The Presence and Degree of Bone Marrow Edema Influence on Midterm Clinical Outcome Following Microfracture for Osteochondral Lesions of the Talus

Yoshiharu Shimozono, MD, Eoghan Hurley, MBBCh, BAO, John Kennedy, MD, FRCS(Orth)

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Introduction/Purpose: Subchondral bone marrow edema (BME) has been associated with articular cartilage loss, with the potential to be a negative prognostic indicator for clinical outcome following microfracture. However, no single study has investigated the influence of BME on clinical outcome following microfracture for osteochondral lesions of the talus (OLT) at mid-term follow-up. The purpose of this study was to clarify the influence of postoperative subchondral BME on the clinical outcome in patients treated with microfracture for OLT at both short- and mid-term.

Methods: Patients who underwent microfracture between 2008 and 2013 were assessed at 2- and 4-year postoperative follow-up. BME was evaluated using magnetic resonance imaging (MRI), and the presence of subchondral BME was determined with fat-suppressed T2-weighted sequences. BME was graded on a 0-3 scale based on the relation to total talar volume as follows: 0, no BME; 1, <25% of talar volume; 2, 25%<, >50% of talar volume; 3, >50% of talar vome. Clinical outcomes were evaluated using the Foot and Ankle Outcome Scores (FAOS). The influence of postoperative subchondral BME on the clinical outcomes were evaluated as following; 1) the FAOS between the BME and the no BME groups were compared at 2 and 4 years post surgery, 2) the FAOS based on the BME grades were compared at each time point, and 3) correlation between the FAOS and BME grade was evaluated at each time point.

Results: Forty-three (83%) of 52 eligible patients were included. No significant differences were found in FAOS between BME and no BME groups at 2-year follow-up (p=0.109), but there was a significant difference at 4-year follow-up (p = 0.041). A significant difference was found among BME grades at 4-year follow-up (p=0.035) (Table 1). A post hoc analysis showed significant differences between grade 0 and 2, 0 and 3, and 1 and 3 (p=0.041, 0.037 and 0.048, respectively). In addition, at 4-years follow-up, a significant correlation was noted between FAOS and BME grade (r= -0.453, p = 0.003) (Table 1), but not at 2-years (r = -0.212, p = 0.178). Seventy-four percent of patients still had subchondral BME at 4-year follow-up after microfracture for OLT.

Conclusion: Patients with the presence of subchondral BME at mid-term follow-up after microfracture for OLT had worse clinical outcomes than those without subchondral BME. In addition, the degree of subchondral BME at mid-term follow-up was correlated with clinical outcome. However, in the short-term follow-up, there were no significant differences in clinical outcomes based on both the presence and degree of BME. The current study suggests that BME at short-term follow-up is a normal physiologic reaction. However, BME at mid-term following microfracture for OLT may be pathological, and is related to poorer clinical outcomes.

Table 1. Clinical outcome based on subchondral bone marrow edema grades

	Grade					
	0	1	2	3	*ANOVA*	*Pearson's correlation*
FAOS						
Preop	57.5 ± 15.2 (n = 13)	59.3 ± 12.1 (n = 27)	60.3 ± 9.0 (n = 3)	-	$p = 0.917$	$r = 0.061$ $p = 0.702$
2 years follow-up	88.6 ± 8.0 (n = 9)	83.9 ± 5.9 (n = 21)	82.4 ± 7.9 (n = 8)	84.0 ± 4.9 (n = 5)	$p = 0.272$	$r = -0.212$ $p = 0.178$
4 years follow-up	84.7 ± 7.4 (n = 11)	80.1 ± 10.5 (n = 22)	74.0 ± 10.3 (n = 6)	67.5 ± 7.1 (n = 4)	**$p = 0.035$***	**$r = -0.453$ $p = 0.003$***

Abbreviations: BME; bone marrow edema, FAOS; foot and ankle outcome scores, Preop; preoperatively,
*Quantitative variables expressed as mean ± standard deviation. *Statistically significant difference.*

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