RESEARCH ARTICLE

Outcome of ACL Reconstruction and Concomitant Articular Injury Treatment

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Abstract

Background: Articular cartilage injuries are a common clinical problem at the time of ACL reconstruction with an incidence rate of 16-46%. Good results of ACL reconstruction combined with the treatment of chondral lesions have been published in some studies.

Method: After statistical analysis 30 patients were selected and divided in 2 groups. The first group consisted of 15 patients with isolated ACL tear without any other concomitant injuries and the second group consisted of 15 patients with ACL tear and concomitant high grade (grade 3 or 4 of outerbridge classification) contained articular cartilage injuries during arthroscopy. Group 1 underwent ACL reconstruction and group 2 underwent ACL reconstruction combined with chondroplasty via the drilling or microfracture technique. For each patient the Lysholm knee score questionnaire was completed before surgery, 6 months and 1 year after surgery.

Results: The mean Lysholm knee score in both groups improves: 9.6 points after 6 months and 16.06 points after 1 year in group 1, 23.26 points after 6 months, 30.66 after 1 year in group 2, which was statistically significant (*P*value<0.05).

Conclusion: Improvement in the Lysholm knee score in both groups shows that ACL reconstruction with concomitant chondroplasty in high grade chondral injuries has good results with patient satisfaction and improvement in their quality of life.

Key words: Anterior cruciate ligament, Chondral injury, Lysholm knee score

Introduction

ACL tear is common in sport activities and accidents and sometimes in injuries as a result of low to middle impact strikes. Furthermore, high percentages of these injuries are associated with menisceal, ligament, or chondral injuries. Rate of concomitant ACL injuries with severe chondral injuries is about 16-46 percent (1).

Anterior cruciate ligament (ACL) spreads from a broad area anterior to and between the intercondylar eminences of the tibia to a semicircular area on the posteromedial portion of the lateral femoral condyle. Its role is to prevent anterior translation of the tibia on the femur and permit normal helicoid knee action, thus preventing the chance for meniscal and articular pathology (2).

Open and arthroscopic intraarticular reconstruction are two methods that consist of graft selection, placement, tensioning, and fixation as well as a postoperative rehabilitation with dramatically improved results (3).

Articular cartilage injury in the knee may be found alone, but it is mostly accompanied with injuries to the ligaments and menisci (4). Articular cartilage does not usually regenerate (the process of repair by formation of the same type of tissue) after injury or disease leading to loss of tissue and formation of a defect. Several surgical

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techniques exist to repair articular cartilage defects (4).

Shelburne and Gray concluded from a large prospective database that articular cartilage damage was the most important predictor of poor results after ACL reconstruction in their 5 to 15 year follow up (5). Takeda et al. identified severe cartilage damage as a significant predictor of failure of return to sports after ACL reconstruction. So some surgeons believe that ACL reconstruction in patients with high grade chondral damage is not a good decision and do not have a good outcome (6).

The best way for diagnosing articular damage is the use of arthroscopy measuring cartilage damage. There are several classifications for cartilage injury and the most popular one is outerbridge classification: grade 0 is normal cartilage, grade I is cartilage with softening and swelling, grade II is a partial-thickness defect with fissures on the surface that do not reach subchondral bone or exceed 1.5 cm in diameter, grade III is fissuring to the level of subchondral bone in an area with a diameter more than 1.5 cm, and grade IV is exposed subchondral bone. Treatment available for articular cartilage injuries includes nonoperative and operative management (7). Operative options are abrasion chondroplasty, osteochondral allo/auto graft, and autologous chondrocyte implantation. Choosing a procedure is based primarily on the size of the lesion and the activity demands of the patient.

Abrasion chondroplasty or microfracture techniques may stimulate a regenerative process for small lesions (<2 cm) in patients. These procedures, which involve penetration of the avascular cartilage layer into the vascular subchondral bone to arouse extrinsic repair, are well supported in the literature. Enhancement in symptoms has been reported in 60% to 70% of patients after abrasion or microfracture. Outcomes are significantly better in patients younger than 40 years than older patients. Benefits of microfracture are the simplicity of the procedure and the relatively low cost. It also does not stop the later use of other, more complex techniques (8).

Combined treatment of ACL tear with chondral injuries was first described by Matsusue et al. in 1993, and since this report, several authors have described a combined surgical approach to ACL and cartilage injuries. Two studies reported the result of ACL reconstruction with autologous chondrocyte implantation (ACI) for cartilage treatment. Peterson et al. reported good results with clinical improvement based on the Lysholm score in patients who received combined ACL reconstruction with ACI as the mean Lysholm score increased from 55 preoperatively to 79 postoperatively (P<0.001) (9,10).

Amin et al. also reported good results with improvement in the Lysholm knee score in patients who received ACL reconstructon combined with ACI from 42 preoperatively to 69 post operatively (11).

Gaweda et al. reported good outcome for patients with chronic ACL deficiency and grade 3 or 4 cartilage injury treated with combined ACL reconstruction and autologous osteochondral grafting with an increase in the Lysholm score from 69 preoperatively to 89 postoperatively (12).

However the result of combined ACL reconstruction and articular cartilage repair have only been reported for osteochondral autograft transplantation and ACI,the available evidence suggests that combined ACL reconstruction and cartilage surgery can yield good results.

Material and methods

This study is an interventional study. After consulting with an epidemiologist and based on previous researches, we decided to enlist 30 patients who were then divided into 2 groups. The first group consisted of 15 patients who had isolated ACL tear without any other concomitant injuries and the second group consisted of 15 patients with ACL tear and a concomitant high grade (grade 3 or 4 of the Outerbridge classification) articular cartilage injuries up to 2 cm in diameter. Patients who had an ACL tear based on their MRI and physical examination were scheduled for arthroscopy and during arthroscopy those with isolated ACL tear without menisceal and chondral injuries categorized in group 1 and those with ACL tear with contained high grade chondral injuries without menisceal and any other ligamentous injuries categorized in group 2 and underwent surgery. Also, after surgery all patients had same physiotherapy protocol and if they did not fully participate in their physiotherapy sessions they were excluded from the study and another one substituted in their place.

Our patients were been operated on in Shiraz Chamran Hospital between 2012 and 2013.A Single experienced knee surgeon operated on all of the patients.Group one underwent ACL reconstruction and the second group underwent ACL reconstruction combined with articular cartilage repair. ACL reconstruction was done by the transportal method using the autologus hamstring tendon graft. Articular cartilage defects were treated by microfracture the drilling method. For each patient the Lysholm knee score questionnaire was filled out before operation, 6 months, and 1 year after surgery.

After collecting the data, statistical analysis was done using the statistical analytic test with repeated measurements and the t test. The mean Lysholm knee score of each group was compared during these 3 intervals and at the same time with each other.

Results

We evaluated 30 cases in the two groups that consisted of 15 patients. The first group consisted of 13 males (86.7%) and 2 females (13.3%) with a mean age of 27.4 years old. The second group consisted of 14 males (93.3%) and 1 female (6.7%) with a mean age of 29.2 years old. So in both groups age and gender variables comparison were not statically significant (P-value >0.05), showing the same age distribution. In the first group The mean Lysholm knee score before surgery was 67.4 with a SD of 14.87, 6 months later was 77.06 with SD of 6.81 and 1 year later it was 83.5 with a SD of 9.62 [Table 1]. Hence, there was a 9.6 point improvement in the score after 6 months and a 16.06 point improvement in the score after 1 year. These improvements were statistically significant (P-value <0.05)

Table 1. Lysholm knee score in the group 1

	Mean	Minimum	Maximum	SD
Before surgery	67.4	41	86	14.87
6 months after surgery	77.06	61	90	6.81
1 year after surgery	83.5	68	97	9.62

Table 3. Lysholm knee score in group 2

	Mean	Minimum	Maximum	SD
Before surgery	44.73	24	72	16.7
6months after surgery	68	50	92	11.18
1 year after surgery	75.4	55	99	11.35

By use of the repeated measurement test comparison between before surgery, 6 months and then 1 year later was done and these improvements in the Lysholm knee score were statistically significant (*P*-value<0.05) [Table 2].

Also, in the second group patients were evaluated with the Lysholm knee score before, 6 months, and 1 year later after surgery. The mean of the Lysholm knee score before surgery was 44.73 with a SD of 16.7, after 6 months was 68 with a SD of 11.18, and after 1 year was 75.4 with a SD of 11.35 and these improvements in the Lysholm knee score were statistically significant (*P*-value < 0.05) [Table 3].

Then by use of repeated measurement test comparison between before surgery and 6 months later and 1 year later was done and these improvements in the Lysholm knee score were statisticallysignificant (*P*-value < 0.05) [Table 4].

We also compared the results of the two groups with each other. The higher mean of the Lysholm knee score in group 1 was seen in all times when compared with group 2. The mean difference of the two groups before and 6 months after surgery was statistically significant (*P*-value < 0.05), but 1 year after surgery there was no statistically significant difference between these two groups (*P*- value > 0.05) [Table 5].

Lastly, frequencies of type and location of chondral injuries were evaluated. Twelve cases had a chondral injury on the medial condyle of the femur (80%)

Table 4. Comparison within group 2

	MD	SE	*P*-value
Before surgery with 6 months after surgery	23.26	2.42	0.001
Before surgery with 1 year after surgery	30.66	2.76	0.002
6 months with 1 year after surgery	7.4	1.2	0.002

Table 2. Comparison within group 1

	MD	SE	*P* value
Before surgery with 6 months after surgery	9.6	2.70	0.01
Before surgery with 1 year after surgery	16.6	3.94	0.03
6 months with 1 year after surgery	6.46	2.23	0.036

and three cases had a chondral injury on the lateral condyle of the femur (20%). Twelve cases had a type III outerbridge chondral injury and three cases had a type IV chondral injury (20%).

Discussion

In our study, like previous studies, improvement in the Lysholm knee score was seen in patients who had an isolated ACL tear with improvement from 67 preoperatively to 83 after ACL reconstruction, which was statistically significant (*P*-value < 0.05) and this showed good results for ACL reconstruction. Also, in accordance with previous studies the medial condyle of the femur had the highest frequency of articular cartilage injury.

As previous studies showed, ACL reconstruction combined with chondroplasty in patients with ACL tear with a high grade chondral injury have good outcomes, but in these studies chondroplasty methods were autologous chondrocyte implantation and autologous osteochondral graft and less studies were found that show the combination of ACL reconstruction and chondroplasty with microfracture or drilling methods. Hence, in our study we evaluated the results of concomitant ACL reconstruction with high grade chondral injury repair via the drilling or microfracture technique. Results showed there was improvement in the mean Lysholm knee score in both groups, but the mean Lysholm knee score in all periods in group two was lower in comparison with group one which maybe due to the presence of the chondral lesion and muscle weakness. Also, as we have seen before surgery the mean Lysholm knee score in group 2 was mcuh lower than group 1, but as timed passed after surgery the mean Lysholm knee score in group 2 almost reached group 1 and this mean

Table 5. Comparison between the two groups

	Group	Mean	SD	MD	*P*-value
Before surgery	1	67.46	14.87	22.7	0.001
	2	44.73	16.7		
6 months after surgery	1	77.06	6.81	9.06	0.012
	2	68	11.18		
1 year after surgery	1	83.5	9.62	8.1	0.43
	2	75.4	11.35		

difference after 1 year was not statistically significant (*P*-value > 0.05). This shows that group 2 had a very good improvement in their Lysholm knee score and the mean Lysholm knee score in this group after 1 year was similar to that of group 1 and patients in this group were satisfied with their surgery with improvement in their quality of life. Our study shows that ACL reconstruction concomitant chondral injury repair via drilling and microfracture is a good option and yields good results that can lead to an improvement in the quality of life of patients who are mainly from the young population. Follow up of our patients was 1 year and perhaps a longer follow up is needed for more precise results.

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