

Early Clinical and Radiological Outcome Following Matrix-Induced Autologous Chondrocyte Implantation: Comparison of an Arthroscopic or Open-Arthrotomic Surgical Approach

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Summary:

This trial has demonstrated comparable, if not superior early clinical and functional outcomes in patients following matrix-induced autologous chondrocyte implantation (MACI) performed arthroscopically, compared with MACI performed via an open mini-arthrotomy, with no adverse effects to the graft as assessed by magnetic resonance imaging.

Abstract:

Introduction:

Matrix-induced autologous chondrocyte implantation (MACI) has become an established technique for the repair of full thickness chondral defects in the knee. Until recently, the implantation of these grafts was only able via an open mini-arthrotomy. However, while the MACI technique permits an arthroscopic approach and several arthroscopic techniques have now been described, limited published work has been reported on the early post-operative outcome and associated benefits following an arthroscopic approach. This study presents the early clinical and radiological outcomes to 12 weeks in patients treated with arthroscopic MACI, compared with a matched-control patient cohort undergoing MACI through a standard open mini-arthrotomy within the same time period, highlighting the potential benefits of arthroscopically performed MACI.

Methods:

A retrospective cohort design was used to investigate clinical and radiological outcomes in 78 patients (recruited between 2006 and 2012) with full-thickness cartilage defects to the femoral or tibial condyles. Patients were treated with MACI performed via arthroscopic implantation (n=41); or open-arthrotomy (n=37). Following surgery, all patients underwent a graduated rehabilitation program that aimed to protect the implant initially, then incrementally increase the load until full WB was attained at 8-weeks post-surgery. Independent t-tests were used to compare pre-operative patient, defect and injury parameters, as well as post-operative subjective (KOOS, SF-36 and VAS), functional (six minute walk test and active knee range of motion) and radiological MOCART scores, between both groups across the post-operative timeline at 4, 8 and 12 weeks. The length of hospital stay was also compared.

Results:

A significantly reduced inpatient hospital stay was observed in the arthroscopic MACI cohort (mean = 1.85 days) compared to the open-MACI cohort (mean = 3.65 days). Subjective clinical scores in both the arthroscopic and open MACI cohort, who both received an identical post-operative rehabilitation intervention to 12 weeks, significantly improved ($p < 0.05$) over the 12-week period. However, there were no significant differences ($p > 0.05$) in subjective clinical scores between the two groups. The arthroscopic cohort demonstrated clear improvements in both active knee flexion and extension at 4, 8 and 12 weeks, with a significantly greater ($p < 0.05$) active knee extension at 12 weeks post-surgery. There were no differences ($p > 0.05$) observed in six-minute walk time at 3 months, nor any of the

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12-week radiological scores. Regardless of the technique, no patient suffered any adverse effect to the implant as assessed by MRI at 12 weeks.

Conclusions:

Arthroscopic MACI in combination with 'best practice' rehabilitation has shown encouraging early results, with comparable, if not superior early clinical and functional outcomes, compared with MACI performed via an open mini-arthrotomy. A significantly reduced length of hospital stay was observed in the arthroscopic group that could potentially reduce hospital costs and accelerate the start of the rehabilitation process. A larger patient cohort and follow-up is required to observe long-term graft outcomes.