstable OCD lesions

References

1. Ellermann J, Johnson CP, Wang L, et al. 2017. Insights into the Epiphyseal Cartilage Origin and Subsequent Osseous Manifestation of Juvenile Osteochondritis Dissecans with a Modified Clinical MR Imaging Protocol: A Pilot Study. Radiology 282:798-806.

2. Zbyn S, Santiago C, Johnson CP, et al. 2021. Compositional evaluation of lesion and parent bone in patients with juvenile osteochondritis dissecans of the knee using T2 * mapping. J Orthop Res.