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Recurrent Patellar Dislocation with Chondral Injury : Our Experience with Distal Realignment and Autologous Chondrocyte Implantation

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Abstract : The surgical management of recurrent traumatic patellar dislocation includes proximal and distal realignment procedures. A subset of patients would present with associated chondral injury. There has been recent interest in the treatment of cartilage injuries to reduce patients' symptoms and to avoid the appearance of future secondary arthrosis. The choice of optimal treatment technique in this group of patients remains unclear.

We evaluate our case series of 12 young patients who underwent autologous chondrocyte implantation (ACI) with a distal realignment procedure for significant chondral injury and patellar maltracking. Pre and postoperative functional assessments were made using the IKDC, Lysholm and Tegner scores. Our results show a significant improvement of outcome.

Further studies with ACI comparing distal and proximal realignment would perhaps better define the optimal treatment options for this cohort of patients.

Introduction

Traumatic patellar dislocations affect mainly adolescent and young adults. To reduce the risk of osteoarthritis secondary to articular injury caused by recurrent dislocations as well as to encourage normal development of the patellofemoral joint, surgical stabilization of the patellar and repair of any chondral injury is important in this age group.[8]

Materials and Methods

Between January 2004 and June 2007, all patients who had a history of traumatic patellar dislocation were referred to the orthopaedic clinic. These patients would have initial X-rays to rule out an osteochondral fragment. Following a 6 to 9-month trial of physical therapy, patients who continued to experience recurrent symptoms of instability or pain, underwent further evaluation. This included a CT scan of the knee from 0 to 30

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degrees flexion to assess patellar tracking as well as a MRI to assess the presence of chondral injury.

Patients with evidence of patellar subluxation (patellofemoral congruence angle +5 degrees or greater)[5] and significant chondral injury (Outerbridge IV, more than 1 cm^2) were offered distal realignment and ACI as a 2-stage procedure. The first stage was performed arthroscopically to assess and debride the chondral lesion followed by harvesting of cartilage from the non-weight bearing region of the superomedial femoral condyle. The second stage a month later involved an arthrotomy and implantation of culture expanded autologous chondrocytes beneath a sutured and fibrin glue-sealed periosteal patch taken from the proximal tibia. The distal realignment procedure was then performed. For a skeletally mature patient, the Elmslie-Trillat procedure was performed, in which the tibial tuberosity wastransposed medially by 1 cm and held by a single screw. In a patient with an open physis, the Roux Goldthwait procedure was performed, in which the lateral half of the patellar tendon was transposed medially. Patellar tracking was visually assessed.

Following surgery, patients underwent rehabilitation therapy in a ranger knee brace for 6 weeks with partial weight bearing. Postoperatively, they were reviewed in the clinic for functional International Knee Documentation Committee (IKDC), Lysholm and Tegner score assessments at 3 monthly intervals for a minimum follow-up period of 12 months.[6][7][11] Mean pre and postoperative functional scores were calculated and analyzed for statistical significance using the Wilcoxon Matched-Pairs Signed-Ranks Test.

Results

From January 2004 to June 2007, a total of 12 patients underwent surgery for distal patellar realignment with ACI. The Roux Goldthwait procedure was performed for 5 patients while 7 patients underwent the Elmslie-Trillat procedure.

The mean age of the patients was 16.0 years (range 12 to 19) with 8 males and 4 females. The mean duration of symptoms preoperatively was 7.2 months while the mean postoperative follow-up duration was 17.5 months (range 12 to 24).

One patient reported transient paresthesia over the wound site. There was also a case of pain over the screw site and extensor lag secondary to quadriceps dysfunction. There was no postoperative infection, osteotomy non-union, patellar tendon rupture or patellar dislocation.

Mean pre and postoperative IKDC, Lysholm and Tegner scores were compared for statistical significance with the Wilcoxon Matched-Pairs Signed-Ranks Test (Table 1).

Discussion

There are numerous surgical procedures for recurrent patellar dislocation which aim to correct malalignment. These range from release of the lateral retinaculum of the patellar to medial displacement of the patellar tendon or tibial tuberosity.[1] Up to 22% of skeletally immature patients require surgery for recurrent dislocations after an initial patellar dislocation, while 33% can have instability.[10] Non-resolution of symptoms following patellar surgery may be due to non-recognition of articular compromise.

The initial results of patellar lesions treated with ACI were disappointing[2]. Improved techniques, which included more radical debridement of

Table 1. Comparison of pre and postoperative functional scores

Functional Scoring System	Mean Preoperative Score (95% C.I.)	Mean Postoperative Score (95% C.I.)	Statistical Significance
IKDC	40.7(30.4-50.2)	65.9(50.7-80.1)	$p<=0.002$
Lysholm	42.0(29.0-53.0)	53.3(43.4-70.7)	$p<=0.003$
Tegner	1.55(0.55-2.20)	3.55(2.10-4.55)	$p<=0.008$

IKDC : International Knee Documentation Committee

tissue around the defect and attention to correcting patellofemoral maltracking, have resulted in good to excellent outcomes.[9]

The aim of a distal realignment procedure would be to alter and improve Q-angle. However, the Q-angle can be measured to be falsely normal should the patellar be in a subluxed position. Hence, we utilized the patellofemoral congruence angle instead as a measure of patellar subluxation for malalignment.

The Hauser technique introduced in 1938 was the initial standard procedure for the treatment of recurrent patellar dislocation. In this procedure, the tibial tubercle was moved distally and medially, however, resulting osteoarthritic changes in the patellofemoral joint were reported. On the contrary, the Elmslie-Trillat procedure introduced in 1964, which involved moving the tibial tubercle only medially, showed less osteoarthritic changes in the patellofemoral joint with good to excellent clinical outcome in more than 80% of knees.[3]

In the immature skeleton, bony realignment procedures would be contraindicated due to possible premature fusion of the anterior tibial physis resulting in a genu recurvatum. In this group of patients, medial transposition of the lateral half of the patellar tendon using the Roux Goldthwait procedure would be more appropriate.

We believe that patients with significant patellar malalignment and chondral injury would benefit from a distal realignment and ACI procedure. Our results indicate improved functional scores post-operatively. However, this 2-stage procedure is not without the morbidity of an arthrotomy which can require a more protracted period of recovery.

Further objective assessment can be performed postoperatively either by arthroscopic evaluation or using MRI. In particular, post chondrocyte implantation evaluation of the grafted area can be performed via arthroscopy using the International Cartilage Repair Society(ICRS) visual cartilage repair assessment. In addition, MRI evaluation can be performed to assess graft fill, surface irregularity and signal as well as subchondral bone marrow oedema and effusion of the immediate area around the repair.[4]

As the number of patients in this series was small and the follow-up duration was relatively short, a larger number of patients with a longer follow-up period are needed to further validate our findings. Nevertheless, our short-term results provide evidence that correction of patellar maltracking and treatment of subchondral lesions with ACI is effective and provides good functional outcome for our young patients.

Conclusion

The management of recurrent traumatic patellar dislocation includes surgical stabilization. Patients with significant patellar malalignment and chondral injury can benefit from a distal realignment with ACI procedure. Further studies involving the use of proximal realignment may provide a clearer comparison and indication of other treatment options.

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