

Joint Surface Lesions in the Knee Treated with an Acellular Aragonite-Based Scaffold: A 3-Year Follow-Up Case Series

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Abstract

Objective. The study aimed to evaluate the clinical outcome and repair capacity of a cell-free aragonite-based scaffold in patients with an isolated symptomatic joint surface lesion (JSL) of the knee. **Design.** Thirteen patients (age 33.5 ± 8.9 ; female 23%; body mass index 25.3 ± 3.4 , K/L [Kellgren-Lawrence] 1.8) with a JSL ($2.6 \pm 1.7 \text{ cm}^2$ [$1.0\text{--}7.5 \text{ cm}^2$]) of the distal femur were enrolled in a single-center prospective case series. Safety and clinical outcome was assessed by the KOOS (Knee Injury and Osteoarthritis Outcome Score), IKDC (International Knee Documentation Committee), Lysholm, and Tegner activity scale at baseline and 6, 12, 18, 24, and 36 months follow-up. The MOCART 2.0 and scaffold integration were evaluated on magnetic resonance imaging at 12, 24, and 36 months postoperatively. **Results.** Primary outcome (KOOS pain) improved with 36.5 ± 14.7 points at 12 months ($P = 0.002$) and 41.2 ± 14.7 points at 36 months ($P = 0.002$) follow-up. Similar increasing trends were observed for the other KOOS subscales, IKDC, and Lysholm score, which were significantly better at each follow-up time point relative to baseline ($P < 0.05$). Activity level increased from 2.75 ± 1.6 to 4.6 ± 2.2 points at final follow-up ($P = 0.07$). The MOCART was 61.7 ± 12.6 at 12 months and 72.9 ± 13.0 at 36 months postoperatively. Sixty-six to 100% implant integration and remodeling was observed in 73.3% cases at 36 months. No serious adverse events were reported. **Conclusion.** The study demonstrated that the biphasic aragonite-based scaffold is a safe and clinically effective implant for treating small-medium sized JSLs of the distal femur in a young and active patient cohort. The implant showed satisfying osteointegration and restoration of the osteochondral unit up to 3 years postimplantation.

Keywords

knee, cartilage repair, scaffolds, natural materials, remodeling

Introduction

Localized (osteo)chondral joint surface lesions (JSLs) are commonly seen among all age categories in both arthritic and nonarthritic knees, causing pain and limiting quality of living.^{1–3} Unfortunately, injured mature cartilaginous tissue owns poor healing potential, due to its avascularity, slow cellular proliferation, and poor cell migration through the densely packed collagen matrix.⁴ Depending on defect size, the depth and the location of the injury, some JSL may remain asymptomatic. This suggests an overall underestimation of the cartilaginous injury rate in the knee, especially in the physically active population, with currently unknown consequences regarding early osteoarthritis (OA) development.^{5,6} When $>50\%$ of the cartilage layer is damaged or the subchondral bone is affected (ICRS [International Cartilage Restoration and Joint Preservation Society] lesions grade 3 or 4), surgical intervention is justified to

bring symptomatic relief and reduce the risk for OA onset and progression.^{4,7} Surgical options for isolated JSL in the knee joint are roughly categorized as either indicated for chondral lesions (i.e., microfracture [MF], autologous chondrocyte implantation [ACI], and matrix-induced ACI [MACI]) or for osteochondral defects (i.e., osteochondral autologous transplantation [OAT] and osteochondral allograft [OCA] transplantation).⁴ Some surgical techniques

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