

# Bone Marrow Aspirate Concentrate May Decrease Reoperation in Osteochondral Allograft Transplantation: A Prospective, Randomized, Double-Blind Investigation

## Study Summary

Yanke AB, Dandu N, Bodendorfer BM, et al. Bone marrow aspirate concentrate may decrease reoperation in osteochondral allograft transplantation: a prospective, randomized, double-blind investigation. *Arthroscopy*. Published online June 6, 2025. doi:10.1016/j.arthro.2025.05.024

### SYNOPSIS

Osteochondral allografts treated with bone marrow aspirate (BMA) processed by the Angel® system demonstrated smaller cystic changes and a lower likelihood of requiring follow-up surgery when compared to traditional osteochondral allograft (OCA) transplantation. The noticeable decrease in large cyst development is thought to be consistent with the expected function of concentrated BMA. Specifically, the higher concentration of MSCs, TGF- $\beta$ , BMPs, and IL-1Ra are thought to support graft integration and mitigate inflammatory responses.

### BACKGROUND

- › Full-thickness articular cartilage defects of the knee are a prevalent source of pain and functional limitation among young, physically active patients.
- › OCA transplantation has become an increasingly popular treatment option due to its effectiveness in alleviating pain and enhancing joint function across both short- and long-term follow-ups.
- › However, this success is largely dependent on successful graft osteointegration.
- › As a result, supplemental treatments like concentrated BMA are being increasingly investigated for their potential to enhance cellular repopulation and neovascularization.

### STUDY OBJECTIVE

Determine potential differences in graft integration and patient-reported outcome metrics (PROMs) between OCA transplantation procedures performed with and without concentrated BMA augmentation.

### STUDY DESIGN AND METHODS

In this Level I study, 36 patients undergoing OCA surgery were randomized to receive either an iliac crest-derived concentrated BMA or a sham incision. CT scans of the knee were taken 6 months postoperatively and graded according to the ACTOCA system. PROMs, including International Knee Documentation Committee (IKDC) and Knee Injury and Osteoarthritis Outcome Score for Joint Replacement (KOOS JR) scores, were also obtained at 6, 12, and 24 months postoperatively.

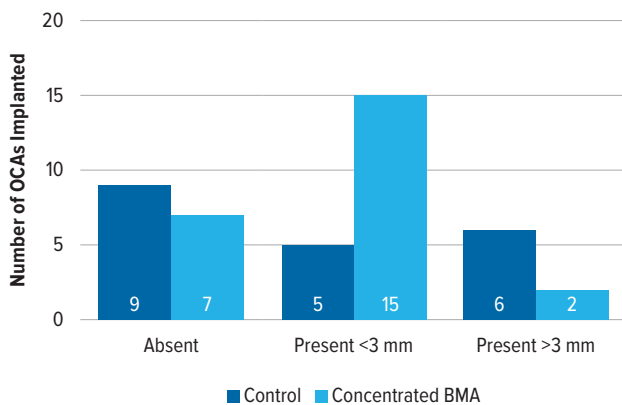
Concentrated BMA was prepared from 60 mL of BMA from the iliac crest and was processed in the Angel system, at 25% HCT, yielding approximately 3-4 mL. Prior to graft implantation, marrow elements were flushed from the osteochondral plug. Grafts in the experimental group were then soaked in concentrated BMA.

### RESULTS

A total of 44 grafts across 36 patients were evaluated. At the 6-month postoperative mark, outcomes across osseous integration, presence of intra-articular fragments, graft signal density, and surface percentage with a discernible cleft were comparable between the control and concentrated BMA groups.

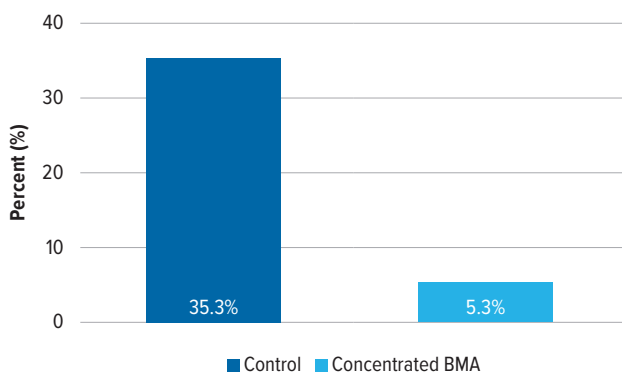


**Figure 1.** Imaging Analysis of OCA Grafts for Cystic Changes



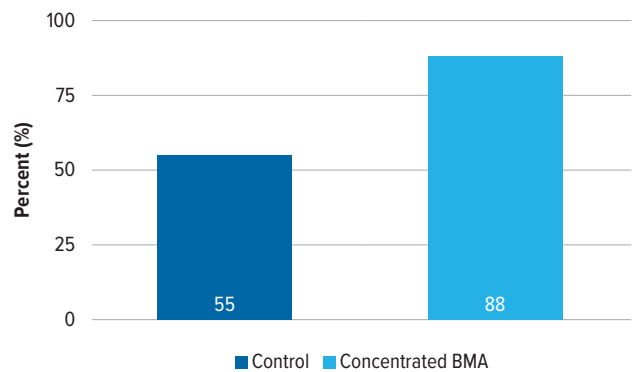
There was a significant difference between groups when cystic changes were measured ( $P = .03$ ). Grafts treated with concentrated BMA were more likely to demonstrate minor cystic changes (Figure 1). The concentrated BMA-treated group also showed a significant decrease ( $P = .02$ ) in reoperation for graft debridement or revision (Figure 2).

**Figure 2.** OCA Graft Failure Rates; All Occurrences in MFC



While there were no statistically significant differences in PROMs preoperatively or at 6, 12, or 24 months postoperatively, the concentrated BMA group demonstrated a meaningful improvement in knee function. According to the KOOS JR score, 88% of patients who received concentrated BMA experienced a meaningful improvement in knee function, compared to only 55% in the control group, which did not receive concentrated BMA ( $P = .076$ ). This suggests a potential benefit of incorporating concentrated BMA by surpassing the minimal clinically important difference (MCID) (Figure 3).

**Figure 3.** Percentage of Patients Achieving MCD in KOOS JR



## CONCLUSIONS

- › Patients receiving concentrated BMA-treated grafts were more likely to exhibit minor cystic changes but, in turn, showed fewer large cystic formations, over 3 mm, when compared to the OCA control group.
- › Additionally, there was a significant difference in both the failure rates and survival times between groups ( $P = .023$ ).
- › Patients in the concentrated BMA group showed improved survival rates and were less likely to require a follow-up surgery due to persistent or new symptoms following the initial procedure.