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Isolated Full Thickness Chondral Injuries. Prevalance and Outcome of Treatment. A Retrospective Study of 5233 Knee Arthroscopies

Izolované chondrální zlomeniny – retrospektivní artroskopická studie na souboru 5233 kolenních kloubů

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ABSTRACT

PURPOSE OF THE STUDY

The aim of this study was to provide data on the prevalence and epidemiology of isolated deep chondral lesions of the knee, diagnosed in arthroscopy. The study was also aimed to analyse subjective treatment results of localized deep isolated cartilage lesions and to determine how the different factors might affect the final outcome.

MATERIAL AND METHODS

From 1997 to 2002, 5233 knee arthroscopies were performed. The first part of the study is an epidemiological and statistical analysis of the isolated articular cartilage lesions in which we used the questionnaire based on the International Knee Documentation Committee (IKDC) Questionnaire. The second part is the analysis of subjective treatment evaluation. For this purpose the IKDC criteria were used. Following aspects were taken into account: lesion location and size, time after surgery, patients' age, performed surgical cartilage procedure. The follow-up period ranged from 1 to 7 years. The statistical analysis was performed with the use of the Pearson correlation coefficient and t-test. Significance was set at $p<0.05$.

RESULTS

In the analyzed material cartilage lesion was diagnosed in 2931 patients (57.3%). Isolated localized chondral Outerbridge grade 3 and 4 lesions were documented in 5.2% of all patients with diagnosed cartilage lesion. The patellar articular surface (37.5%) and the medial femoral condyle (32.2%) were the most frequent localizations of these lesions.

There was no correlation between the results and the period of time after arthroscopy. The best results were obtained in cases of loose body removal, debridement, mosaicplasty and also in cases where the lesion was left untreated.

DISCUSSION

The management of full-thickness cartilage injury remains one of the most difficult problems in the orthopedic surgery, particularly isolated and symptomatic. In 7 years of follow-up we found good and satisfactory results when debridement and loose body removal was performed and when the lesions was left untreated. Significantly the worst results in subjective evaluation we observed in marrow-stimulating procedures. This study confirms that the appropriate qualification for treatment plays the most important role in successive management of cartilage injuries.

CONCLUSIONS

Treatment of isolated deep chondral lesions of the knee remains a questionable issue. Little invasive arthroscopic methods as well as using no surgical treatment in grade 3 and 4 isolated cartilage lesions may be effective and improve symptoms and knee function at mid-term follow-up. Our data support also the contention that the natural history of cartilage lesions still remains unpredictable and not well understood.

Key words: knee, arthroscopy, cartilage lesion, chondral injuries, articular cartilage, cartilage repair.

INTRODUCTION

Although a rapid development of diagnostic and therapeutic methods of articular cartilage lesions has been made, a problem of choosing the best treatment still persists. Isolated, particularly symptomatic, deep chondral lesions seem to be problematic.

There are several choices in treatment of articular cartilage defects. For last few years, new techniques that aim to reestablish hyaline cartilage have been introduced. They include the use of cultured cells, bone marrow mesenchymal stem cells as well as tissue-engineering (3, 7, 8, 9, 15, 19, 23, 25, 27, 34). On the other hand, however, there are papers proving that little invasive simple method or even willful negligence of a surgical treatment might also be effective in achieving good function of the joint (13, 16); Messner et al. (11, 21) showed that without treatment 22 of the 28 patients had excellent and good function 14 years after surgery. Another study was published by Shelbourne et al. (30) in 2003 – at 10-year follow-up there was no significant difference between the outcomes of patients with ACL-associated untreated cartilage injury and patients with no cartilage injury. It is suggested that in certain conditions conservative treatment of cartilage defects should be also considered (1, 5, 6, 33).

The aim of this study is to provide data on the prevalence and epidemiology of isolated traumatic deep articular cartilage lesions of the knee diagnosed in arthroscopy. This is also an attempt to determine what effect the different factors might have on subjective treatment evaluation scores of deep isolated cartilage lesions.

MATERIAL AND METHODS

From 1997 to 2002, 5233 consecutive knee arthroscopies were performed. The study group were patients with the diagnosis of isolated (with no other intra- or extra-articular lesions) deep chondral lesion based on the performed arthroscopy. The initial criteria for submission to arthroscopy were: diagnostics of acute knee injuries, diagnostics of unexplained knee pain and dysfunction, loose body, meniscal tears, osteoarthritis, cartilage repair, ACL reconstruction and others.

The first part of the study is an epidemiological analysis of the study group. The data were collected with the use of questionnaire based on the International Knee Documentation Committee (IKDC) Questionnaire (11). The questionnaire providing information concerning cartilage lesion (grade, location, size, status of surrounding cartilage), associated articular lesions and performed procedure after each arthroscopy was completed. The lesion grade was determined with the use of the Outerbridge classification (26). We documented location of the lesions on the articular surfaces of patella, trochlea, medial femoral condyle, lateral femoral condyle, medial tibial plateau, lateral tibial plateau and the size of the lesions was estimated with the use of a meniscal probe (5mm). In cases of repeated arthroscopic procedures, only the first procedure was analyzed. Patients who had both knees operated were not included in the study group.

The lesion was considered as localized isolated deep chondral lesion if one to three well-defined localized chondral defects of Outerbridge grade 3 and 4 surrounded by normal cartilage were found.

The second part is the analysis of subjective treatment evaluation scores. For this purpose the IKDC criteria were used. The mean follow-up period of observation in the analyzed material was 5.6 years (range: one to seven years). In the analysis of subjective scores following aspects were taken into account: lesion location and size, time after surgery, patients' age.

The detailed analysis was focused on results of performed surgical cartilage procedure in cases where the lesion was localised on femoral condyles. In that subgroup the treatment method was choosen randomly as a part of prospective analysis.

The statistical analysis was performed with the use of the Pearson correlation coefficient and t-test. Significance was set at $p<0.05$.

RESULTS

In the analyzed material cartilage lesion was diagnosed in 2931 patients (57.3%). Isolated localized chondral Outerbridge grade 3 and 4 lesions were documented in 153 cases (5.2% of all patients with diagnosed cartilage lesion). The study group consisted in 61.6% of male and in 38.4% of female patients. The average age of patients was 41 years and the largest group – patients aged 21-30 years (32.5%).

In 117 cases (76,4%) patients remembered sustained knee injury. In remaining 37 cases similar arthroscopic findings were observed, but there was no knee injury in history data.

The analysis of the localization of the lesion revealed that the patellar articular surface (37.5%) and the medial femoral condyle (32.2%) were the most frequent localizations of the cartilage lesions, while lateral tibial plateau (6.8%) was the least frequent one (Table I). Focal cartilage lesions were found in 40%. In 68.5% these were single defects.

In the analyzed study group surgical cartilage procedure was performed in 97 cases (60.7%) (Table II). In

Table 1. The locations of diagnosed isolated deep chondral lesions

MFC	LFC	MTP	LTP	PAT	TROCH
32.2%	9.3%	7.1%	6.8%	37.5%	7.1%

MFC – medial femoral condyle, LFC – lateral femoral condyle, MTP – medial tibial plateau, LTP – lateral tibial plateau, PAT – patella, TROCH – trochlea

Table 2. Performed surgical cartilage procedures

Debridement	Loose body removal chondrectomy	Mosaicplasty	Shaving	Microfracture	Drilling	Abrasion
41.8%	13.2%	10.9%	10%	8.6%	7.8%	7.7%

56 patients (36.7%) no surgical cartilage procedure was performed and the lesion was left untreated.

Treatment results

Routine follow-up was conducted in all patients with grade 3 and 4 lesions. Patients were sent a questionnaire regarding subjective treatment evaluation. Subjective follow-up scores in 1 to 7 years after surgery were obtained from 94 patients – 61%.

Time after surgery

There was no significant correlation between the results and the period of time after surgery regardless of the lesion location and size, patients' age and performed surgical cartilage procedure (p = 0.085).

Patients' age

Significant negative correlation between patients' age and the subjective treatment results was found (p = 0.823).

Lesion location and size

The best mean postoperative subjective scores were obtained when the lesions were located on the medial femoral condyle. Comparing the lesion size: ≤1 cm^2, 1–2 cm^2, ≥2 cm^2, it was found that in patients with the defect size of 2 cm^2 and more there was significant negative correlation between the defect size and postoperative subjective scores (Fig. 1).

Surgical treatment

In analysed subgroup of patients (37 cases) the lesions were larger than 2 cm^2 and were localised on femoral condyles. The mean lesion size was 2.3 cm^2 (range, 2.0 to 3.6 cm^2).

The best results in subjective evaluation were obtained in cases of loose body removal, debridement, mosaicplasty and also in cases where the lesion was left untreated – in those groups of patients there was no significant difference between the results. Worse results, but not statistically significant, were observed in cases where shaving (debridement with the use of motorized shaver system) was performed. Significantly the worst mean results were obtained in the group of patients with abrasion, drilling and microfractures (Fig. 2.).

DISCUSSION

Already since the times of Hippocrates it has been observed that cartilage once damaged should never heal. That is why the management of cartilage injury, especially full-thickness and occurring in young people remains one of the most difficult problems in the orthopedic surgery.

In the analyzed material chondral lesions were found in 2931 patients – 57.3% of the arthroscopies. Isolated lesions were documented in 940 (32.1%) cases. Grade 2 lesions were the most common and the patellar articular surface and the medial femoral condyle were the most frequent locations. Deep chondral lesions accounted for 16.2% of all the diagnosed isolated lesions. These epidemiological findings are in accordance with results from other studies (2, 4, 12).

Fig. 1. IKDC score: localized isolated deep chondral lesions – lesion size.

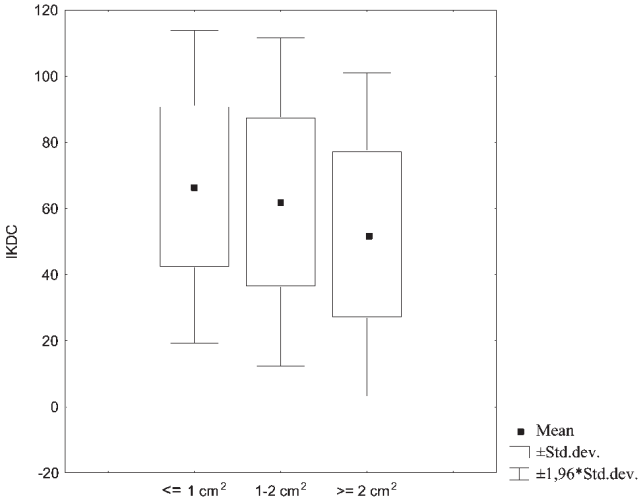
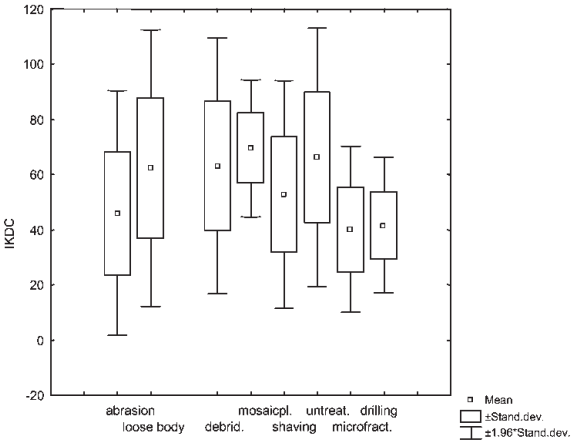


Fig. 2. IKDC score (medial femoral condyle): localized isolated deep chondral lesions – performed surgical cartilage procedure.



In or study we compared 3 groups of treatment methods used in cartilage surgery. The results were obtained from 94 patients (61% of 153 cases), which according to standards of statistical analysis (more than 51%) is enough for reliable evaluation. Additionally we analysed group with the untreated lesion. Debridement and lavage, methods of simple excision of damaged cartilage, have been reported as to improve symptoms and knee function for five years and more (13, 16, 35). Recently this technique has come under criticism by Moseley et al. (24). They have shown that arthroscopic debridement and lavage in osteoarthritis are effective only because of placebo effect.

Another group of treatment methods are marrow-stimulating procedures – microfracture, drilling, abrasion

(17, 29, 32). One of the most prevalent is microfracture technique, developed by Steadman et al. (32). Good and satisfactory results were published by several authors (14, 18, 31). However what was also indicated, this method is suitable rather for small contained defects, as the first line treatment especially in younger patients (less than 35 years) (31).

The last technique analysed in our study was mosaicplasty, or osteochondral cylinder transplantation. This procedure was first described in 1993 by Matsusue (20) and popularized by Hangody (10). The main advantage of this method is that the lesions are filled with mature, hyaline articular cartilage. The limitation is the donor site morbidity and that is why it is recommended for lesions of area between 1 and 4 cm^2. Hangody and Fules reported good and excellent results in 92%, 87% and 79% of patients who underwent mosaicplasty of the femoral condyle, tibial plateau and patella (9). Our data seem to reinforce results and observations from Hubbard (13), Jackson (16) and Messner (21). In 7 years of follow-up we found good and satisfactory results in subjective evaluation of the treatment after using debridement and loose body removal, and also when the lesions was left untreated. Additionally, there was no significant difference with results of mosaicplasty. Significantly the worst results in subjective evaluation we observed in marrow-stimulating procedures. Probably the main reason was the patients' age. Older patients improved less than younger. This is comparable with results published by Steadman et al. (31).

CONCLUSIONS

Although some of results might appear to be general and simplified, nevertheless in our opinion this study, especially part concerning surgical treatment, confirms that management of isolated deep chondral lesions of the knee remains a questionable issue. The results of the subjective evaluation of treatment revealed that little invasive arthroscopic methods as well as using no surgical treatment even in grade 3 and 4 isolated chondral cartilage lesions may be effective and improve symptoms and knee function at mid-term follow-up. These data support the contention that still the natural history of cartilage lesions is unpr edictable and not well understood. Our findings also seem to reinforce observations from other studies (1, 21, 36), that qualification for treatment remains one of the most important problems – which lesion needs treatment, which does not. In our opinion, keeping in mind the Poehling's warning – "Cartilage, primum non nocere" (28), appropriate selection of patients for certain cartilage procedure, concerning different circumstances, should be performed to avoid bad and not-satisfactory results. There is need for further investigations to develop standardized algorithm for cartilage treatment.

ZÁVĚR

Výsledky studie se mohou jevit jako všeobecné a zjednodušující, avšak podle našeho názoru tato studie, a zejména její část zaměřená na operační léčbu potvrzuje, že ošetření izolovaných hlubokých chondrálních lézí kolenního kloubu je stále spornou otázkou. Výsledky subjektivního hodnocení léčby ukázaly, že mini-invazivní artroskopické metody stejně jako konzervativní léčba i v případě 3. až 4. stupně izolovaných lézí kloubní chrupavky mohou být účinné a přispět ke zlepšení funkce kolenního kloubu v rámci střednědobého sledování. Tyto údaje podporují tvrzení, že vznik chondrálních poranění není ještě stále uspokojivě vysvětlen. Naše poznatky podporují také zjištění jiných studií (1, 19, 32), že indikace k léčbě zůstává jednou z nejdůležitějších otázek z hlediska toho, zda léze vyžaduje léčbu či nikoli. Podle našeho názoru a s ohledem na varování Poehlinga – „cartilage, primum non nocere" (24) – operativní ošetření chrupavky u vybraných pacientů vede k eliminaci špatných a neuspokojivých výsledků. Není třeba provádět další studie pro vývoj standardizovaného algoritmu ošetření chrupavky.

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