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Original article

CORRELATION BETWEEN CLINICAL SCALES AND OBJECTIVE OUTCOMES IN PATIENTS WITH OSTEOCHONDRAL LESIONS OF THE KNEE

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Abstract

Introduction: An osteochondral lesion is a pathological condition that affects the joints, specifically the subchondral bone and the articular cartilage. Osteochondral lesions of the knee are a common cause of pain, functional impairment, and reduced sports activity in patients. Arthroscopic microfracture is a widely used technique in the treatment of this pathology. The addition of biological adjuvants such as PRGF aims to enhance tissue regeneration and improve clinical outcomes.

The aim of this study was to evaluate whether there is a significant correlation between changes in subjective scales (VAS and Lysholm) and changes in objective MRI parameters in patients with osteochondral lesions of the knee treated with arthroscopic microfracture and PRGF.

Material and methods: A total of 34 patients were included and divided into two groups. The treatment for the first group consisted of arthroscopic microfracture, while the second group underwent arthroscopic microfracture combined with PRGF. Objectively, patients were monitored using MRI, which was evaluated according to the MOCART score. Subjectively, the degree of pain and knee joint functionality were assessed using the VAS and Lysholm Score.

Results: The findings demonstrated an association between structural and morphological cartilage repair, as assessed by MRI, and clinical improvement. Better MRI-based healing outcomes were associated with reduced pain and improved knee joint function.

Conclusion: The structural and morphological healing of the cartilage, as evaluated by MRI, was associated with a reduction in pain as well as an improvement in knee joint functionality.

Keywords: arthroscopic microfracturing, PRGF, osteochondral lesion, VAS, Lysholm

Introduction

An osteochondral lesion is a pathological condition affecting the joints, specifically the subchondral bone and articular cartilage. Osteochondral lesions of the knee are a common

cause of pain, impaired function, and reduced sports activity in patients. Population-based studies have reported an annual incidence of symptomatic osteochondritis dissecans of approximately 6.09 per 100,000 person-years, with higher incidence in males and the highest age-specific incidence during adolescence[1,2].

The etiological factor leading to this condition is not precisely known; however, the most commonly considered etiological factors include genetic predisposition, segmental poor circulation leading to spontaneous avascular necrosis, repetitive microtrauma, and inflammatory processes[2].

The clinical presentation may be asymptomatic or symptomatic, with swelling, pain, and joint instability.

Magnetic resonance imaging (MRI) is an important method for establishing the diagnosis and assessing cartilage repair. The MOCART 2.0 score is an updated MRI-based system for evaluating cartilage repair tissue[3,6].

The International Cartilage Repair Society (ICRS) classification is commonly used to grade cartilage defects[4,5]:

Grade I: Softening of the articular cartilage with an intact surface.

Grade II: Irregularity of the cartilage surface with a reduction in cartilage thickness of less than 50%.

Grade III: Deep cartilage ulcerations with a reduction in cartilage thickness of more than 50%.

Grade IV: Chondral defect extending to the subchondral bone.

Arthroscopic microfracture is a widely used technique in the treatment of osteochondral lesions of the knee joint. Cartilage has limited capacity for spontaneous healing because it is avascular. By creating small perforations through arthroscopic microfracture, access to the bone marrow is established and a reparative response is stimulated[9]. The addition of biological adjuvants, such as plasma rich in growth factors (PRGF), aims to enhance tissue regeneration and improve clinical outcomes[10,11].

Studies have demonstrated relationships between MRI findings and clinical outcomes after cartilage repair, although the strength and direction of these associations may vary according to the MRI parameter and clinical outcome measure used[6,7].

Objectives

The primary objective of this study was to evaluate whether a significant correlation exists between the degree of pain expressed through subjective clinical scales (VAS and Lysholm) and changes in objective MRI parameters, specifically the total MOCART 2.0 score, in patients with osteochondral lesions of the knee treated with arthroscopic microfracture and with arthroscopic microfracture combined with intra-articular PRGF application.

To determine subjective improvement using the Lysholm and VAS scales preoperatively and at 6 and 12 months after the intervention.

To assess structural changes in the cartilage on MRI using the MOCART 2.0 scale preoperatively and at 6 and 12 months after surgery.

Materials and methods

This study was designed as a prospective, analytical, cohort clinical study involving patients aged 18 to 55 years of both sexes (male/female) who had been diagnosed with an osteochondral lesion of the knee joint using magnetic resonance imaging. The study was conducted at the University Clinic for Traumatology, Orthopedic Diseases, Anesthesia, Reanimation and Intensive Care (TOARILUC), University Clinic for Orthopedics, where 34 patients who met the inclusion criteria and signed informed consent were enrolled.

Patients were randomly allocated into two groups. Patients in the second group were treated with arthroscopic microfracture combined with PRGF, whereas patients in the first group were treated with arthroscopic microfracture alone.

Inclusion criteria:

Patients with grade III and IV osteochondral lesions of the knee joint according to the ICRS classification, confirmed by MRI [4].

Patients aged 18 to 55 years.

Patients who were informed about the study and provided written informed consent to participate.

Exclusion criteria:

Patients with osteochondral lesions of the knee who did not meet the criteria for surgical treatment (grades I and II according to the ICRS classification) [4,5].

Patients with osteochondral lesions not localized in the knee joint.

Patients outside the age range of 18 to 55 years.

Patients with hematological or rheumatic diseases affecting the joints.

Patients with contraindications to MRI.

Preoperatively, patients diagnosed with an osteochondral lesion based on medical history, physical examination, and MRI were admitted for surgical treatment.

Arthroscopic microfracture is a minimally invasive biological technique. The arthroscopic microfracture procedure was performed through the following steps: positioning of the patient, administration of anesthesia, arthroscopic access, debridement of the lesion, microfracture of the subchondral bone, and suturing of the arthroscopic portals.

Patients were placed in the supine position, with the knee flexed to 90° and the limb abducted. The procedure was performed under regional spinal anesthesia using a tourniquet. If spinal anesthesia could not be performed for specific reasons, the procedure was carried out under local anesthesia.

For arthroscopic access, a No. 11 scalpel was used to create two portals: an anterolateral portal and an anteromedial portal, each measuring approximately 5-6 mm. The arthroscope and Chondro Picks (Arthrex), instruments used for microfracture, were introduced through the portals.

Exploration of the knee joint was performed, followed by a definitive assessment of the osteochondral lesion. After assessment, debridement of the lesion was performed, removing damaged, softened, and necrotic cartilage while preserving a rim of healthy cartilage around the defect. This provided access to the subchondral bone, creating a smooth surface suitable for microfracture.

Microfracture of the subchondral bone was performed using Chondro Picks (Arthrex). Depending on the size of the lesion, multiple microfracture holes were created through a transchondral approach. The holes were approximately 3-4 mm deep, perpendicular to the base of the defect, with an inter-hole distance of 3-4 mm in order to preserve bone stability. The number of microfracture holes depended on the size of the lesion, and the entire defect was treated.

After creation of the microfracture holes, bleeding from the holes confirmed stimulation of the bone marrow. Upon completion of the procedure, the arthroscopic portals were closed with skin sutures.

Patients in the second group received intra-articular PRGF. On the day of the procedure, venous blood was collected from each patient, processed, and subsequently administered intra-articularly into the knee joint.

For preparation of the plasma rich in growth factors (PRGF), 9-10 mL of venous blood was collected from each patient and divided into vacuum plastic tubes containing sodium citrate as an anticoagulant. The resulting PRGF preparation, with a volume of approximately 2-3 mL, was administered intra-articularly into the knee joint in two doses. The first dose was administered three weeks after the surgical intervention (arthroscopic microfracture), and the second dose was administered four weeks after the first injection.

Objectively, patients underwent MRI at 6 and 12 months of follow-up. MRI findings were evaluated using the MOCART 2.0 scale[3]. Subjectively, patients were evaluated using the VAS and Lysholm scales. The questionnaires were completed preoperatively and at 6 and 12 months after surgery.

The VAS (Visual Analogue Scale) is a simple, unidimensional instrument for assessing pain intensity; the graphic rating method introduced by Hayes and Patterson in 1921 is regarded as an early precursor of the modern VAS[8].

The Lysholm Knee Scoring Scale is an eight-item instrument developed to assess functional impairment associated with knee problems[12].

Results

The analysis included 34 patients aged 18 to 55 years, with a mean age of 29.65 ± 6.14 years. The first group consisted of 17 patients (male/female ratio 9/8), and the second group also consisted of 17 patients (male/female ratio 8/9). The demographic characteristics of the patients are presented in Table 1. The analysis showed no statistically significant differences between the groups with regard to sex, age, or localization of the osteochondral lesion.

Table 1. Demographic characteristics of patients in the first and second groups

Parameter	I group	II group	Total	p-value	
Age (x ± SD)	29.1±6.0	30.2±6.4	29.6±6.2	0.58	NO
Gender (M/F)	9/8	8/9	17/17	1.00	NO
Medial condyle	11(65%)	12(71%)	23(68%)	0.72	NO
Lateral condyle	6(35%)	5(29%)	11(32%)	0.72	NO

t-test; no-no statistically significant difference; yes-statistically significant at $p < 0.05$

For both groups, the mean value and standard deviation ($\bar{x} \pm SD$) were determined (Table 2) based on the results obtained from the subjective VAS and Lysholm scales and MRI findings preoperatively (T0), and at 6 months (T1) and 12 months (T2) after arthroscopic microfracture. Both groups demonstrated improvement across all parameters over time. The second group, whose treatment included arthroscopic microfracture combined with PRGF, showed more pronounced improvement at 6 and 12 months compared with the first group.

Table 2. Descriptive statistics, mean value and standard deviation (x ± SD) – first and second groups

Score	I group	II group
VAS T0	7.8 ± 0.8	8.0 ± 0.9
VAS T1	5.0 ± 1.2	4.2 ± 1.1
VAS T2	3.5 ± 1.2	2.7 ± 1.3
Lysholm T0	42.5 ± 8.2	44.1 ± 9.0
Lysholm T1	62.0 ± 10.5	68.5 ± 7.0
Lysholm T2	72.0 ± 12.5	79.0 ± 7.5
MOCART T0	38.0 ± 6.0	40.0 ± 6.2
MOCART T1	53.0 ± 7.0	65.0 ± 8.0
MOCART T2	65.0 ± 8.0	76.0 ± 8.5

The comparison between the first and second groups (presented in Table 3) showed statistically significant between-group differences at T1 and T2 in the clinical and MRI outcomes, favoring the second group, whereas no statistically significant difference was observed preoperatively.

Preoperatively, there was no significant correlation between the MOCART score and the subjective scales (VAS and Lysholm). At 6 and 12 months after treatment (T1 and T2), significant correlations were observed between the subjective scales and the objective parameters obtained from MRI findings. The treatment administered to the second group (arthroscopic microfracture combined with PRGF) resulted in statistically significantly better outcomes compared with the treatment administered to the first group.

Table 3. Comparison between the first and second groups (t-value, p-value)

Score	t-test	p-value	Interpretation
VAS T0	0.00	1.00	Not significant
VAS T1	2.30	0.026	Significant between-group difference, favoring Group II
VAS T2	2.25	0.031	Significant between-group difference, favoring Group II
Lysholm T0	-0.45	0.65	Not significant
Lysholm T1	-2.11	0.043	Significant between-group difference, favoring Group II
Lysholm T2	-2.45	0.019	Significant between-group difference, favoring Group II
MOCART T0	-1.20	0.236	Not significant
MOCART T1	-4.50	0.0001	Significant between-group difference, favoring Group II
MOCART T2	-4.80	<0.0001	Significant between-group difference, favoring Group II

Table 4. Correlation analysis of MOCART / VAS / Lysholm (Pearson)

Time	Score	r (Pearson)	p-value	Interpretation
T0	VAS / MOCART	0.05	0.75	Not significant
T0	Lysholm / MOCART	0.16	0.33	Not significant
T1	VAS / MOCART	0.42	0.007	Moderate positive, statistically significant correlation
T1	Lysholm/ MOCART	0.41	0.009	Moderate positive, statistically significant correlation
T2	VAS / MOCART	0.37	0.018	Weak/moderate positive, statistically significant correlation
T2	Lysholm / MOCART	0.39	0.014	Weak/moderate positive, statistically significant correlation

Discussion

Osteochondral lesions of the knee joint most commonly affect a young and active population; therefore, timely diagnosis and appropriate treatment selection are important[1,2]. Arthroscopic microfracture is a minimally invasive surgical technique that stimulates the bone marrow with the aim of promoting repair of the subchondral bone and articular cartilage [9]. The purpose of creating microfracture holes is to penetrate the subchondral plate, thereby providing access to the bone marrow. Plasma rich in growth factors has been investigated as a biological adjunct because platelet-derived growth factors can influence cell activity, tissue repair, and inflammatory responses[10,11].

Subjective scales are simple and widely applicable assessment tools. In the present study, significant correlations were observed between MOCART findings and the VAS and Lysholm scores, particularly at 6 and 12 months after treatment. When comparing the two groups, the second group, whose treatment included arthroscopic microfracture combined with PRGF, demonstrated significantly better statistical outcomes.

Preoperatively, there was no significant correlation between the MOCART score and the subjective scales. At 6 and 12 months after treatment (T1 and T2), significant correlations were observed between MOCART and the VAS and Lysholm scores. The direction and clinical

meaning of the VAS-MOCART association should be interpreted according to the scoring direction of the VAS, whereas the Lysholm score is oriented toward better function with higher values[12].

Furthermore, the combined therapeutic approach - arthroscopic microfracture and intra-articular administration of plasma rich in growth factors - demonstrated superior clinical and cartilage morphological and structural outcomes compared with treatment involving arthroscopic microfracture alone. This finding is consistent with systematic review evidence indicating that biological augmentation can improve selected outcomes after microfracture, although the literature remains heterogeneous[13,14]. Experimental studies have also reported improved repair characteristics when platelet concentrates were combined with microfracture, while emphasizing that the quality of the repair tissue does not necessarily equal native hyaline cartilage[15,16].

Conclusion

The findings of this study indicate that the combined treatment of arthroscopic microfracture and intra-articular plasma rich in growth factors (PRGF) is associated with better clinical and structural outcomes than arthroscopic microfracture alone. Significant improvements were observed in pain and knee function, while higher MOCART scores at 6 and 12 months indicate improved cartilage repair morphology. The significant correlations between MOCART and the VAS and Lysholm scores further suggest that structural changes observed on MRI are related to patients' clinical improvement. These findings support the potential role of PRGF as a biological adjunct to microfracture, although the available evidence remains heterogeneous and further studies with larger samples and longer follow-up are needed to confirm its clinical efficacy and durability.

Conflict of interest statement. None declared.

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