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Original article

Return to sports after autogenous osteochondral mosaicplasty of the femoral condyles: 25 cases at a mean follow-up of 9 years

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ABSTRACT

Introduction: Autogenous osteochondral mosaicplasty is the most common cartilage restoration technique in standard clinical practice. The purpose of this study was to evaluate the return to sports 9 years after mosaicplasty of the femoral condyles.
Hypothesis: The long-term results of an osteochondral autograft show that patients can regain their pre-injury activity level.
Material and methods: This study is based on a series of 25 patients with a mean age of 28.9 years (range, 16–44 years) who had stage 3 or 4 chondral lesions of the femoral condyles (according to the ICRS or ICRS-OCD scores). The origin of the lesion was osteochondritis dissecans (13 knees), osteochondral fracture sequelae (ten knees), or aseptic osteonecrosis (two knees). The average size of the lesion was $2.11 \pm 0.9\,cm^2$. Ten patients (40%) had an associated procedure during the osteochondral autograft. The patients were assessed clinically (IKDC and Lysholm-Tegner scores) and radiographically by a reviewer independent of the team of operators.
Results: All patients were re-examined at a mean follow-up of 9 years (range, 6–15 years), with 84% satisfied or very satisfied with the procedure. The average IKDC was 74.5 ± 18.5 points. The average Lysholm score was 87.3 ± 11.6 points. The average Tegner score ranged from 6.35 ± 1.53 points prior to surgery to 5.60 ± 1.64 points after surgery ($P = 0.001$). The average loss was 0.64 points for patients whose presurgery Tegner score was greater than or equal to 7 ($P = 0.019$) and 0.3 points if lower than 7. The radiologic evaluation of 21 patients showed complete osteointegration of the grafts in 90% of cases.
Conclusion: The results of the femoral condyle mosaic autografts are satisfactory, a mean of 9 years after surgery. The most active patients lowered their activity level while the more sedentary did not have to adapt their lifestyle.
Level of evidence: Level IV, retrospective study.

1. Introduction

Chondral and osteochondral lesions are frequent pathologies [1]. These lesions must be treated in young subjects with a high level of physical activity who experience pain, effusion, or locking knee. Improving on the traditional techniques such as debridement, microfractures or Pridie perforations [2,3], osteochondral autografting has been increasingly used since the 1990s, when the Matsusue surgical technique was disseminated by Hangody et al. [4–7].

The results obtained in terms of pain, effusion and activity level over the short and intermediate term with the addition of hyalin cartilage at the lesion site are much better than the fibrous scar tissue obtained with the above-cited traditional techniques [8,9].

Other cartilage reconstruction techniques exist such as autologous chondrocyte implantation (ACI), with or without a matrix, or patches, which seem to provide very encouraging results [9–15]. Bentley et al. compared mosaicplasty and ACI [16]. However, in December 2010, the French National Health Authority did not conclude that there was sufficient therapeutic advantage for it to be included in article L. 162-1-7 of the Social Security Code. ACI cannot currently be used in France. In their work for the *Société Française d'Arthroscopie*, Versier and Dubrana [17] provided a decisional tree for management of cartilage lesions in which mosaicplasty is recommended for lesions measuring 1–4 cm^2 in a load-bearing area. ACI or massive autologous grafting are therapeutic solutions designed for surface lesions greater than those studied in this series. Autogenous osteochondral grafting has the advantage of being a surgical technique performed in a single procedure, is moderate in

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cost, and is therefore the most accessible therapeutic solution for cartilage restoration in routine clinical practice [9,15].

Few studies have examined the long-term results of knee mosaicplasty [18–20]. The objective of this study was to assess the results at a mean of 9 years of follow-up in a continuous series of patients operated between 2001 and 2008. The main objective of the study was to evaluate the level of return to physical and sports activities at a minimum of 5 years of follow-up after a femoral condyle mosaicplasty. The secondary objective of the study was to search for any correlation between the degree of recuperation and the pre-injury level of activity.

We hypothesized that the long-term result of autogenous osteochondral grafting would allow the patient to return to the pre-injury level of physical and sports activity.

2. Material and methods

2.1. The series

This retrospective single-center study's included patient having undergone autogenous osteochondral graft surgery of the knee femoral condyles more than 5 years before, without regard to etiology. The exclusion criteria radiologically demonstrated osteoarthritis or the presence of kissing lesions on MRI, arthro-CT, or arthroscopy. Twenty-nine patients were included.

At the last follow-up, 25 patients (six females and 19 males) whose mean age was 28.9 ± 9.04 years (range, 16–44 years) were reviewed. The chondral lesions were stage 3 or 4 according to the International Cartilage Repair Society (ICRS) or International Cartilage Repair Society Osteochondritis Dissecans (ICRS-OCD) Scores [21], involving the medial condyle (20 cases) or the lateral condyle (five cases). The radiological location of the injured area was determined using a hybrid classification combining the Cahill and Berg classification [22] on the AP x-ray and the Harding classification [23] on the lateral x-ray. The lesions stemmed from osteochondritis dissecans ($n = 13$), osteochondral fracture sequelae ($n = 10$), or aseptic osteonecrosis ($n = 2$). The mean surface of the lesion measured intraoperatively was 2.11 cm^2 ± 0.9 cm^2 (range, 0.9–3 cm^2). Thirteen patients out of 25 had already undergone surgery on the same knee (Table 1), including two to treat the osteochondral lesion (repositioning of the osteochondral fragment and curettage of the lesion).

2.2. Surgical technique

All surgeries were performed by two senior surgeons. All the surgical interventions began with arthroscopy, with ablation of any foreign bodies and precise localization of the lesion.

One patient underwent the complete procedure with arthroscopy. All the others had a mini-arthrotomy after the arthroscopic phase. The surgical technique was identical to the one described by Hangody et al. [4], and the ancillary instrumentation used was Mosaicplasty (Smith and Nephew). Once all the grafts had been placed, the regularity of the new joint surface was checked by palpation and mobilization of the knee (Fig. 1), looking for mobilization with no impingement.

All plugs harvested measured between 20 and 25 mm in depth. In all cases, the plugs were taken in the same knee as the lesion in the following order: medial side of the trochlea, then the lateral side, and finally the intercondylar notch. A mean of four plugs (range, 1–10) were harvested per knee (Fig. 2). At the beginning of the experiment, the tendency was to harvest small plugs (4.5 mm and 3.5 mm in diameter). For patients with a shorter follow-up, the plugs harvested were 6.5 mm in diameter. The objective of the cartilage repair was to cover at least 70% of the cartilage loss in the load-bearing area [6]. The percentage of coverage estimated intraoperatively was 70 ± 6.9%. The objective of 70% coverage of the injured surface was achieved in 96% of the cases.

Fig. 1. Final aspect after grafting four plugs 6.5 mm in diameter.

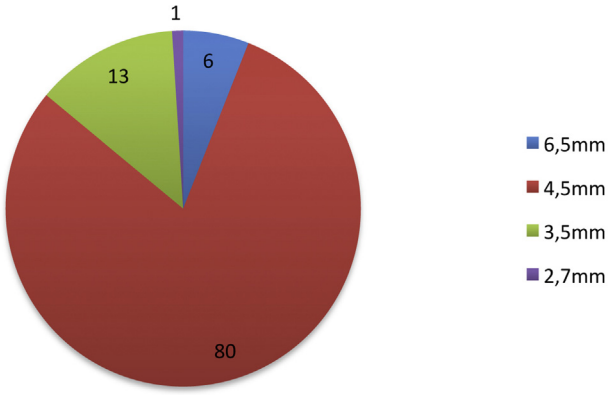

Fig. 2. Distribution of grafts implanted according to diameter.

Ten patients (40%) underwent an associated procedure during the autogenous osteochondral graft (Table 1). When axial deformation exceeded 5° varus or valgus, a realignment osteotomy was performed (four osteotomies). The objective of realignment was hypercorrection between 0 and 4°, obtained in all cases.

2.3. Recovery

Postoperative rehabilitation comprised immediate joint mobilization with the amplitude limited to pain-free mobility. Weightbearing was forbidden for 45 days, with progressive return to weightbearing after this time. Joint acclimatization (swimming and cycling) was recommended for 2.5 months, running at 4 months, and return to all activities at 6 months.

2.4. Assessment

All patients were assessed by an independent observer; 20 patients were seen in consultation and five were contacted by telephone. The evaluation included a clinical examination and a subjective evaluation using the International Knee Documentation