

EVALUATING THE EFFICACY OF FIRST,  
SECOND AND THIRD GENERATION OF  
AUTOLOGOUS CHONDROCYTE  
IMPLANTATION AS TREATMENT FOR  
SYMPTOMATIC FULL THICKNESS  
CARTILAGE LESIONS OF KNEE JOINTS

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## ABSTRACT

**Background:** Patellofemoral chondral injuries are noted in a significant number of patients with anterior knee pain. These injuries occur as a result of acute traumatic events or chronic patellofemoral malalignment and presents a significant management challenge. Anatomic factors such as increased quadriceps angle, tight lateral retinaculum and weakened vastus medialis oblique muscle produces maltracking, thus overloading of the lateral patellofemoral joint. Patella alta and hyperlaxity can result in patellofemoral instability and subluxation. These factors play a role in the development of patellofemoral chondral injuries. A trial of 6 months of conservative management is indicated for most patients. Surgical options often include a realignment procedure in addition to treatment of the chondral injury. Traditional cartilage resurfacing techniques including debridement, abrasion arthroplasty and microfracture have been used but are limited by the inferior wear characteristics of the fibrocartilage tissue which forms over the defect. Newer cartilage repair techniques include autologous chondrocyte implantation (ACI) and osteochondral autograft transfer (mosaicplasty) attempt to repair the chondral defect with hyaline cartilage. Osteochondral allograft transfer is an option for large chondral defects in which the surface contour of the patella has been lost. Patellofemoral arthroplasty may be superior to total knee arthroplasty in patients with isolated patellofemoral joint collapse. Newer techniques such as arthroscopic autologous chondrocyte implantation (ACI) using biologic scaffolds in place of the periosteal cover are currently becoming more popular for treatment of full thickness cartilage lesions of the knee joint.

A literature review of the existing evidence from randomized clinical trials of ACI treatment would contribute to understanding the advantages and limitations of this method and would inform the planning of future studies.

**Design and objective:** This literature reviews the scientific data and clinical studies evaluating the use of first, second and third generation of ACI as treatment for symptomatic full thickness cartilage lesions of the knee joints.

**Findings:** Forty one studies which are freely available full text and human as subjects were extracted for this review. Failure rate after for all generations of ACI is low (1.5-7.5%).

**Conclusion:** Failure rate is highest with first-generation PACI, and lower with first generation CACI and second-generation ACI techniques. One out of three ACI patients underwent a re-operation. Unplanned re-operations are seen most often following PACI. Hypertrophy and delamination are most commonly seen after PACI. Arthrofibrosis is most commonly seen after arthrotomy-based ACI. Use of a collagen-membrane cover, second-generation techniques, and all-arthroscopic, second-generation approaches have reduced the failure and complication after ACI.