Archives of the Balkan Medical Union

THE EXPERIENCE OF THE USE OF THE OF Diart® IN THE SURGICAL TREATMENT OF THE CHONDRAL AND OSTEO-CHONDRAL FRACTURES OF THE KNEE

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REZUMAT. Experienţa utilizării preparatului Diart® în complexul de tratament chirurgical al bolnavilor cu fracturi condrale şi osteocondrale ale genunchiului

Experienţa noastră constă în tratamentul a 60 bolnavi cu fracturi condrale şi osteocondrale ale genunchiului cu folosirea tehnicii artroscopice pe perioada anilor 2010-2011. La toţi bolnavii sa efectuat artroscopie diagnostică, în 21 cazuri sa practicat numai înlăturarea fragmentului detaşat, in 21 cazuri înlăturarea fragmentului cu abrazia condroplastică a defectului, în 10 cazuri înlăturarea fragmentului cu abrazia condroplastică şi microfracturare, în 2 cazuri refixarea fragmentului, în perioada postooperatorii bolnavii au primit tratament intra-articular cu Diart®, prima priză imediat după fini-sarea intervenţiei cu repetarea la o lună în 2 prize cu intervalul de o săptămînă. Evaluarea rezultatelor la 1-2 ani postoopera-tor, în toate cazurile am obţinut rezultate bune.

SUMMARY. The experience of the use of Diart® in the treatment of chondral and osteo-chondral fractures of the knee

Our experience consists in the treatment of 60 patients with chondral and osteo-chondral fractures of the knee using the arthroscopic technique during 2010 and 2011, followed by intra-articular treatment with Diart®. In all the cases we performed arthroscopic diagnostics, that resulted in the removal of the detached fragment (21 cases), removal of the detached fragment with abrasive chondroplasty (21 cases), removal of the fragment with abrasive chondroplasty and forage(10 cases), re-fixing of the fragment(2 cases). Post-operatory treatment included intra-articular administration of Diart®, the first injection immediately after the in-tervention, the second one after a month and the third one a week later. While analyzing the treated cases in 1-2 years after the intervention we evaluated the results as fully satisfactory.

INTRODUCTION

The chondral and osteo-chondral fractures are acute injuries of the articular cartilage and subchondral region caused by a direct or indirect trauma. These fractures of the knee joint can be isolated, multiple or combined with injuries of the capsular ligamentous complex and other intra-articular injuries. Clinical features of the chondral and osteo-chondral fractures are the same as for intra-articular acute injuries; - pains in the knee joint, especially at a physical effort made with the painful leg, hemarthrosis, restricted movements, articular blockages, etc. The traditional clinical and radiological methods do not allow identifying all the chondral injuries, the localization and character of the fractures. For an accurate diagnosis there are necessary special investigation methods: computed tomography, NMR diagnostics, utrasonography, diagnostic arthroscopy. Before the arthroscopic techniques appeared, it was difficult to diagnose these types of injuries and they had been treated on the basis of various other diagnoses.

For the first time the term „osteo-chondral fracture" was described by A. Krida in 1924. Thus, there were described 4 cases of osteo-chondral fracture of the lateral femoral condyle within patella dislocation (13). This type of fracture had been descried earlier: in 1905 M. Kroner described a case of marginal fragment of intra-articular lateral femoral condyle, similar to osteochondritis dissecans in traumatic patellar dislocation (12).

The potential for spontaneous healing of the articular cartilage lesions represents a dilemma in the treatment of young patients with increased motor activity(2,6,9,l 1), since such lesions may develop early posttraumatic arthritis of the knee associated with the degeneration of the traumatized articular cartilage. The mature cartilages do not have blood and lymphatic vessels and the chondrocytes' nutrition is ensured by the synovial fluid via the extracellular matrix. For minor mechanical lesions the chondrocytes synthesize proteoglycans and thus heal the small damage (1, 2, 6, 8), while for severe lesions, which imply severe cartilage damages, the regeneration is limited considerably.

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A significant importance in the treatment of severe cartilage damages has the subchondral region, which is rich in blood vessels. As well a great importance has the use of chondroprotective drugs during the postoperative period, sometimes for long-term periods: - like medications that contain glucosamine, chondroitin sulphate and hyaluronic acid (13).

The implementation of arthroscopic methods for the diagnosis and treatment of chondral and osteo-chondral fractures in the knee joint form new concepts and perspectives for the treatment of this type of injuries with minimal trauma of intra-articular and para-articular anatomical structures.

MATERIALS AND METHODS

During the years 2010-2011 we have diagnosed and treated from chondral and osteo-chondral fractures 60 patients from 600 patients, who have been treated arthroscopically. Thus, the frequency of these fractures constituted 10.0 + 3.1% from the total number of patients with injuries and disorders of the knee joint treated arthroscopically. The chondral and osteo-chondral injuries occur more frequently among the young patients with increased motor activity (Tab.1).

The mechanisms causing injuries that were presented more frequently in our study were: the sport injuries - 29 (65.1+ 6.2%, p<0.001) cases, direct trauma – 12 (20.0 + 5.2%, p<0.001) cases, while in 8(16.7%) cases in children the fractures were caused by patella dislocation.

Table 1. Distribution of patients according to the age

Age (years) / Type. Fracture.	14-20 years		21-30 years		31-40 years		41-50 years		51-70 years		Total Patients	
	abs	%	abs	%	abs	%	abs	%	abs	%	abs	%
Chondral and osteo-chondral fractures	18	30.0	13	21.7	15	25.0	8	13.3	6	10.0	60	100

Table 2. Distribution of patients according to the localization of chondral and osteo-chondral fractures

Fracture localization	Patella		Medial femoral condyle		Lateral femoral condyle		Tibial plateau		Total	
	Abs.	p1±m1	Abs.	P2±m21	Abs.	P3±m3	Abs.	P4±m4	Abs.	%
No. of patients	36	60.0±6.3	14	23.3±5.5	6	10.0+3.9	4	6.7±3.2	60	100

Table 3. Structure of patients according to the frequency of concomitant intra-articular injuries (%)

Fr. localization / Concomitant injuries	Patella		Medial femoral condyle		Lateral femoral condyle		Tibial plateau		Total	
	abs	%	abs	%	abs	%	abs	%	abs	%
Meniscus	3	8.3	-	-	2	33.0	-	-	5	8.3
ACL anterior cruciate ligament	2	5.6	2	14.3	-	-	-	-	4	6.7
Mediopatellar fold	-	-	2	14.3	-	-	-	-	2	3.3
Joint capsule rupture	6	16.7	-	-	-	-	-	-	6	10.0
total	36	60.0	14	23.3	6	10	4	6.7	60	100.0

The localization of chondral and osteo-chondral fractures was more frequent in patella - in 36 (60.0 % ± 6.3%, p<0.001) cases, and medial femoral condyle - 14. (23.3 + 5.5%, p<0.001%) (Tab. 2)

Very often chondral injuries are associated with other intra-articular knee injuries (Tab. 3). Thus, the more frequent lesion that was associated with chondral injuries was the meniscus lesion, being encountered in 8.3% cases, while the anterior cruciate ligament injury - in 6.7% cases.

Via the clinical and radiological examination the patients were diagnosed preoperatively in 9 (15.03%) cases only, in the rest of cases they were diagnosed on the basis of the arthroscopic examination. In the majority of cases the clinical examination established the meniscus injury diagnosis. The localization of these injuries was more frequent in patella - 36 (60.0 ± 6.3%, p<0.001) patients.

During the diagnostic arthroscopy there were identified the following types of injuries:

- Linear chondral fracture - 15(25.0%)
- multiple linear injuries - 13 (21.7%)
- limited chondral detachment with free intra-articular chondral fragment - 20(33.3%)
- osteo-chondral defect with free intra-articular osteochondral fragments- 10(16.7%)

The diagnostic arthroscopy along with the examination of all articular joints allowed us to diagnose the injury, to identify the fracture localization, to establish the degree of damage and dimensions of the fracture.

Along with the chondral and osteo-chondral fractures there were diagnosed injures of the medial meniscus in 5(8.3%) patients, anterior cruciate ligament injuries - 4(6.7%), medial capsule rupture - in 6(10%) patients.

In the cases of multiple or single linear chondral fractures we applied the remodelling of the fracture surface and the economical resection of the cartilage edges, as well as the abrasive chondroplasty of the fracture. In chondral fractures with free intra-articular chondral fragments we carried out the removal of fragments, the debridement of fracture and the articular lavage.

In the cases of osteo-chondral fractures we applied the removal of the osteo-chondral fragment in 15(25.0%) patients, the debridement of fracture and the abrasive chondroplasty - 33 (55.0%), microfracture of the fracture subchondral region - 10 (16.8%). In two cases, due to the extended dimensions of the osteo-chondral fragment, we carried out the screw osteosynthesis of the fractured fragment (Tab. 4).

Since in 6 (16.6 ± 6.25%, $p < 0.05$) cases the osteo-chondral fracture of the patella was caused by the traumatic patellar dislocation, we used for the kneecap centring and stabilization the method of R. K Yamamoto, which was proposed in 1986 (8). During the postoperative period all the patients were given the intra-articular injection of Diart®. The first injection was given immediately after the arthroscopic surgery, the second one after a month and the third one a week later after the second injection was given. As well the patients were given another 2 injections 6 months later.

Table 4. Structure of surgeries carried out in cases of chondral and osteo-chondral fractures (%)

Fracture localization / No. of patients / Surgeries :	Patella		Medial femoral condyle		Lateral femoral condyle		Tibial plateau		Total	
	abs	%	abs	%	abs	%	abs	%	abs	%
	36	100	14	100	6	100	4	100	60	100
1. Fractured fragment ablation	15	41.7							15	25.0
2. Fractured fragment ablation + abrasive chondroplasty	20	55.6	7	50.0	3	50.0	3	75.0	33	55.0
3. Fractured fragment ablation, microfracture surgery	1	2.7	7	50.0	1	16.6	1	25.0	10	16.8
4. Osteosynthesis of the fractured fragment	-	-	-	-	2	33.4	-	-	2	8.3

Table 5. Results of the surgical treatment of patients with chondral and osteo-chondral fractures in knee joint according to the R.Larson scale

No. of patients / Results	Number of patients						T1	p1	T2	P2	T3	p3
	Osteo-chondral fractures of the femoral condyles		Osteo-chondral fractures of patella		Osteo-chondral fr. of tibial plateau							
	Abs.	P1±m1	Ab	P2±m2	abs	P3+m1						
1. Excellent	14	70.0±10.2	23	63.9±8.0	2	50.0±25.0	6.8	••••	7.9	••••	2.0	••
2.Good	4	20.0+8.9	10	27.8±7.5	1	25.0+21.7	2.2	•••	3.7	•••	1.2	•
3. Satisfactory	2	10.0±6.7	3	8.3±4.6	1	25.0+21.7	1.5	•	1.8	•	1.2	•
Total-60	20	33.3±6.1	36	60.0+6.3	4	6.7+3.2	5.5	••••	9.5	••••	2.1	••

.. p< 0.05. p > 0.05, ...p > 0.01,.... p < 0.001

RESULTS AND DISCUSSIONS

The results of the arthroscopic treatment that was applied in case of patients with chondral and osteo-chondral fractures were evaluated according to the R.Larson scale. The treatment results of these fractures, the articular cartilage regeneration and recovery depend to a great extent on the fracture localization – in the load bearing areas or in the areas that do not bear any loads. The potential for spontaneous healing of the articular cartilage lesions represents a dilemma in the treatment of young patients with increased motor activity (Buckwalter J.A. 1999, Jackson D.W. 2001), since such lesions may develop early posttraumatic arthritis of the knee associated with the degeneration of the traumatized articular cartilage(3,4).

With the view of the articular cartilage regeneration, these patients were administered chondroprotective drugs (Diart®) post-operatively. The frequency of the given lesions in our study constituted 10% from the total number of patients with knee joint injuries.

Kuznetsov I.A. (1998) analyzed the arthroscopic treatment, which was applied in case of 1066 patients with knee joint injuries and disorders, chondral and osteo-chondral fractures, and established that in 3.4% cases the most injuries were localized in patella - 41.8% (7).

The functional results and recovery of patients with such type of injury depend to a great extent on the type of fracture, localization and surface of the damaged articular cartilage. If the lesion is localized in the load bearing area, the patients have to observe a long-term orthopaedic regimen and to exclude physical effort of the damaged leg for 2-3 months. Among our patients there were 8 persons with the localization of the fracture in the load bearing area; 2 persons with the osteo-chondral fracture of the tibial plateau and 6 patients with the fracture of the femoral condyle.

A significant importance in the treatment of severe cartilage damages has the subchondral region, which is rich in blood vessels. In the case of osteo-chondral fractures with severe damages we carried out the microfracture surgery of the fracture subchondral region in 10 (16.8%) patients and obtained good results in all cases. Kai Mithoefer, Riley J. (2005) studied the effectiveness of the microfracture surgery treatment in 254 patients with osteocartilaginous injuries of the knee joint. The postoperative results of the treatment that were established three years later were evaluated as good in 92% patients (6).

CONCLUSIONS

Arthroscopy is justified in the cases of diagnosis and treatment of knee joint chondral and osteo-chondral fractures, since it allows diagnosing such type of injuries in 100% cases, along with the carrying out of healing procedures during the same session.

The minimally invasive interventions ensure the integrity of the articular capsule and the articular motor activity.

The use of Diart® in the arthroscopic surgical treatment of chondral and osteo-chondral fractures creates favourable conditions for the recovery of the damaged articular cartilage in favourable terms, as well as for the recovery of the articular motor function.

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