

Patients with prevalent BMLs should not be candidates for arthroscopic knee surgery: the Osteoarthritis Initiative

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Introduction

- Arthroscopic knee surgery is performed more than 2 million times per year globally and remains one of the most common orthopedic procedures.
- The presence of meniscal tears on magnetic resonance imaging (MRI) is typically used for indication of arthroscopic surgery.
- However, there lacks evidence that having meniscal tears alone prior to surgery improves knee outcomes.
- Knee osteoarthritis (OA) properties such as bone marrow lesions (BMLs), which have strong associations with knee pain, can be gleaned from the same MR images but are not factored into surgical decision-making.
- It is possible that even if meniscal tears were resolved, the presence of BMLs would still result in pain persisting.
- It is important to consider other MRI variables before surgery because arthroscopic knee surgeries have previously been shown to be no better than exercise alone.

Objective & Hypothesis

Objective: To determine the influence of meniscal tear and bone marrow lesion abnormalities on knee arthroscopy outcomes.

Hypothesis: Individuals with BMLs are associated with having negative surgical outcomes despite having meniscal tears before arthroscopy and having the tears repaired or debrided.

Methods

- A prospective discrete time analysis was performed using data from the Osteoarthritis Initiative (OAI), which included participants (N=4796, 45-70 years old) at risk of OA or have OA in ≥ 1 knee.
- Data for a subset of this cohort from baseline-108 months were included if knee arthroscopy was reported to have been performed since last visit, knee outcome scores were available before and after surgery, and if MRI was completed before surgery.
- MR images examining meniscal tears and BMLs used coronal intermediate-weighted turbo spin-echo (IW TSE) (3mm slice thickness, 0.37x0.46 resolution) and 3D sagittal Double Echo Steady State (DESS) water excitation (0.7mm slice thickness, 0.37x0.46 mm resolution) MRI sequences
- MR images were semi-quantitatively graded for BML number, size, and % of lesion that is BML (vs cyst) using the MRI Osteoarthritis Knee Score (MOAKS) scoring tool.

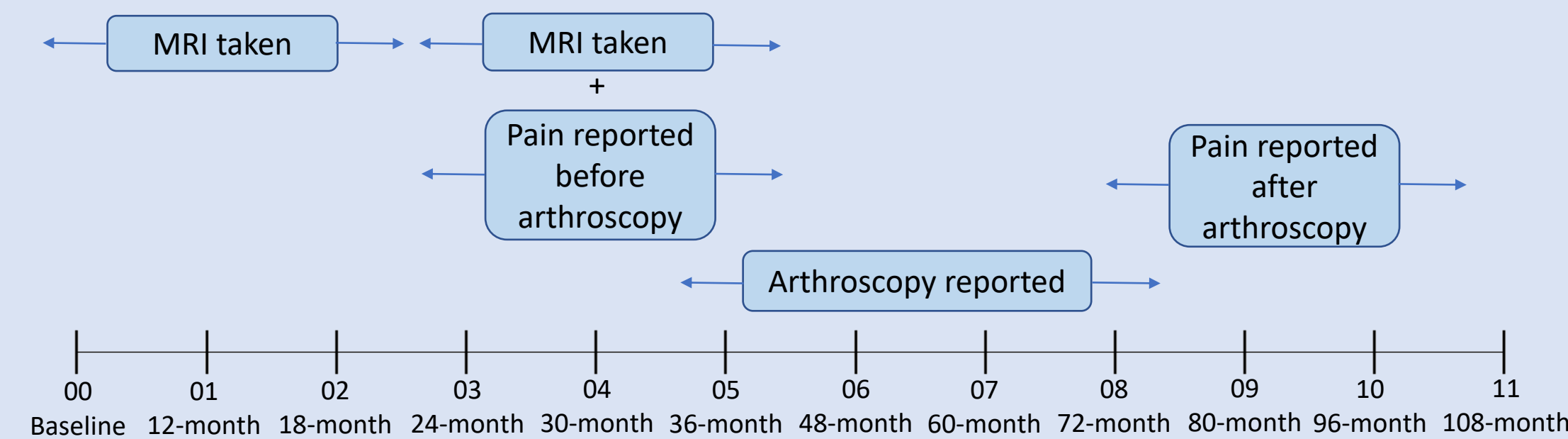


Figure 1. Timeline of visit numbers and follow up months.

Statistical Analysis

- A binary logistic regression model determined how pain changes (Knee Osteoarthritis Outcome Score (KOOS) questionnaire pain item) from before to after surgery (dichotomized to whether changes exceeded minimal clinically meaningful improvement) were associated with meniscal tears and BML scores.
- Odds ratios (OR) were reported with 95% confidence intervals.
- Models were adjusted for sex, age, education, income, analgesic use, KOOS before arthroscopy, time between pre-surgical KOOS and arthroscopy, time between arthroscopy and post-surgical KOOS, and time between pre-surgical MRI and pre-surgical KOOS.

Table 1. Participant characteristics. MT=meniscal tear, BML=bone marrow lesion.

Variable	Mean/ Median/ Freq	SD/ IQR/%
Participants (N = 167)		
Age	59.3	8.5
Sex (women)	91	54.49%
Race		
White/Caucasian	146	87.43%
Black/ African American	16	9.58%
Hispanic	2	1.20%
Other Non-White	3	1.80%
BMI (kg/m ²)	29.46	4.42
Education		
High graduate or less	28	16.87%
Some post-secondary school	46	27.71%
Post-secondary school graduate	92	55.42%
Yearly Income (< 50K)	55	33.54%
Analgesic Use (Yes)	53	31.74%
Knees (N = 178)		
Right Knees	98	55.06%
Knees with MT	122	68.54%
Knees with BMLs	78	43.82%
BML Number		
Tibia	0	(0, 1)
Femur	1	(0, 2)
BML Size		
Tibia	0	(0, 1)
Femur	1	(0, 2)
BML Effusion		
Tibia	0	(0, 3)
Femur	3	(0, 3)

Table 2. Knee Injury and Osteoarthritis Outcome Score (KOOS) pain scores before and after arthroscopy.

Variable	N	Score <u>before</u> arthroscopy		Score <u>after</u> arthroscopy		Score stayed the same/worsened <u>after</u> arthroscopy	
		Mean	SD	Mean	SD	Freq	%
KOOS Knee pain	178	71.45	21.22	76.70	18.02	125	70.22%

Table 3. Logistic regression analysis, reporting odds ratios (OR) for associations between having a femoral or tibial meniscal tear (MT) or specific bone marrow lesion (BML) properties (sum number, size, or effusion) and same/worse pain scores (from the Knee Injury and Osteoarthritis Outcome Score (KOOS) questionnaire) after knee arthroscopy.

Exposure	Outcome	MT Only			MT Adjusted for BML			BML Only			BML Adjusted for MT		
		N	OR	95% CI	N	OR	95% CI	N	OR	95% CI	N	OR	95% CI
Tibia													
BML Number	Same/Worse Knee Pain	156	1.55	0.51, 4.77	111	1.10	0.31, 3.95	111	2.82	1.37, 5.83	111	2.81	1.36, 5.82
BML Size	Same/Worse Knee Pain	175	1.93	0.73, 5.09	111	1.12	0.32, 3.93	111	2.05	1.11, 3.79	111	2.03	1.10, 3.78
BML Effusion	Same/Worse Knee Pain	156	1.55	0.51, 4.77	111	1.12	0.32, 3.93	152	2.11	1.22, 3.63	152	2.01	1.18, 3.43
Femur													
BML Size	Same/Worse Knee Pain	175	1.93	0.73, 5.09	152	1.81	0.65, 5.05	152	1.89	1.10, 3.26	152	1.81	1.04, 3.15

For all models, the outcome was the dichotomous variable of whether knee outcomes after arthroscopy improved (0) or stayed the same/worsened (1), according to their respective minimal clinical important differences (MCIDs).

MT only refers to models that had presence or absence of a meniscal tear as the exposure, without adjusting for the BML property of interest.

BML only refers to models that have the BML property of interest as the exposure, without adjusting for presence or absence of a meniscal tear.

MT adjusted for BML and BML adjusted MT refer to models that included both presence or absence of a meniscal tear and BML property of interest.

Results

- 167 participants (54.5% women, mean age = 59.3±8.5 years, mean BMI = 29.46±4.42 kg/m²) had knee arthroscopy, 11 of whom had it performed in both knees, resulting in 178 knees analyzed.
- Worse knee pain after arthroscopy was significantly associated with a greater number of BMLs (OR = 2.82(1.37,5.83)), larger BML size (OR = 2.05(1.11,3.79)), and greater % of lesion that is BML (OR = 2.11(1.22,3.63)) in the tibia and this association remained significant despite having had meniscal debridement.
- Only greater BML size in the femur was associated with an increased odds for same/worse score for KOOS pain (OR 1.89 [95% CL 1.10 to 3.26]) and odds ratios for this outcome remained significant despite having had meniscal debridement.
- Having a femoral or tibial meniscal tear before knee arthroscopy was not independently associated with improved knee pain.

Conclusion

- The presence of BMLs remains to be a significant source of pain post-surgery even after meniscal repair or debridement.
- Therefore, patients with prevalent BMLs in presurgical MRI scans should not be candidates for arthroscopic knee surgery unless the BMLs are treated.

Acknowledgments

