Patient-Reported Outcomes After Microfracture With and Without Biologic Augmentation for Talar Osteochondral Defects

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INTRODUCTION: Talar osteochondral defects (OCDs) commonly result from acute or repetitive ankle trauma and are difficult to treat due to the limited healing capacity of articular cartilage. Standard surgical management involves bone marrow stimulation (BMS) techniques such as microfracture, as well as adjunct biologics including bone marrow aspirate concentrate (BMAC), platelet-rich plasma (PRP), and whole blood. Despite the increasing popularity of biologic augmentation, its clinical efficacy compared with solely BMS remains unclear. This study aimed to retrospectively compare patient-reported outcomes following microfracture alone versus microfracture with micronized allograft cartilage (BioCartilage) and biologic adjuvants for talar OCDs.

METHODS: This study was approved by the Institutional Review Board and included adult patients of male and female sexes who underwent surgical treatment for talar OCD between 2015-2025, with Patient-Reported Outcomes Measurement Information System (PROMIS) scores preoperatively (pre-op) and up to one year postoperatively (post-op). A retrospective chart review was conducted. Patients were stratified into two cohorts: microfracture alone as controls and microfracture with biologic augmentation with allograft cartilage as interventions. The intervention group was further subdivided into 3 subgroups based on biologic type: BMAC, PRP, and whole blood. The Wilcoxon Signed-Ranks test was used to assess pre- to post-op differences in three PROMIS scores categories across three-time intervals. Intergroup baseline differences were evaluated with Kruskal-Wallis for pre-op PROMIS scores and Wilcoxon Rank-Sum for lesion size. A linear mixed model (LMM) was conducted to synthesize additional factors that may identify biomarkers conducive to success within each treatment group.

RESULTS: A total of 50 patients were included, with a sample size of 25 in each group (non-parametric dataset). Controls demonstrated pre- to post-op improvement in six of nine PROMIS domains: pain intensity at 0-3 and 3-6 months post-op, physical function at 0-3 and 6-12 months post-op, and pain interference at 3-6 and 6-12 months post-op. Comparatively, three improvements were seen in the intervention group: pain intensity at 0-3 and 6-12 months post-op and physical function at 6-12 months post-op (Table 1). Subgroup analysis by biologic type did not reveal statistically significance differences. Lesion size was found to be greater in patients treated with biologics ($P<0.01$). LMM analysis demonstrated that cardiovascular disease, diabetes, and smoking were associated with higher pain and lower function, whereas alcohol use (vs. alcohol non-users) was linked to lower pain.

DISCUSSION: This study provides preliminary evidence that biologic augmentation of microfracture does not yield additional improvement in patient-reported outcomes for small talar lesions, but it may confer a beneficial effect in the management of larger lesions. While these findings could potentially reinforce microfracture as an effective and reliable treatment for small talar OCDs, the size of the lesion remains an influential factor in the process of decision-making given that in our study, biologics were mainly used for the larger OCDs. The retrospective nature and small sample size in this study as well as some incomplete datasets among the patients limited our ability for a more concrete conclusion. Further prospective studies with size-matched OCD groups and more structured follow-up protocols may help to clarify the role and benefits of biologic augmentation in the treatment of talar OCDs.

SIGNIFICANCE/CLINICAL RELEVANCE: By providing comparative clinical data on the increasing use of biologics for cartilage and OCD repair, this retrospective study aims to determine whether biologic augmentation can improve PROMIS outcomes in patients with talar OCD treated with microfracture.

IMAGES AND TABLES:

Table 1. Patient-Reported Outcomes Measurement Information System score medians for patients in the following groups: interventions (arthroscopy treatment using microfracture with allograft cartilage (BioCartilage)), intervention subgroup 1 (BioCartilage augmented with whole blood), intervention subgroup 2 (BioCartilage augmented with platelet-rich plasma), intervention subgroup 3 (BioCartilage augmented with bone marrow aspirate concentrate), and control group (arthroscopy treatment using microfracture without allograft cartilage). *P*-values correspond to the change in value from pre- to post-op score. Baseline comparison *P*-values correspond to intergroup distribution of pre-op scores.

	Pre-op	*P*-value	0-3 months post-op	*P*-value	3-6 months post-op	*P*-value	6-12 months post-op
Pain intensity							
Interventions	52.10	0.01*	46.30	0.02	52.10	0.01*	48.00
Group 1	49.40	0.14	43.50	0.04	40.20	0.08	43.50
Group 2	52.10	0.15	46.30	0.40	52.10	0.14	48.00
Group 3	55.00	0.12	52.10	0.18	55.00	0.23	55.00
Controls	54.50	<0.01*	46.30	<0.01*	49.40	0.06	51.00
Baseline comparison *P*-value	0.06						
Physical function							
Interventions	41.70	0.04	37.00	0.02	45.50	<0.01*	47.90
Group 1	45.50	0.14	40.90	0.27	49.40	0.08	53.40
Group 2	41.70	0.07	35.50	0.22	44.40	0.02	49.00
Group 3	39.00	0.61	37.00	0.08	46.00	0.31	43.00
Controls	40.10	<0.01*	33.30	0.04	43.00	<0.01*	47.90
Baseline comparison *P*-value	0.21						
Pain interference							
Interventions	60.00	0.97	58.50	0.04	55.60	0.04	56.00
Group 1	52.00	0.69	57.10	0.14	52.00	0.47	49.60
Group 2	57.10	0.75	61.20	0.33	55.60	0.09	52.00
Group 3	63.80	0.46	61.00	0.24	60.00	0.40	59.00
Controls	63.00	0.12	63.00	<0.01*	57.10	<0.01*	56.00
Baseline comparison *P*-value	0.07						

*Wilcoxon Signed-Ranks test; statistical significance set at $P<0.05/3=0.0167$ to account for Bonferroni adjusted *P*-values.