Anterior cruciate ligament reconstruction by mini-arthrotomy

S. Al-Zarahini¹, J.-P. Franceschi¹, J. Coste¹, B. Zerroug², W. Al-Sebai²

¹ King Khalid University Hospital, Riyadh, Saudi Arabia

² Riyadh Medical Complex, Saudi Arabia

Accepted: 9 November 1996

Summary. *We present 50 consecutive patients with chronic anterior cruciate deficiency treated by reconstruction of the ligament through a limited arthrotomy using the middle third of the patellar tendon as a graft. The patients were all men with a mean age of 26 years (range 17 to 36 years) with an average follow up of 24 months. There were good or excellent results as measured by the Lysholm score in 41, and in 27 with the ARPEGE score. Movements were full in 46 and retropatellar pain was experienced by 4.*

Résumé. *Nous présentons une série de 50 malades ayant bénéficié d'une reconstruction du ligament croisé antérieur par une arthrotomie limitée utilisant le tier moyen du tendon rotulien pour une laxité chronique du genou. Tous les patients sont des hommes, d'âge moyen de 26 ans (entre 1–36 ans). Après un suivi de 24 mois nous avons retrouvé un résultat objectif excellent ou bon chez 82% des sujets opérés, alors que ces bons et excellents résultats étaient de 54% si on les juge selon le système ARPEGE. 92% des patients ont une mobilité normale du genou. Une douleur rétropatellaire a été présente chez 8% des malades. Le but de cette étude est de présenter notre expérience de reconstruction du LCA par arthrotomie limitée utilisant un greffon du tier moyen du tendon rotulien, et en particulier en l'absence d'expérience pratique ou du matériel nécessaire pour ce type de chirurgie sous arthroscopie.*

Introduction

There has been increasing recognition during the past decade of the functional impairment and the development of osteoarthritic changes following disruption of the anterior cruciate ligament (ACL) [1, 3, 13, 17], and it is widely accepted that reconstruction is the treatment of choice in young, active and athletic patients [12].

Different techniques are available for reconstruction with a free patellar graft including by arthroscopy, arthrotomy and mini-arthrotomy with or without operative displacement of the patella, but few results have been published [4, 6, 7, 9, 11].

Our study assesses the results of ACL reconstruction using a free patellar tendon autograft through a mini-arthrotomy.

Patients and methods

Fifty consecutive patients were treated for chronic ACL deficiency from 1990 to 1993 using the middle third of the patellar tendon, attached at both ends, as an autograft. The average age was 26 years (range 17 to 36 years) and all were men.

Thirty-five patients were active in sport. In 17 the injury occurred at soccer, in 8 when skiing, in 2 at handball, 3 in motorcycle accidents and one each in volleyball, karate, judo, aerobic and army exercises. The remaining 15 did not sustain a sports injury.

The main reason for reconstruction was instability and pain. Sporting activity was severely restricted. None of these patients had a previous operation on their injured knee. The clinical findings are shown in Table 1.

Operative technique.

The patient was supine with the knee flexed from 40° to 60°. A longitudinal incision was made based on the centre of the patellar tendon. The paratenon was opened longitudinally and a strip 10 mm wide was removed from the central part of the

Reprint requests to: S. Al-Zarahini, Division of Orthopaedics (49), King Khalid University Hospital, PO Box 7805, Riyadh 11472, Saudi Arabia

Table 1. Preoperative clinical evaluation

	Negative	Positive+	Positive++	Positive+++
Effusion	33	13	4	0
Lachman	0	10	18	22
Anterior drawer	0	12	23	15
Pivot	0	0	28	22

Fig. 1. Radiograph of a knee after operation showing the method of graft fixation

tendon with bony plugs 2 cm long at each end. A mini-arthrotomy was performed through this defect by incising the synovium at the lower pole of the patella and reflecting it inferiorly to expose the intercondylar area. A notchplasty carried out. A tibial tunnel was made after localising the isometric point. A guide wire was inserted through the isometric point on the medial surface of the lateral femoral condyle, and a femoral tunnel was made. Three holes were made in each bone plug and nylon sutures threaded for pulling the graft through the tunnel. A guide wire with an eye was then introduced through the femoral tunnel to pull the free patellar graft from the tibial to the femoral tunnel. The femoral plug was fixed by an intra-articular interference screw and the tibial plug by tying the nylon suture around a cancellous screw (Fig. 1). The defect in the patellar tendon was approximated and the paratenon closed.

Rehabilitation.

Immediately after the operation the knee was fixed in 0° extension using a brace; static quadriceps exercises and straight leg raising were started. After the drain was removed, continuous passive motion was allowed as tolerated. The patient was discharged from hospital when he could perform straight leg raising with full extension, 90° of flexion and when he had good patellar mobility with a minimal effusion and could walk with crutches. This was usually 5 to 7 days after the operation. Active knee exercises were begun on the 7th day and gradually increased.

Table 2. Postoperative result using the Lysholm system

Excellent	Good	Fair	Poor
32	9	6	3

Table 3. Postoperative result using the ARPEGE system

	Excellent	Good	Fair	Poor
Competition	9	2	1	6
Recreation	12	3	4	4
Activity	1	0	3	1
Sedentary	0	0	1	3
Total	22	5	9	14

Table 4. Postoperative clinical evaluation

	Negative	Positive	Positive++	Positive+++
Effusion	49	1	0	0
Lachman	47	3	0	0
Anterior drawer	30	20	0	0
Pivot	48	2	0	0

Evaluation:

(a) *Subjective.* Every patient was asked his opinion of the result which was classified as very satisfactory, satisfactory or not satisfactory.

(b) *Objective.* We used clinical evaluation, the Lysholm system, the ARPEGE (Association pour la Recherche et Promotion de l'Étude de Genu), Score, and KT 1000 measurement.

Results

After an average follow up of 24 months (range 12 to 36 months), 45 patients were very satisfied with their result. Forty-one were rated good and excellent by the Lysholm score, and 27 by the ARPEGE score (Tables 2 and 3). The Lachman test was negative in 47 patients, and the anterior drawer test in 30. The pivot shift was absent in 48, and 49 had no effusion (Table 4). Forty-six patients had full movement, and 2 had an extension deficit. Four had retropatellar pain and crepitus.

Anterior laxity measured by KT 1000 showed that 36 patients had less than 5 mm of laxity compared with the normal side; 13 had more than 5 mm, but less than 8 mm, and one had more than 8 mm.

Discussion

The primary functions of the ACL are to prevent anterior tibial displacement and act as a secondary restraint to tibial rotation [2, 5, 14, 19]. The incidence of erosion of articular cartilage and osteoarthritis due to ACL instability is more than

60% [15, 16, 18], so that early recognition of the injury and adequate operative repair are essential [12]. Our results are similar to those of other studies where a one-third patellar tendon graft was used, but better than those treated conservatively [9, 11, 17, 18].

Dejour et al and Glancy et al had excellent results after reconstruction using a patellar tendon graft augmented with extra-articular reconstruction [7, 9]. We achieved similar success without the additional procedure. O'Brien et al reported good results using a patellar tendon graft through a medial arthrotomy, but one-third of their patients had marked retropatellar pain due to displacement of the patella during operation [18]. Jarvinen et al used an AO screw to fix the femoral graft which meant a further incision on the lateral part of the thigh [11]. Bach and Hales recommended arthroscopic reconstruction to decrease joint morbidity [4, 10].

In our procedure, we used only a mini-arthrotomy, so eliminating the need for displacement of the patella and minimising biomechanical disturbance to the patellofemoral joint after operation. The intra-articular interference screw used to fix the femoral graft avoided an additional incision.

The incidence of joint morbidity after ACL surgery is relatively high and includes flexion contracture, patellofemoral pain, quadriceps weakness and joint stiffness.

Our subjective and objective results showed that 82% of our patients had good and excellent results with full movement and without pain or effusion. The pivot shift was negative in 92% and only 8% had retropatellar pain and crepitus which is comparable with the results of arthroscopic reconstruction [4, 10]. Morbidity is reduced by avoiding patellar displacement during the operation and beginning early passive and active exercises which retain full movement, decrease patellofemoral pain and prevent muscle wasting.

The type of operation we have described is a good procedure which can be done where arthroscopic surgery is not available. Postoperative rehabilitation is the key to success.

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