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"A RANDOMISED PROSPECTIVE STUDY OF FUNCTIONAL OUTCOMES BETWEEN ARTHROSCOPIC RECONSTRUCTION OF ACL WITH OATS (OSTEOCHONDRAL AUTOGRAFT TRANSFER SYSTEM) AND RECONSTRUCTION OF ACL WITH MICROFRACTURE IN PATIENTS WITH ACL TEAR ASSOCIATED WITH OSTEOCHONDRAL DAMAGE"

Orthopaedics

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ABSTRACT

Introduction: Articular cartilage injuries commonly occur in conjunction with anterior cruciate ligament (ACL) injury. Osteochondral autograft transfer (OATS) is a one-stage surgical procedure to treat chondral defects of the knee and other articulating surfaces. **Aims & Objective** Our study aims to evaluate the functional outcomes between arthroscopic reconstruction of ACL with OATS (osteochondral autograft transfer system) and ACL with Microfracture in patients with ACL tear associated with osteochondral damage **Material & Methods** 30 patients with ACL tear and osteochondral damage size ≤ 1.5 cm2 were chosen for our study from January 2021 to January 2023 in SGITO, Bangalore, were randomly divided into 2 groups. Group A were patients who underwent arthroscopic ACL reconstruction with OATS Vs Group B were patients who underwent arthroscopic ACL reconstruction with MF. Their functional outcome was assessed using lysholm score and IKDC score at 6 weeks, 3 months and 12 months. **Results** Lysholm Score and IKDC score (functional assessment) were analysed for the 30 patients, both the scores were better for group A than group B (p value < 0.001) at 6 weeks, 3 months and 12 months follow-up. **Conclusion** On the basis of studies done earlier, incidence of articular cartilage injury with acute ACL tear is between 16- 46 %, and combined surgery is preferred. Our study compared the different cartilage repair techniques OATS and MF, when combined with ACL reconstruction. Patients who underwent with OATS gave better results than patients who underwent microfracture for cartilage defect, while ACL reconstruction technique was kept same for both groups

KEYWORDS

osteochondral autograft transfer system, osteochondral damage, arthroscopic reconstruction, anterior cruciate ligament

INTRODUCTION

ACL tears are frequent in sports-related injuries and accidents, as well as occasionally in wounds brought on by low to medium impact blows. Furthermore, meniscal, ligament, or chondral injuries account for a significant portion of these injuries. 16–46% of severe chondral injuries occur along with ACL damage.(1) The anterior cruciate ligament (ACL) is located on the lateral femoral condyle, where it extends from a large region anterior to and between the intercondylar eminences of the tibia to a semicircular region. Its function is to stop the tibia from anteriorly translating on the femur and to allow normal helicoid knee motion, hence reducing the risk of meniscal and articular pathologies (2).

Although articular cartilage damage in the knee can occur on its own, ligament and meniscal damage is more common (3). After an injury or illness that results in tissue loss and the development of a defect, articular cartilage typically does not regenerate (the process of repair by production of the same type of tissue). Articular cartilage deficiencies can be fixed surgically using a variety of methods (3). The modified Outerbridge classification divides cartilage defects into five classes. Grade 0 denotes normal cartilage, Grade 1 denotes abnormal intrachondral signal (signal increase in T2 weighted images), Grade 2 denotes cartilage loss of less than 50% but without exposure of subchondral bone defect, Grade 3 denotes cartilage loss of more than 50% but without exposure of subchondral bone, and Grade 4 denotes complete loss of cartilage with exposure of subchondral bone.

The treatment for chondral abnormalities of the knee and other articulating surfaces is osteochondral autograft transfer (OATS), a single-stage surgical technique. The best course of action for knee lesions that are symptomatic is still debatable. One method for repairing cartilage is osteochondral autograft transfer. Marrow stimulation, cell-based approaches, and allograft transplantation are additional methods. For the safe and minimally invasive repair of knee articular cartilage, microfracture is used. This procedure generally produces fibrous or hybrid repair cartilage tissue with varying repair tissue volume and does not restore typical hyaline cartilage (4). In our study, we examine the effects of osteochondral autologous transplantation (OAT) and microfracture techniques used in conjunction with anterior cruciate ligament (ACL) restoration to treat damaged articular cartilage in the medial femoral condyle.

METHODOLOGY

This prospective study was conducted in the Department of Orthopaedics, Sanjay Gandhi Institute of Trauma and Orthopaedics, Bangalore for 24 months period from January 2021 to January 2023. The clearance from institutional ethical committee was obtained before starting the study. 30 (15 in each group) patients of age more than 18 years old and less than 50 years old of either sex who have with ACL tear associated with osteochondral damage of size ≤ 1.5 cm2 fitting inclusion criteria after excluding those who meet exclusion criteria are chosen among the outpatients at the Orthopaedic Department of SANJAY GANDHI INSTITUTE OF TRAUMA AND ORTHOPAEDICS, BANGALORE.

A total of 30 patients, who had given an informed and written consent, posted for arthroscopic reconstruction of ACL with OATS (osteochondral autograft transfer system) or ACL with Microfracture, as per randomization. Patients were admitted and examined according to protocol both clinically and radiologically, and functional outcome was assessed by distribution of Lysholm score and IKDC score both preoperatively and postoperatively. The patients were reviewed with post op x-rays immediately after surgery and at the end of 6 weeks, 3 months and 12 months after the surgery

All patients were subjected to post operative anteroposterior and lateral radiographs to determine the tunnel placement and position of endobutton and interference screw. Patients were followed at 6 weeks, 3 months and 1 year and functional outcomes assessed. The International Knee Documentation 2000 score(IKDC) and Lysholm and Gillquist Knee Scoring Scale were used for evaluation of patients.

RESULT

In our study, there were 30 patients in total out of which 15 patients in

group A and 15 patients in group B. The range for age was 18 to 50 years, the mean age was 27.3 ± 8 years. 21 (70.0%) of the participants had Age: 18-30 Years, 5 (16.7%) of the participants had Age: 31-40 Years, 4 (13.3%) of the participants had Age: 41-50 Years. 27 (90.0%) of the participants had Gender: Male, 3 (10.0%) of the participants had Gender: Female. 22 (73.3%) of the participants had Mode Of Trauma: Fall From Motorbike, 6 (20.0%) of the participants had Mode Of Trauma: Fall While Playing, 2 (6.7%) of the participants had Mode Of Trauma: Fall From Cycle. No statistical differences were seen in the preoperative data of Group A and Group B, with respect to sex, age, cartilage defect size, mode of trauma.(Table 1) (fig 1,2,3) Lysholm Score and IKDC score were better for group A than group B (p value < 0.001) at 6 weeks, (table 2) (figure 4) 3 months .(table 3) (figure 5)and 12 months follow-up .(table 4) (figure 6)

DISCUSSION

Gudas et al.'s study (5) had 102 patients with ACL tears and articular injury who were randomly assigned to have OATS, microfracture, or debridement at the time of ACL repair. The patients' average age was 34.1 years. There were 34 patients in the OAT-ACL group, 34 in the MF with ACL group, 34 in the D with ACL group, and 34 in the IAC-ACL control group, which included 34 patients. Tegner activity score and IKDC score were used to evaluate patients. 97 (95%) of the 102 patients were available for the last follow-up. IKDC subjective knee evaluation scores for the OATS-ACL group were substantially higher than those for the MF-ACL group (P value .024) and Debridement with ACL group (P .018). The IKDC subjective score of the ACL group, however, was considerably higher than the IKDC evaluation of the OATS-ACL group (P .043). IKDC subjective scores did not significantly differ between the MF-ACL and Debridement with ACL groups (P .058). 20 individuals with 21 focal cartilage abnormalities were studied by Shekhar et al. (6) After a mean of 42.4 12 months for the first follow-up and 90.4 11.9 months for the second, respectively, after surgery. When compared to pre-operative values, the IKDC score considerably increased at both follow-ups (P 0.001). At the first follow-up, the TAS demonstrated statistically significant improvement (P = 0.011), but not at the second follow-up (P = 0.052).

When using the International Cartilage Repair Society evaluation, Marcacci et al. (7) evaluated 30 patients (mean age, 29.3 years) with full-thickness knee chondral lesions (2.5 cm2) treated with arthroscopic autologous osteochondral transplantation and found that 77% of patients who underwent OATS for lesions 2.5 cm2 had good or excellent results. Significant improvements in IKDC and Tegner scores were also noted (7). Barber et al monitored 36 patients for an average of 4 years and discovered that 66% of patients had satisfactory or excellent results and that the Lysholm score had improved significantly. The second-look arthroscopy results for all 14 patients revealed satisfactory plug integration into the surrounding cartilage (8).

Klinger et al., (9) in a prospective study of 21 patients with chronic ACL injury, average patient age was 29 years (range 22-44 years) who received combined open ACL reconstruction with bone patellar tendon bone (BPTB) graft and OAT for articular cartilage defects of the MFC, showed significant improvement in the IKDC rating post- operatively. The mean cartilage defect measured 3.5 cm2 (2-5 cm2) in their study, their study suggest that symptomatic full thickness cartilage defect with ACL instability can be effectively treated by performing ACL reconstruction and OATS in one procedure. Shelbourne et. al.,(10) concluded in their study of 928 patients with a mean follow up of 8.6 years, that the long-term results of a successful arthroscopic ACL reconstruction were affected by the status of the articular surface. In their study patients with articular cartilage damage at the time of their ACL reconstruction had more subjective symptoms at follow-up.

Osti et. al., (11) concluded that performing a microfracture procedure during ACL reconstruction does not prevent the evolu tion of degenerative changes (11). Steadman et. al.,(12) measured functional outcomes of patients treated arthroscopically with microfracture for full-thickness chondral defects of the knee. Patients were assessed using Lysholm score (scale 1 to 100; preoperative, 59; final follow-up, 89) and Tegner score (1 to 10; preoperative, 3; final follow-up, 6) scores. At final follow-up, the SF-36 and WOMAC scores showed good to excellent results. Lim C. et. al., (13) prospectively investigated isolated articular cartilage defects without any other knee injury. Arthroscopy at 1 year showed excellent or good results in 80% after MF, 82% after OAT, and 80% after ACI. Their study did not show a clear benefit of either ACI or OAT over MF, and they suggested MF is a reasonable option as a first-line therapy given its ease and affordability relative to ACI or OAT (13).

CONCLUSION

In accordance with our findings, individuals who underwent ACL restoration surgery in addition to OATS (Figure 7) rather than microfracture had higher functional outcomes. Patients who underwent microfracture surgery experienced increased side effects, such as knee pain.

Table 1

Basic Details	Mean ± SD ‖ Median (IQR) ‖ Min-Max OR N (%)
Group	
A	15 (50.0%)
B	15 (50.0%)
Age (Years)	27.33 ± 8.46 ‖ 25.50 (20.25-31.00) ‖ 18.00 - 45.00
Age	
18-30 Years	21 (70.0%)
31-40 Years	5 (16.7%)
41-50 Years	4 (13.3%)
Gender	
Male	27 (90.0%)
Female	3 (10.0%)
Mode Of Trauma	
Fall From Motorbike	22 (73.3%)
Fall While Playing	6 (20.0%)
Fall From Cycle	2 (6.7%)
Anaesthesia (SAB)	30 (100.0%)

Table 2 association between Group and LYSHOLM at 6 week

Lysholm Score (6 Weeks)	Group		Wilcoxon-Mann-Whitney U Test	
	A	B	W	p value
Mean (SD)	86.53 (1.25)	82.73 (1.98)	215.500	<0.001
Median (IQR)	86 (86-87)	83 (81-84)		
Min - Max	84 - 89	80 - 86		

Table 3 association between Group and LYSHOLM at 3 month

Lysholm Score (3 Months)	Group		Wilcoxon-Mann-Whitney U Test	
	A	B	W	p value
Mean (SD)	91.27 (1.16)	87.40 (1.88)	222.500	<0.001
Median (IQR)	91 (90-92)	88 (87-88.5)		
Min - Max	90 - 93	83 - 90		

Table 4 association between Group and LYSHOLM at 12 month

Lysholm Score (12 Months)	Group		Wilcoxon-Mann-Whitney U Test	
	A	B	W	p value
Mean (SD)	95.67 (1.76)	91.20 (1.42)	220.500	<0.001
Median (IQR)	96 (94.5-97)	92 (90-92)		
Min - Max	93 - 98	89 - 93		

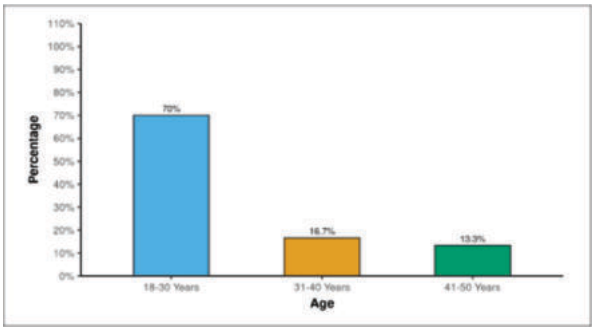

Figure 1 distribution of age

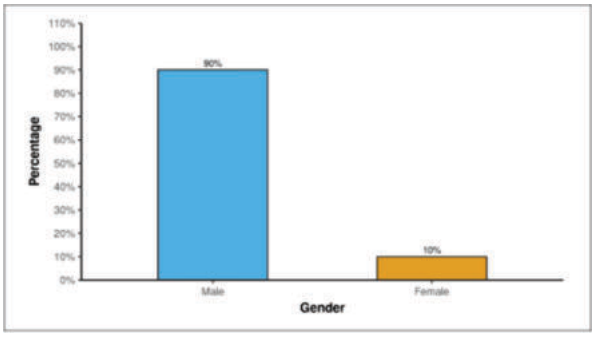

Figure 2 distribution of gender

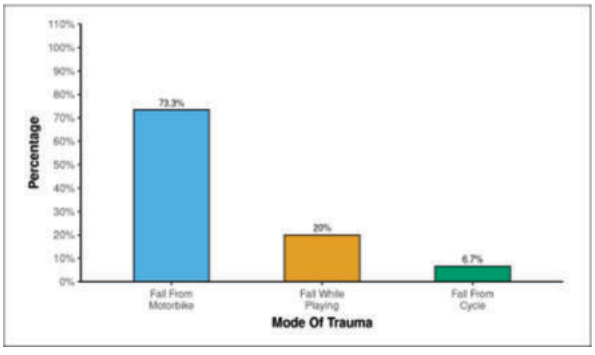

Figure 3 distribution of mode of trauma

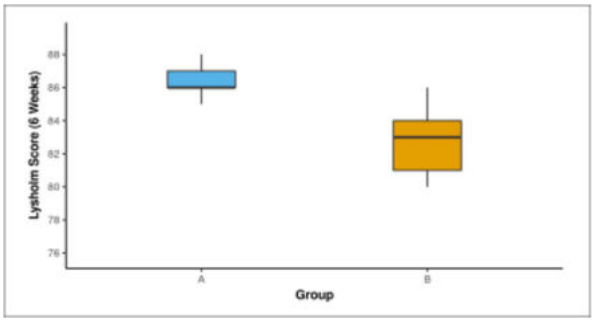

Figure 4 association between Group and LYSHOLM at 6 week

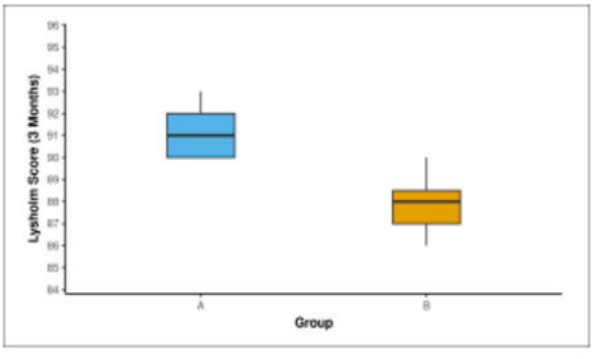

Figure 5 association between Group and LYSHOLM at 3 months

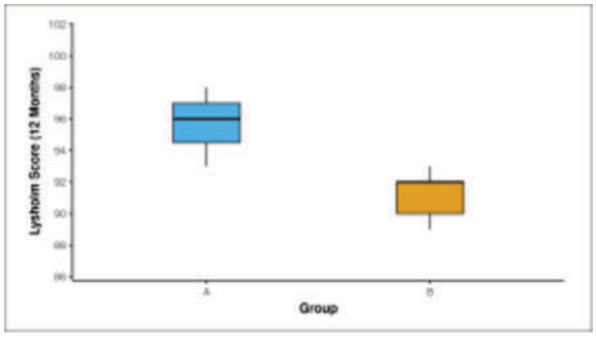

Figure 6 association between Group and LYSHOLM at 12 months

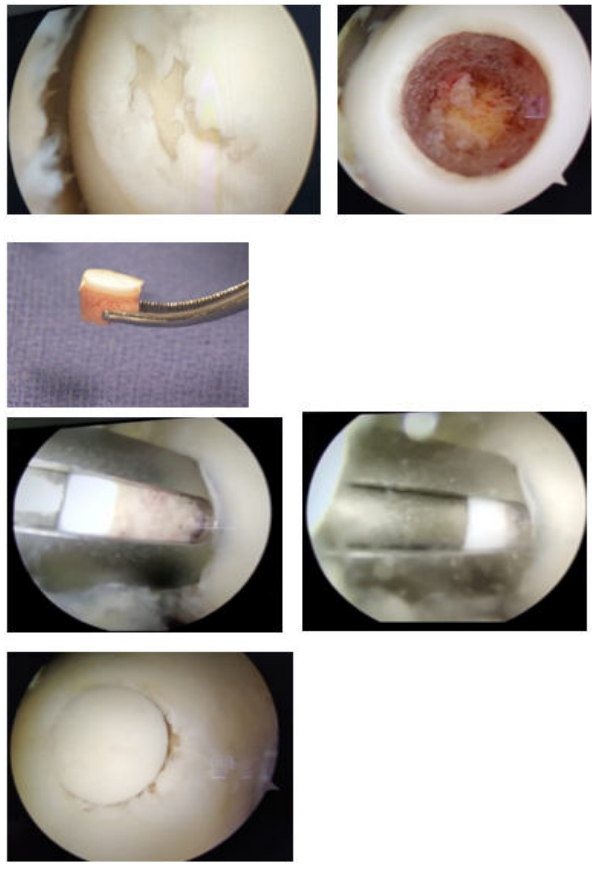

Figure 7 Surgical steps in OATS

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