Single-Stage Biphasic Cartilage Implant Outperforms Microfracture: A Five-year Follow-up Study for Knee Cartilage Defects

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INTRODUCTION:

Full-thickness cartilage defects of the knee pose a significant clinical challenge due to the avascular nature and limited regenerative capacity of articular cartilage. While microfracture (marrow stimulation, MS) is widely used, its long-term efficacy remains suboptimal. This study aimed to evaluate the long-term clinical performance of a single-stage biphasic scaffold loaded with autologous cartilage (RevoCart) compared to microfracture for the treatment of focal osteochondral lesions of the knee.

METHODS: A total of 33 patients with symptomatic focal chondral or osteochondral lesions were randomized to undergo either RevoCart implantation (n=17) or microfracture (n=16). RevoCart involves a single-stage surgical approach utilizing a biphasic bioresorbable scaffold seeded intraoperatively with autologous cartilage fragments. Clinical outcomes were assessed using the IKDC, KOOS, and Tegner activity scale at baseline and at 12, 24, and 60 months postoperatively. MRI evaluation was also performed at each time point. In consenting patients, second-look arthroscopy and biopsy were conducted at 12 months to evaluate tissue integration.

RESULTS:

At the 60-month follow-up, 75% (25/33) of patients remained in the study (RevoCart: 13, MS: 12). Both groups showed initial clinical improvements at 1 and 2 years. However, RevoCart demonstrated significantly superior outcomes at 24 and 60 months, particularly in IKDC scores (Figure 1a). KOOS scores improved in both groups, but the MS group experienced a decline in the Sports/Rec subscale over time, whereas RevoCart sustained high levels of functional improvement (Figure 1b). Importantly, all patients returned to their pre-injury activity levels by 12 months (Tegner: RevoCart 6.8, MS 6.7). However, by 60 months, only 8% of patients in the MS group remained active in competitive sports, compared to 92% in the RevoCart group (Figure 2), demonstrating the superior ability of RevoCart to preserve high-level physical activity long term.

DISCUSSION AND CONCLUSION:

The single-stage RevoCart procedure offers a significant clinical advantage over traditional microfracture for treating focal osteochondral lesions. RevoCart not only achieves superior mid- and long-term functional outcomes but also enables durable return to pre-injury sports activity, as validated by IKDC, KOOS, and Tegner scores. These findings support RevoCart as a promising alternative to marrow stimulation techniques, especially for physically active patients seeking sustained performance and joint preservation.

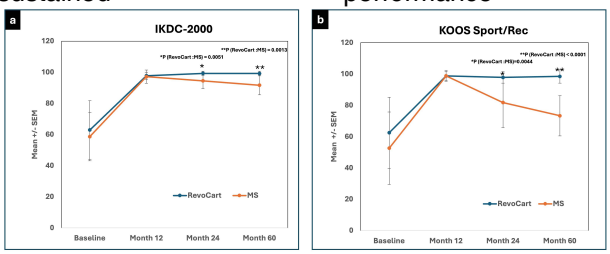

Figure 1

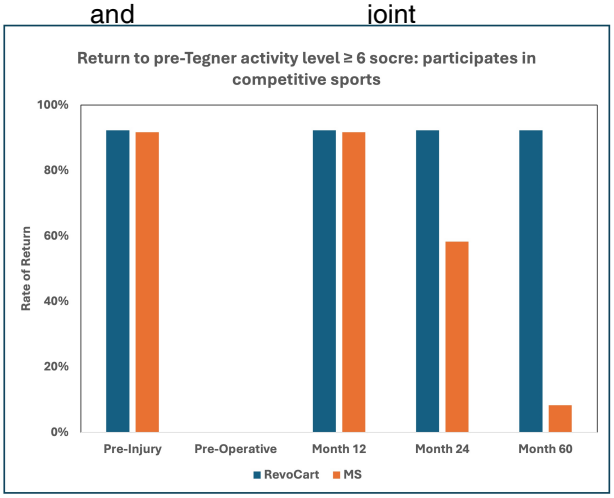

Figure 2