Long-term results after operative treatment of osteochondritis dissecans of the knee joint—30 year results

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Abstract Osteochondritis dissecans (OD) mostly appears at the knee joint on the weight-bearing part of the medial femoral condyle. A multi-factorial event is most likely responsible for the triggering of OD. The aim of this retrospective study was to carry out long-term assessment of the results of operative treatment. Between 1959 and 1976, 148 patients were treated for OD by an open technique. For this purpose, a total number of 38 patients were analysed after approximately 30 years. Twenty-six patients were evaluated clinically by means of standardised questionnaires and also radiologically; 12 patients were analysed only by questionnaire. In order to verify the clinical findings and the subjective assessment, radiographs were done and analysed according the Kannus score. The Brückl score was used to evaluate the results of the OD. Twenty-four knee joints were analysed by radiographs. Sixty percent of the operated joints showed poor results in the analysis according to Kannus. Only four patients showed an excellent result by using the clinical scoring system. Nevertheless, we were able to prove a markedly higher rate of osteoarthritis. The causal explanation for this lies in the patient selection. Most of the patients were above average age, and the OD was discovered quite late, and thus the disease had already progressed to a higher degree. In 74% of all cases, an extirpation of the osteochondral fragment was performed, whereas today there are several operative options. In our

view, therefore, the need arises to conduct further follow-up examinations with comparative time spans, as well as to conduct a parallel analysis of corresponding control groups in order to evaluate the aetiology of the increased rate of osteoarthritis.

Résumé L'ostéochondrite disséquante (OD) est habituellement localisée, au niveau de l'articulation du genou, sur la surface portante du condyle médial, son déclenchement est souvent multifactoriel... Le but de cette étude rétrospective est d'évaluer à long terme le traitement. Entre 1959 et 1976, 148 patients ont été opérés d'une ostéochondrite disséquante par voie sanglante 38 patients ont été analysés après 30 ans d'évolution. Vingt-six patients ont été évalués cliniquement après un questionnaire standardisé et une radio; 12 patients ont été évalués simplement par questionnaire. Afin de vérifier les éléments cliniques et l'évaluation subjective, des radios ont été faites et analysées avec le score de Kannus. Le score de Brückl a été utilisé pour évaluer les résultats de l'ostéochondrite disséquante. Vingt-quatre genoux ont été analysés radiographiquement; 60% des genoux opérés montraient un mauvais résultat selon le score de Kannus. Seulement 4 patients ont montré un excellent résultat. Néanmoins, nous pouvons affirmer que ces patients présentent un taux important de gonarthrose. L'explication causale de ces résultats vient du choix des patients. La plupart des patients ont été diagnostiqués à un âge moyen élevé et, l'ostéochondrite découverte tard. Dans 74% des cas, l'ablation du séquestre a été réalisé alors qu'aujourd'hui les types de traitement sont multiples. Selon nous il est nécessaire, aujourd'hui, de conduire des études de suivi comparatives avec le groupe contrôle afin d'évaluer l'origine du devenir arthrosique.

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Introduction

The OD is a typical aseptic separation of an osteochondral fragment. Mostly, this change takes place in the area of convex joint parts, mainly at the knee joint. The aetiology, as of now, has not been explained [1]. This clinical picture was described for the first time by Paget [21]. In the year 1887, F. König [17] dealt particularly with this disease; he described it as osteochondrosis dissecans [3, 17]. An increased incidence of deformity in the sense of genu varum, valgum or recurvatum is a possible explanation for the development of OD [23]. This thesis is based on experimental analysis as well as pressure measurement at the joint surfaces [7]. Another important factor is micro-trauma [20]. After analysing the available literature, it appears that 40% of patients cite a trauma in the case history. Despite a relatively small rate of morbidity of 0.041–0.06%, OD is not a rare clinical picture in the orthopaedic practice. Mostly children and young adults are affected by OD, and the age limit lies between 10 and 40 years. Bläsius [4] found an appearance of OD in 41% of the cases between 11–20 years. A similar distribution was confirmed by Imhoff [15]. The symptoms are unspecific. In some cases there can even be an asymptomatic course. With increasing symptoms there will be effusions and synovitis after pain and locking. This increase in pain is based on the formation of a potential loose osteochondral fragment or a subsequent osteoarthritis [8]. The diagnosis is made by radiographs, CT or MRI scans or by means of bone scan [10, 20]. By means of arthroscopy, it is possible to view osteochondral fragment with the option of immediate therapy [25]. This is an invasive method with well-known complications and the danger of iatrogenic damage.

Today, there are several therapy options available. The indications depend upon the symptoms, size and location of the focus and the age and demands of the patient. Mostly the operative therapy is chosen in adolescence or adulthood. The detaching of the fragment is an indication for operation. The long-term aim is to avoid or to diminish osteoarthritis [3, 6, 12]. The rehabilitation program as well as the operative treatment are conducted differently in the

Fig. 1 Condyle distribution in right and left knees

Table 1 OP methods in examined (clinical and radiological) patients

	OP method	Absolute	%
0	Pridie drilling	0	0
1	Fixation of fragment	3	11.5
2	Fixation of fragment with removal of implant	2	7.7
	Subchondral spongiosaplasty	2	7.7
4	Removal of fragment	19	73.1
Sum		26	100

literature. Formerly, immobilisation was the therapy of choice, whereas today an early functional rehabilitation is preferred.

Materials and methods

Between 1959 and 1976, 148 patients underwent operations for OD at the Department of Orthopaedic Surgery at the University of Cologne. All patients were operated on by an open technique. The present address of the 118 patients was determined. For 30 patients, there was only incomplete information. The study was conducted with at least 38 available patients who received a questionnaire and a written invitation for follow-up. Twelve patients (eight male and four female) completed the questionnaire, and 26 patients were clinically and radiologically examined (20 male and six female). The localisation of the OD is shown in (Fig. 1).

The women were on average 22 years old and the male patients on average 24 years old. At follow-up, the women were on average 51 years old and the men 55 years old. The time between operative treatment and follow-up was on average 28 years (22–38). Preoperatively, the OD was classified according to Rodegerdts and Gleißner [22] by means of stage 0–5. The methods of treatment in the

Table 2 Score according to Kannus

Radiological parameters	Scoring
Osteophytes	0–3 (maximum $7 \times 3 = 21$)
Subchondral sclerosis	0–3 (maximum $5 \times 3 = 15$)
Flattening of femoral condyles	1. medial; 2. lateral 0–3 (maximum $2 \times 3 = 6$)
Subchondral cysts	0–6
Ligament calcification	0–3 (maximum $6 \times 3 = 18$)
Narrowing of joint spaces	0–12 (maximum $2 \times 12 = 24$)
Angular deformity	1. Valgus; 2. varus 0–10 (maximum $2 \times 10 = 20$)

Results: excellent (100 points); good (95–99 points); moderate (94–90 points); poor (<90 points)

Table 3 Score according to Brückl

Clinical parameters	Scoring
Pain	0–3
Endurance	0–3
Knee flexion	0–3
Knee extension	0–3
Others	0–2

Results: excellent (0–1 points); good (2–3 points); moderate (4–5 points); poor (>6 points)

patients who were clinically and radiologically examined are shown in (Table 1). The written questionnaire comprised pain, postoperative rehabilitation, respectively, stress strain, function, range of motion, orthopaedic devices and personal assessment. In the course of the clinical examination, the findings of the affected as well as the contralateral extremity were recorded. In order to verify the clinical findings and the subjective assessment, radiographs were taken and analysed according to the Kannus score [16] (Table 2). This score was applied in order to carry out a differentiated radiological analysis of the condition of the knee joint. The special focus was on the development of osteoarthritis. The score according to Brückl [5] (Table 3) as a specific score to evaluate the results of the OD at the knee joint was additionally used. For the result, 43% subjective and 57% objective criteria were used.

Results

By means of averaging the qualitative and quantitative information, the following table was determined (Fig. 2). Twenty-five percent of the unexamined and 12% of the examined patients were currently without pain. Sixteen patients showed a good or very good result with regards to subjective assessment, three patients moderate and seven patients a poor result. Figure 3 shows the distribution of OD according to the Rodegerts/Gleißner classification.

Fig. 2 Pain at the operated knee joint **Fig. 3** Distribution of OD

There were two patients with stage 2 OD, six patients with stage 4 and 17 patients with stage 5 with free dissection. Out of 26 patients, 24 knee joints were analysed by radiographs. Sixty percent of the operated joints showed a poor result in the analysis according to Kannus (Fig. 4). By using the score of Brückl, four patients showed an excellent result (Fig. 5). Another five patients received the rating good, eight moderate and the other nine patients poor.

Discussion

In the literature, there are several studies dealing with OD of the knee joint up to five years postoperatively. However, there are very few that report the long-term results with a treated OD of a minimum of ten years. Venbrocks [24] reports results of conservative and operative therapy after three years. An observation span from 0–15 years is provided by further working groups [9, 11, 13, 21, 22]. A long-term study by Anderson [2] comprises a time span of 2–20 years. The longest postoperative follow-up term took place in a study by Havulinna [14] after 10–34 years. In our study, a follow-up of OD was conducted postoperatively on average after 28 years (22–38). In the examined group, there were 20 men and six women. If the patients who only filled in the questionnaire are added to this, there are 28 men and ten women, which equals a ratio of 2.8 to 1. This information coincides with the literature. In a multicentric

Fig. 4 Score according to Kannus

Fig. 5 Score according to Brückl

study by the European Society for Childrens' Orthopaedics, the ratio was 2:1 in 798 cases [9, 19]. We were unable to ascertain a marked side difference. In the literature, the occurrence in the right knee joint is described frequently [24]. The prevalence occurring in the medial condyle is also consistent with our results [7–9, 11, 15]. New findings on the aetiology of the development of OD could not be found. Whether the condition develops in early childhood as suggested in the literature, could not be ascertained by direct questioning [23]. After consulting the literature, there was no comparable study that examined patients with an OD after 28 years in terms of the development of osteoarthritis of the knee joint. An important assessment criterion for the success of operative treatment is the incidence of osteoarthritis. Many authors found markedly better results with children and adolescents, whereas the course with adults led markedly more to arthrosis [1, 5, 9, 15]. In 1992, Imhoff [15] showed a significant difference between the group under 16 years old as opposed to the group over 16 years old, independent of the stage of OD at the time of diagnosis, the localisation or the size of the fragment. At the time of diagnosis, there was only one patient with a juvenile form of OD in our patient group. All others were operated on after closure of the epiphysial plate at the minimum age of 16 years. In Kannus's analysis [16], no patient achieved 100%. We found that in 92% there was a radiologically proven osteoarthritis after 28 years. In comparison with other studies, the development of osteoarthritis was markedly higher in our patient group. Funke [11] was able to document an excellent result in 81%. This is also shown by further studies [6–8]. A direct comparison of development of osteoarthritis from the operated to the non-operated knee was not found in the literature. Our examinations showed that compared to the affected side, the opposite knee proved to have an excellent to good result in over 60% in the radiological analysis. This corroborates the results of the retrospective long-term analysis of Linden [18].

In conclusion, long-term follow-up of the operative treatment of OD shows considerably worse results than those reported in the literature. We only found an excellent to good clinical result in only 35% of the operated cases, as

opposed to average clinical results of 71% in the known literature. With 92%, the rate of osteoarthritis in this patient group is very high. In comparison, the rate of osteoarthritis in the current literature is 42%. However, the shorter time span of observation has to be considered in comparing the literature. It remains to be seen if these results lead to an improvement of the operative treatment of OD and if the clinical results can positively influence the development of osteoarthritis. The study probes the importance of early detection of OD in order to avoid the stage of a loose osteochondral fragment. Long-term outcome studies of modern operative techniques for treatment of OD have to prove that they can prevent the development of osteoarthritis in these patients.

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