

Autologous Chondrocyte Implantation in the Hip: Case Report and Technique

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The treatment of symptomatic, full-thickness articular lesions in the hip in young patients provides a challenge to orthopedic surgeons. The advent of hip arthroscopy has improved the diagnostic as well as some therapeutic capabilities surrounding certain hip pathologies. With the advancements in diagnostic ability, more symptomatic chondral defects are being recognized in the hips of young patients. The optimal surgical treatment for these patients has not been clearly defined, and there is little in the literature about biological repair for hip chondral defects. The current options include open and arthroscopic debridements and microfracture, redirection osteotomies, autologous and allogenic osteochondral grafting, biological resurfacing with periosteum or autologous chondrocyte implantation, and prosthetic resurfacing arthroplasties. This article presents a clinical case and describes the surgical technique of autologous chondrocyte implantation for a large femoral head chondral defect (10 cm²) in a young patient who had progression of disease after prior autologous osteochondral mosaicplasty.

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Full-thickness chondral lesions in the hip are being recognized more frequently as the result of advancements in magnetic resonance imaging (MRI) technology and hip arthroscopy.^{1,2} Unfortunately, physical examination and plain radiographs often are normal in patients with focal chondral defects.³ Baber et al¹ performed diagnostic hip arthroscopy on 154 patients with a preliminary diagnosis of idiopathic hip pain and found that 74 of these patients had localized osteoarthritis or an osteochondral defect. The etiology of these lesions can arise from a multitude of causes, including trauma, developmental dysplasia, femoroacetabular impingement, Legg–Calve–Perthes disease, slipped capital femoral epiphysis, and osteonecrosis. Hip arthroscopy is being used more frequently to treat labral tears and femoroacetabular impingement with increased success; however, it is well recognized that patients with chondral damage have poorer outcomes than patients with intact articular surfaces after these types of procedures.⁴

The optimal surgical treatment method for young patients with a focal chondral defect in the hip is not clear and remains controversial. Ideally, the treatment should aim to

restore the patient's skeletal anatomy and biological articular surface with resolution of pain and achievement of predisease function. This option has not been elucidated, and there are few proposals that attempt to meet the ideal goals of treating such a problem. These include redirection osteotomy, arthroscopic and open debridement and microfracture, autologous osteochondral grafting, mosaicplasty, biological resurfacing with periosteum or autologous chondrocyte implantation and, finally, prosthetic resurfacing and total hip arthroplasty.

There is very little in the current literature with regard to biological resurfacing for chondral defects in the hip joint. Several authors demonstrate short-term temporary relief after arthroscopic debridement, including removal of loose bodies, the shaving of loose chondral flaps, and performing of partial synovectomies. The use of microfracture in the hip has been described but includes studies with small patient populations and short-term follow-up. Byrd et al⁵ reported on microfracture during hip arthroscopy on 21 patients with an average follow-up of 32 months. Using the Harris hip score, they found that the average improvement was 23.9 points, and the authors noted that there was no correlation between clinical results and preoperative imaging, associated pathology, including grade of chondral injury, or any other patient-related factors.

Autologous osteochondral grafting also has been described, however; there are only case reports with scant fol-

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low-up to evaluate the results. Hangody and Fules⁶ reported on 831 mosaicplasties involving weight-bearing joints, of which only 6 involved the hip (femoral head) with overall good-to-excellent results of 79-94%; however, isolated results for the femoral head procedures were not reported. Yang et al⁷ used free autogenous periosteum for large articular defects in the hip and knee (31 hips and 6 knees) and followed these patients for an average of 10.5 years. Continuous passive motion was used for 4 to 6 weeks and weight-bearing was allowed at 6 months. The results were excellent in 11, good in 18, and poor in 8 patients.

Autologous chondrocyte implantation (ACI) for focal chondral defects in the knee was introduced in 1987, gaining in popularity since, and has shown to be clinically effective with good-to-excellent results ranging from 80 to 90%.⁸ The amount of literature supporting the use of ACI has grown, and the indications for its use in the setting of multiple defects, including the patellofemoral joint, are expanding. Given the success of ACI for the knee, its potential application for chondral defects in the hip is promising. To date, there are no reports of ACI in the hip.

Case Report

A 19-year-old college student first presented with a long history of pain in her left hip after having a congenital hip dislocation that was treated with closed reduction as an infant. Her problems began when she was 15 years of age, which included pain in her groin and difficulty with activities of daily living, such as rising from a chair from a seated position, negotiating stairs, and simple foot care as the result of pain during extremes of motion. Before her initial visit, she had already had 3 hip arthroscopies for symptomatic labral tears with debridements and removal of loose bodies. It was reported on her last arthroscopy that she had a central, linear, full-thickness chondral lesion on the weight-bearing aspect of her femoral head measuring 0.5 × 2.5 cm. Her acetabular articular surface was found to be intact.

The physical examination at this time demonstrated a short-stanced antalgic gait with no leg length discrepancy. There was no Trendelenburg sign or gait and no hip flexion contracture. She had pain at terminal flexion, which was limited to 90° and pain with rotational torque at terminal internal rotation of 15°. The remainder of hip motion demonstrated external rotation of 30°, abduction of 30°, and adduction of 15°. She also had a positive anterior impingement test.

Radiographs demonstrated minimal joint space narrowing and no residual dysplasia. There were small Kissing osteophytes located at the superior-lateral border of the acetabulum and at the lateral head-neck junction on the femoral side (Fig. 1). An MRI scan revealed a small acetabular cyst on the superior-lateral aspect of the anterior wall and the chondral defect on the superior weight-bearing femoral head. The previous arthroscopy pictures from the referring surgeon were obtained, which confirmed the preliminary diagnosis.

The initial surgical treatment performed after following this patient for 5 months was an open autologous osteochon-



Figure 1 Anteroposterior preoperative radiograph demonstrating minimal joint space narrowing with small Kissing osteophytes located at the superior-lateral border of the acetabulum and at the lateral head-neck junction on the femoral side.

dral mosaicplasty (Fig. 2). Three grafts were used from the nonweight-bearing aspect of the most distal portion of the lateral trochlea proximal to the sulcus terminalis from the ipsilateral knee. The surrounding areas between the grafts were microfractured to stimulate a fibrocartilage tissue response as per a classic mosaicplasty technique as described by Hangody and Fules.⁶ Postoperative continuous passive motion was implemented, and the patient was toe-touch weight bearing for 6 weeks.

The patient had almost complete resolution of her preoperative pain and had an improvement in her range of motion. At her 2-year postoperative visit she noted some discomfort

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