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Blood Flow Signals Through the Bone Cortex on Ultrasonography as a Screening Test for Detecting Bone Marrow Lesions on Magnetic Resonance Imaging in Patients with Early Knee Osteoarthritis

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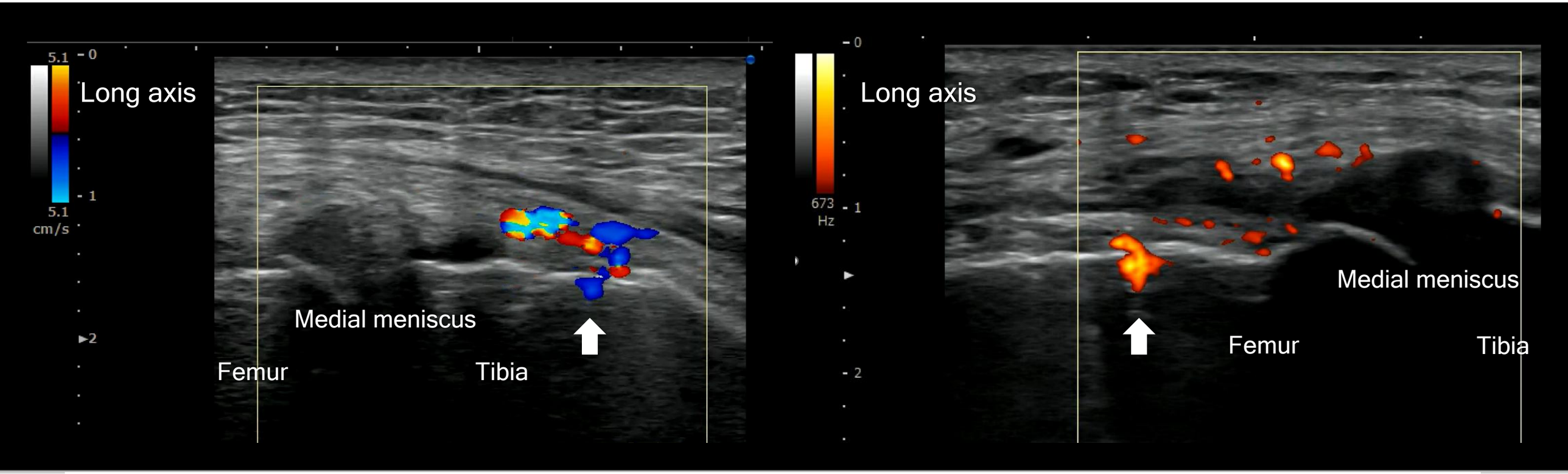
Faculty Disclosure Information

- Nothing to disclosure

Introduction

Blood flow signals (BFS) through the bone cortex on ultrasonography (US)



BFS have been observed in patients with knee osteoarthritis (OA) and are thought to indicate the presence of bone lesions

Introduction

Bone marrow lesions (BML) on magnetic resonance imaging (MRI)

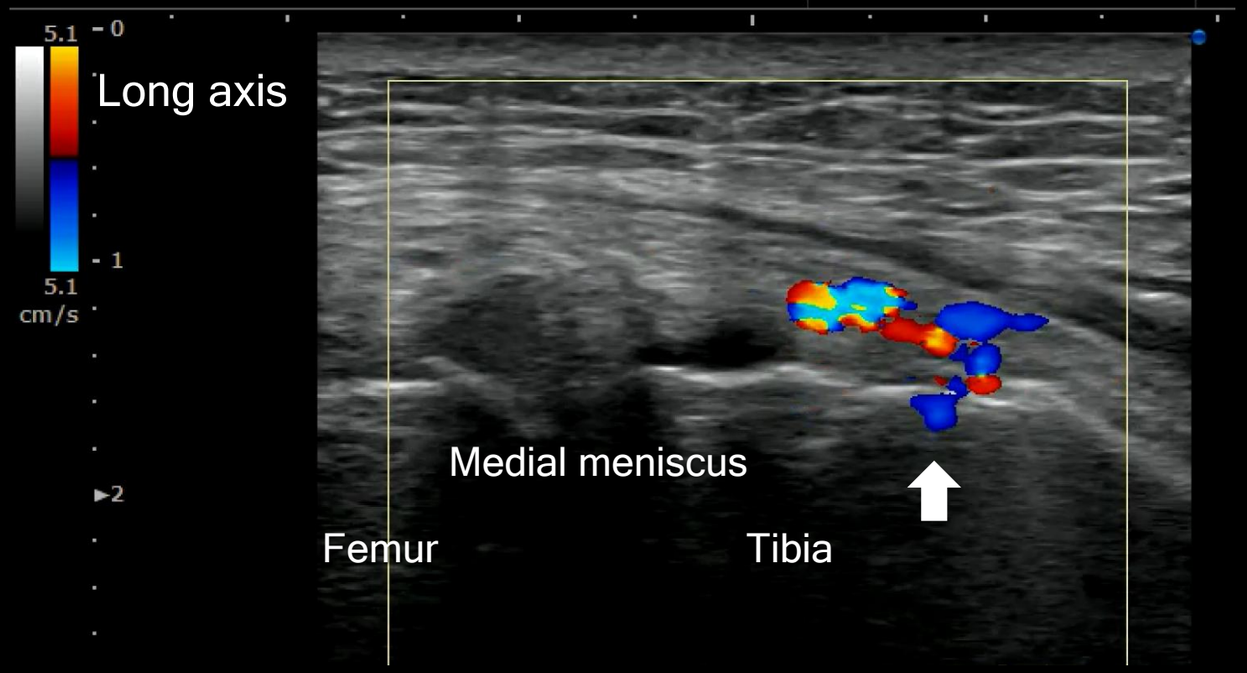
Fluid-sensitive MRI (STIR, T2 FS)

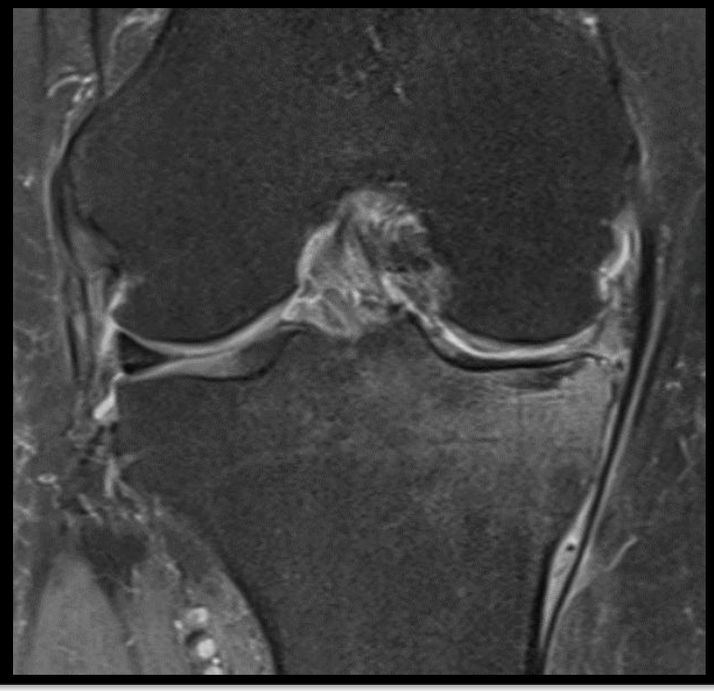
- Indistinct high-signal regions
- Adjacent to the articular cartilage
- Absence of clear fracture lines
- Exclusion of trauma, rheumatoid arthritis, and tumor

BML are characteristic imaging findings of knee OA. BMLs have been reported to reflect high metabolic activity of the bones and microfractures.

Introduction

BFS through the bone cortex and BML





BFSs through the bone cortex and BMLs can be used to assess bone lesions. However, no studies have reported their correlation.

This study aimed to assess whether BFS through the bone cortex on US can be used as a screening test to detect BML on MRI in patients with early knee OA.

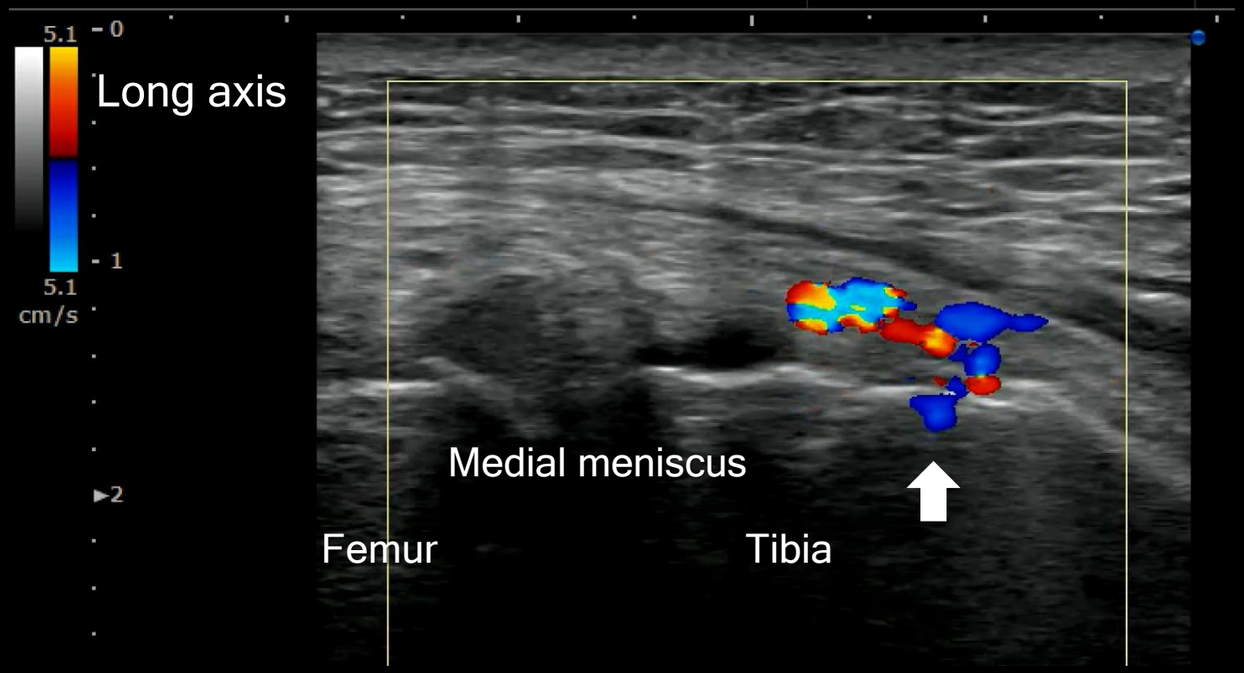
Materials and methods

Patient selection

- Nonrandomized, prospective, multicenter clinical trial
- Patients with knee joint pain who were diagnosed with early knee OA based on the Luyten diagnostic criteria
- We enrolled 107 patients who underwent MRI and confirmed the presence or absence of BFS through the bone cortex on US

Materials and methods

Detecting BFS through the bone cortex on US

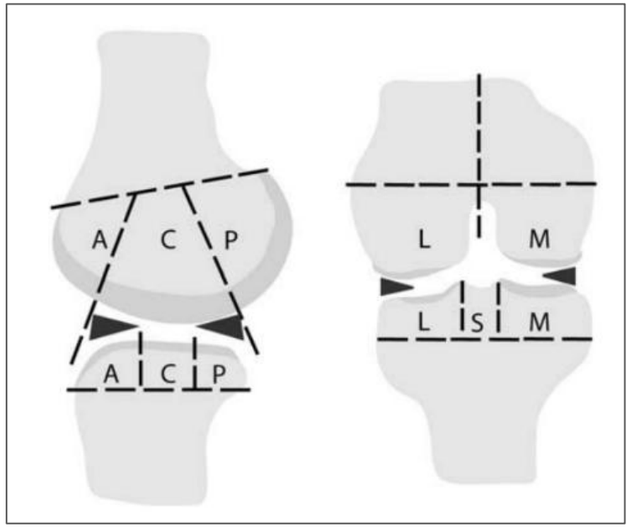


- In the supine position with slight knee flexion
- In power or color Doppler mode on US

Materials and methods

Detecting BML on MRI

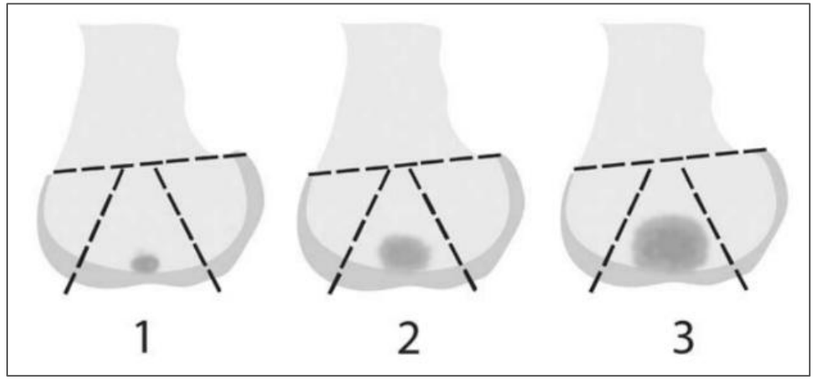
- **WORMS (Whole-Organ Magnetic Resonance Imaging Score)**



Sag 3 compartments

× Cor 5 compartments

= 15 compartments



0	none
1	< 25%
2	25% ～ 50%
3	> 50%

- BML score was calculated for each area.
- Areas with a total score of ≥1 were defined as having BML.

Results

107 cases

Male: 42, Female: 65, mean age: 67.4 years

Femur

BFS \ BML	+	-	Total
+	24	2	26
-	5	76	81
Total	29	78	107

$\chi^2(1) = 73.9, p<0.001$

Sensitivity	83 %	PPV	92 %
Specificity	97 %	NPV	94 %

Tibia

BFS \ BML	+	-	Total
+	28	4	32
-	4	71	75
Total	32	75	107

$\chi^2(1) = 72.2, p<0.001$

Sensitivity	83 %	PPV	92 %
Specificity	97 %	NPV	94 %

※ PPV: Positive Predictive Value, NPV: Negative Predictive Value

Conclusion

BFS through the bone cortex on US can be used as a screening test to detect BML on MRI in patients with early knee OA.

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