OSTEOCHONDRAL AUTOGRAFT TRANSPLANTATION FOR THE TREATMENT OF OSTEOCHONDRAL DEFECTS IN ATHLETES.

JOÃO PARIS BUARQUE DE HOLLANDA, MARIO FERRETTI, MARCELO LUIZ QUARTEIRO, JOICEMAR TAROUCO AMARO, MOISÉS COHEN

ABSTRACT

Objective: To evaluate clinical outcomes of the osteochondral autologous transplantation technique for treatment of osteochondral defects of the knee in athletes. Methods: For an average follow-up period of 52 months (30 to 82 months), 19 patients were evaluated pre and post-operatively by using subjective IKDC scores, modified Cincinnati Scores, and rate of return to sports activities. Prognosis according to age, duration of symptoms and location of the lesion was also evaluated. Results: Subjective IKDC scores were 64.6 + 6.8 pre-operatively and 81.8 + 20.1 post-operatively. Modified Cincinnati score was 5.3 + 0.8 pre-operatively and 7.5 + 1.7 post-operatively. Fifty-three percent of the patients returned to pre-operative level of sports activity, 29% returned to a lower level, and 17% did not return to sports. Better results were observed in patients younger than 35 years, with less than one year of symptoms, in patients with femoral condyle defects and without concomitant meniscus or ACL tear. Throclear lesions had inferior results to condylar defects. Conclusion: Osteochondral autologous transplantation promoted a subjective improvement of the knee in athletes. Return to sports activity occurred in a specific group of patients

Keywords: Articular cartilage. Transplantation, autologous. Athletic injuries. Osteoarthritis.

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INTRODUCTION

Osteochondral defects of the knee in athletes frequently evolve with pain, limitation of sports activity and knee arthrosis.[1-4] Some surgical procedures target the repair of osteochondral defects[1,2,5], yet none of the procedures currently in use is capable of regenerating the hyaline cartilage in its original aspect.

Osteochondral autologous transplantation was initially proposed by Hangody.[6] In this situation, various bone plugs are removed from a donor area outside the articular cartilage load area and transferred to the lesion area, forming a mosaic. The aim of this treatment is for the lesion to be covered by hyaline cartilage, similar to the original cartilage, and thus to improve the prognosis of these lesions on the long term.

Results of this surgical technique in our field, in patients with high demand, are not well described, and neither is the presence of prognostic factors that may better indicate this treatment. Between 73% and 93% of good results are being obtained with OAT[7-12], yet this prognosis is variable according to factors such as lesion site, age, patient's demand, presence of associated lesions and time of symptoms before procedure performance.[7,9,12-14]

The objective of this study was to evaluate the clinical result of 30 athletes operated arthroscopically and to attempt to determine the factors associated with a better or worse prognosis of the OAT.

MATERIAL AND METHODS

The indication of OAT in the service consists of chondral lesions from one to four cm^2 in knees without degenerative changes. Between June 2000 and April 2005, 30 OAT procedures were performed by the arthroscopic route according to these criteria, with 21 on the medial femoral condyle, seven on the lateral femoral condyle and two on the trochlea. There were 27 male and three female patients. The mean age was 37 years (13 to 54 years) at the time of the procedure. (Figure 1) The duration of the symptoms before surgery was from 01 to 120 months

All the authors declare that there is no potential conflict of interest referring to this article.

Department of Orthopedics and Traumatology of Universidade Federal de São Paulo – UNIFESP

Study conducted at the Center of Sports Traumatology, Department of Orthopedics and Traumatology of Escola Paulista de Medicina – Universidade Federal de São Paulo
Mailing address: Moisés Cohen: Rua Embaú, 87. São Paulo, SP, Brazil. Cep: 04039-060. E-mail: m.cohen@uol.com.br

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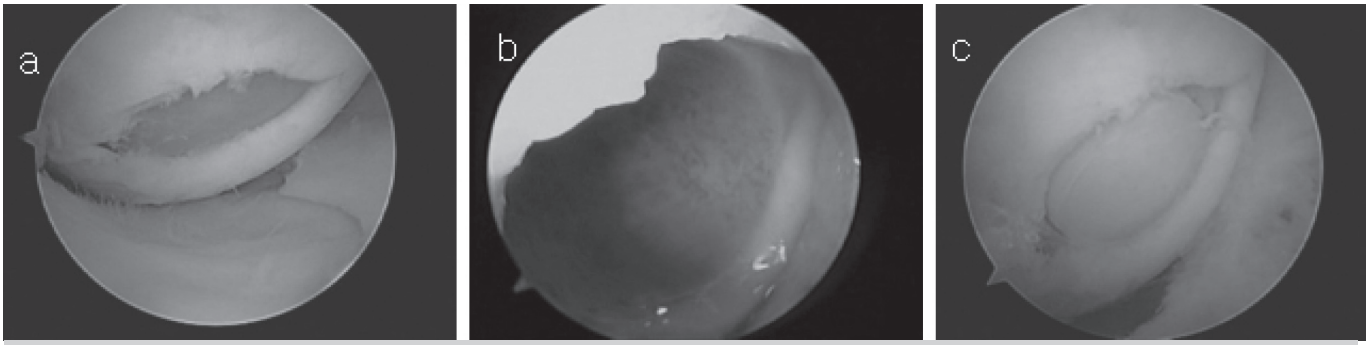

Figure 1 – Degree 4 chondral lesion of the medial femoral condyle (a); femoral bed prepared for the introduction of the graft (b); osteochondral graft (c).

(mean time 51 months). In 27 patients the lesion was a result of trauma, and in 3 it was due to osteochondritis dissecans. All the patients practiced sports regularly before the lesion, with four at professional level and 26 at amateur level. In the preoperative period the patients underwent the application of the IKDC protocol. Fifteen patients exhibited isolated defect of the cartilage, while OAT was the only procedure; seven patients underwent meniscectomy and eight, in addition to the meniscectomy, also underwent reconstruction of the anterior cruciate ligament in association with OAT. In the postoperative period the patients were instructed to go for four weeks without load, with free mobilization of the knee; return to sports was permitted after four to six months of rehabilitation, in the presence of a complete range of motion, muscular force from 80 to 90% in comparison with the contralateral limb and normal clinical examination. Nineteen patients responded to the call for reevaluation, which was performed face to face or by telephone interview. The subjective IKDC protocol and the modified Cincinnati protocol (Table 1) were applied; the patients were also questioned about their ability to return in the postoperative period to the sports practices performed before surgery. Eleven patients did not respond to the call for reevaluation.

Table 1 – Modified Cincinnati scale.

Poor (02)	Significant limitations that affect daily life activities
Regular (04)	Moderate limitations that affect daily life activities. The practice of sports is not possible
Good (06)	Limitations on the practice of sports, but is capable of practicing them
Very good (08)	Minor limitations on the practice of sports
Excellent (10)	No limitations including on the practice of sports

Statistics

The statistical evaluation was carried out according to the Wilcoxon test for classification of the pre-and postoperative IKDC score and to the paired t-test for statistical evaluation of the modified Cincinnati score.

RESULTS

Of the 19 patients reevaluated, two were excluded from the analysis: one that evolved with chronic lumbar sciatic pain, in which the limitation results more from the spine than from the knee itself, and another victim of a firearm projectile wound in the spine that evolved with paraplegia.

Among the 17 patients included in the analysis, (53%) said they had returned to sports at the same level as before the lesion, five (29%) at a lower level and three (17%) abandoned the regular practice of sports. According to the subjective IKDC, an excellent result was observed in nine patients (IKDC>90), with a good result in five (IKDC between 75 and 90), regular in one (IKDC between 50 and 75) and poor in two patients (IKDC<50). In relation to the preoperative period, two patients refer to deterioration, three maintained the same pain in relation to the preoperative period and 12 presented an improvement. The preoperative IKDC was 64.6±6.8 and, in the postoperative period, 81.8±20.1. The modified Cincinnati score in the preoperative period was 5.3±0.8 and, in the postoperative period, 7.5±1.7. These results were statistically significant. (Table 2)

Table 2 – *Pre- and postoperative IKDC and modified Cincinnati. P < 0.01.*

	PREOPERATIVE	POSTOPERATIVE
IKDC	64.6 +/- 6.8	81.8 + / - 20.1
CINCINATI	5.3 + / - 0.8	7.5 + / - 1.7

The two poor results were observed precisely in the two patients that underwent OAT of the trochlea. Among the patients that underwent mosaicplasty of the medial condyle, five had excellent evolution, four good, one regular and none poor. Of the five patients that underwent OAT of the lateral condyle, four presented excellent evolution and one a regular result. (Figure 2)

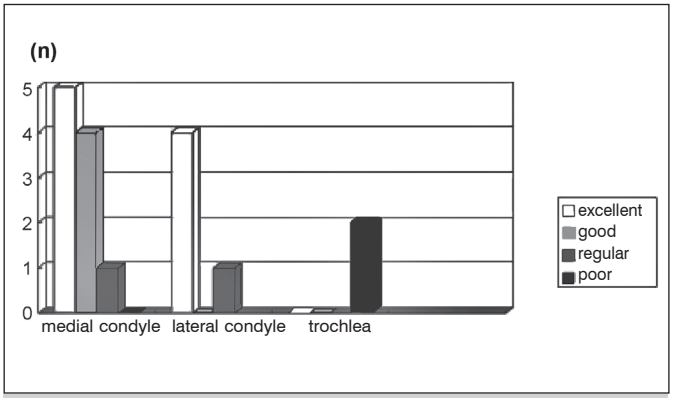

Figure 2 – *Result of the osteochondral autologous transplantation in conformity with the lesion site. according to the subjective IKDC. Excellent >90. good: 70 - 90: regular: 50 - 70: poor: <50.*

91% of the patients without anterior cruciate ligament defect had excellent or good evolution, against 66% of those that underwent ligament reconstruction. As regards age, 87% of the patients under 35 years of age presented excellent or good evolution, against 78% of the patients over 35 years of age. All of the patients with less than 1 year of symptoms before surgery presented excellent or good results, which was also observed in 72% of the patients with more than 1 year of symptoms prior to surgery. (Figure 3)

DISCUSSION

In our series we observed excellent or good results in 82% of the patients, compatible with that found in literature. The evaluation of the first 831 patients operated by Hangody demonstrated good or excellent results in 92% of the patients and cartilage similar to the original hyaline cartilage in 69% of the biopsies performed. Several clinical series performed at different institutions presented good or excellent results between 73% and 93% of the patients.[7-12]

The prognosis after OAT, however, varies according to the site and size of the lesion, the presence of associated lesions, the duration of symptoms before surgery and the patient's age.[7,9,12-14]

In relation to the lesion site, Hangody and Fules[10] evaluated 118 patients that underwent OAT on the patella or trochlea, obtaining 79% of good or excellent results. Bentley et al.[8] reevaluated two patients with trochlear defect, one of whom presented good evolution and the other excellent. Among our patients, the only two that underwent trochlear OAT exhibited poor evolution. The results both of our series and of that of Bentley, however, should be considered with discretion, due to the low number of patients. Anyhow, another possible explanation for the poor result obtained with these patients is the greater technical difficulty in obtaining the original articular contour due to the concavity of this area of the articular surface, besides the fact that the cartilage is much thicker at the trochlea than at the condyles.

We also observed a better result in young patients, without associated lesions and with a shorter time of symptomatology before surgery. Although the small number of patients proved insufficient for the performance of an adequate statistical analysis, this result is in keeping with that found in most of the literature.[7,9,12-14] Marcacci et al.[14], however, refer to better results when associated with other procedures, such as meniscectomy or reconstruction of the anterior cruciate ligament.

According to Martin et al.[15], cell function in relation to the maintenance and restoration of cartilage matrix is reduced with the advancement of age. This, associated with a greater possibility of pre-radiographic arthritic changes, justifies a worse result in older patients. Nevertheless, the fact that 78% of the patients over 35 years of age have had a good or excellent evolution justifies the performance of the procedure in this group in select cases.

Although the regeneration capacity of the articular cartilage after trauma is limited, incomplete and variable from patient to patient, which is justified by the low tissue vascularization, small number of cells and limited cell renewal[4], Nakamura et al.[4], in studying the natural history of chondral lesions, noted that 50% of degree III or IV lesions according to the classification of Outerbridge in the femoral condyles presented an improvement of at least one degree in the classification when observed in a second arthroscopy. Also studying the natural history of chondral defects associated with the reconstruction of the anterior cruciate ligament, Shelbourne et al.[16] noted that 79% of the patients appeared with symptoms either absent or somewhat limiting. These studies justify the better result obtained in patients treated acutely, although, since we do not know which patients will present positive evolution, we believe that the procedure is justified even in the acute phase.

As a limitation of our work we can consider the fact that the evaluations were conducted retrospectively, that part of the evaluations were conducted by telephone interview and that there was a low number of patients. For a better evaluation of the result of the OAT it would also be important to perform biopsies or imaging exams that show graft incorporation, which were not done. Although all the lesions were of a size between 1 and 4cm^2, it would be important for us to have the measurement of each one of the lesions, yet this measurement was not documented with adequate methodology at the time of surgery.

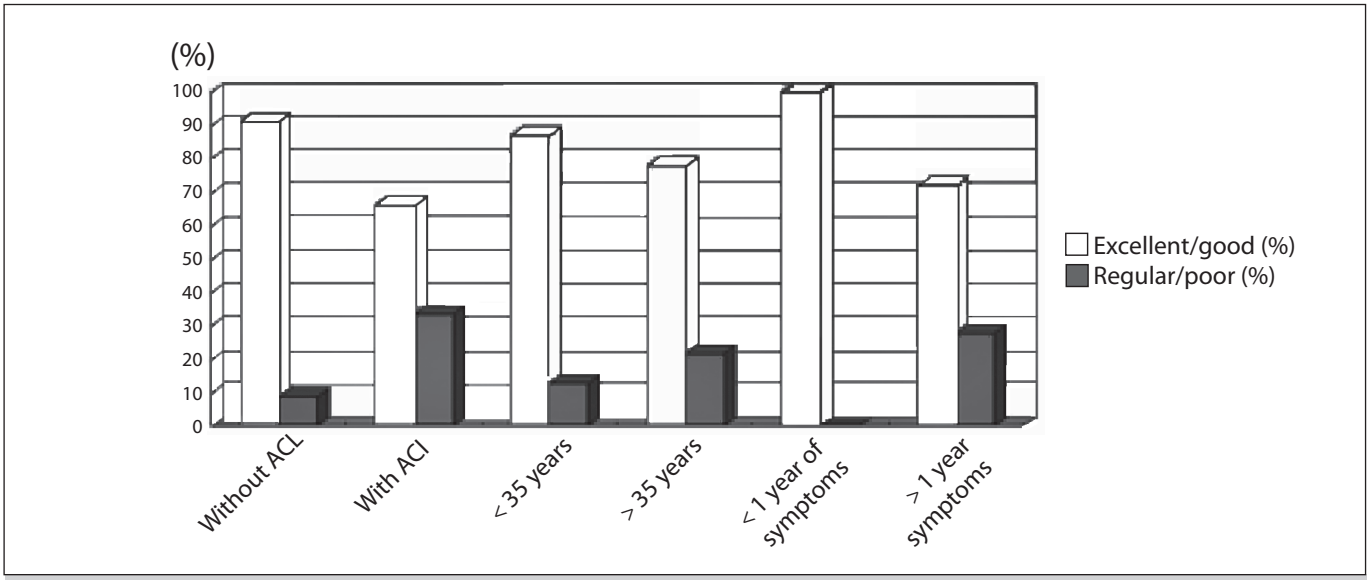

Figure 3 – *Result of the Osteochondral Autologous Transplantation in relation to associated lesion of the ACL, age and time of symptomology, according to the subjective IKDC. Excellent >90. good: 70 – 90: Regular: 50 – 70: Poor: <50.*

There is still a shortage of prospective studies with a larger group of cases in literature, particularly if we consider the subgroups of patients (age, lesion site, time of symptomatology, associated lesions), hence it is necessary to evaluate these studies jointly to allow a more adequate analysis of OAT.

Advanced age, the presence of associated lesions, prolonged symptomatology time and lesions in hardly favorable sites, such as the trochlea, are, however, factors that determine a worse prognosis for chondral lesions in general, regardless of the type of treatment performed and not just for mosaicplasty. None of the techniques that exist today represents an ideal form of treatment of chondral lesions. New research has been developed in the fields of tissue engineering through the development of scaffolds, of cell therapy, of the use of growth factors and of gene therapy, and this will certainly lead to further changes in the focus on chondral lesions.

CONCLUSION

OAT proved to be a good procedure for the treatment of chondral lesions from 1 to 4 cm^2 on the knee, with significant subjective improvement of patients. We believe that it should be part of the therapeutic arsenal for the treatment of chondral lesions of the knee. New studies with larger group of cases are necessary for a better evaluation of specific groups of patients.

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