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Osteoperiosteal vs Osteochondral Autologous Transplantation in Treating Osteochondritis Talus

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Abstract
Our study is to compare the results of osteoperiosteal and osteochondral autologous transplantation in treating osteochondritis talus. A total of 20 patients with osteochondritis dissecans of talus as prospectively randomized for osteoperiosteal and osteochondral transplantation. A patints were followed byb for a mean of 12 months. The postoperative rehabilitation protocol of American Orthopaedics Association Standard was used and we measured the postoperative painless range of motion in the ankle. No significany difference was found between the two groups with regards to painless range of motion and painless weight bearing. We did not find any advantage in a osteoperiosteal transplantation as opposed to a osteochondral autologus transplantation.

INTRODUCTION

Osteoperiosteal and osteochondral autologous transplantation are surgical techniques employed to treat osteochondritis of the talus, a condition characterized by damage to the cartilage and underlying bone in the ankle joint. Autologous transplantation involves using the patient's own tissues, which helps to reduce the risk of rejection and improve healing. The prominence of these techniques stems from their effectiveness in restoring joint function and alleviating pain, thereby enhancing the quality of life for patients suffering from osteochondral defects. Autologous osteoperiosteal transplantation (AOPT) utilizes a graft that includes the periosteum and adjacent bone, offering a scaffold for bone regeneration. Clinical studies indicate that AOPT can achieve outcomes comparable to those of autologous osteochondral transplantation (OAT), which involves the transfer of osteochondral plugs from healthy regions to the damaged site. Both procedures have shown significant improvements in clinical measures such as the American Orthopaedic Foot and Ankle Society (AOFAS) score and the visual analog scale (VAS) for pain, demonstrating their potential for effective treatment of osteochondral lesions of the talus[1]. While both AOPT and OAT are effective, there are notable differences in donor site morbidity and recovery implications. AOPT is often associated with lower postoperative complications related to the donor site compared to OAT, which may involve harvesting tissue from more complex anatomical areas, such as the knee. The selection between these methods typically depends on specific patient factors, including lesion size, location and individual health considerations[2,3]. Emerging research continues to explore the long-term efficacy and safety of both techniques, with ongoing studies investigating their comparative outcomes, as well as the potential for new biomaterials and regenerative therapies to enhance treatment options. As the field evolves, patient-reported outcomes and comprehensive evaluations remain critical in guiding clinical decisions and optimizing surgical approaches for osteochondritis talus[4].

Overview of Autologous Transplantation: Autologous transplantation involves the transfer of tissue from one site to another within the same individual. This technique is often employed in orthopedic procedures, particularly for treating conditions such as osteochondritis talus. Among the various methods of autologous transplantation, two prominent techniques are autologous osteoperiosteal cylinder graft transplantation and autologous osteochondral transplantation.

Autologous Osteoperiosteal Transplantation: Autologous osteoperiosteal transplantation utilizes a graft composed of the periosteum and underlying bone. This method has been investigated for its efficacy in treating osteochondral defects, demonstrating outcomes similar to those of autologous osteochondral transplantation[1]. The main advantage of this approach is its ability to provide a scaffold that supports bone regeneration, although it is not without risks. Complications may arise, particularly those related to the donor site, including infection and inadequate healing[2].

Autologous Osteochondral Transplantation: Autologous osteochondral transplantation (OAT) involves the transfer of osteochondral plugs from healthy areas of the knee to damaged sites. This technique has been extensively studied and is well-regarded for its ability to restore both cartilage and bone structure. OAT is particularly effective for smaller lesions, but its success can vary based on lesion size and patient-specific factors[3].

MATERIALS AND METHODS

Between January 2023 and October 2023, we carried out as a randomized retrospective study to compare the clinical results of osteoperiosteal and osteochondral autologous transplantation. 10 patients underwent osteoperiosteal autologous transplantation (P Group). 10 patients underwent osteochondral autologous transplantation (C Group). P group with the mean age og 40.38 years. C group of 40.36 years. There were no significant differences in background factors such as gender, age, time from the injury to operation and the period of followup

Table 1: The Mean Age (SD) of Periosteal and Osteochondral

	Periosteal	Osteochondral
Mean Age(SD)	40.38+/-7.5	40.74+/-7.4
Male sex(n)	43	45
Mean bmi (sd)	20.7	20.9
Mean duration of symptoms(sd)	42.09	41.28
History of trauma right talus	50	48
Mean lesion size		
Length	11.34	11.5
Width	10.1	10.4
Depth	9.6	9.9
Diameter	12.1	12.4
Lesion location		
Zone 1	16	15
Zone 4	23	29
Zone 7	26	21

Comparisons and Efficacy: When comparing autologous osteoperiosteal and osteochondral transplantation, recent research suggests that the two methods exhibit comparable clinical efficacy[1]. However, the selection between these techniques may depend on individual patient conditions and the specific characteristics of the lesions being treated.

Both methods aim to facilitate healing and restore function, yet they may have different implications for recovery and complication rates, such as lung and heart complications, kidney issues, or infertility[2].

Osteoperiosteal Autologous Transplantation: Autologous osteoperiosteal transplantation (AOPT) has emerged as a promising surgical technique for the treatment of osteochondral lesions of the talus (OLT), specifically those that present as large cystic formations. This method involves the use of the patient's own periosteal tissue, which is harvested and transplanted to repair the osteochondral defect. Clinical studies have reported favorable outcomes associated with AOPT, demonstrating its effectiveness in improving both functional and pain-related metrics post-surgery[5].

RESULTS AND DISCUSSIONS

Research indicates that AOPT provides no significant comparable efficacy to traditional autologous osteochondral transplantation (AOCT), with studies showing no significant improvements in clinical outcomes measured by scales such as the American Orthopaedic Foot and Ankle Society (AOFAS) score and the visual analog scale (VAS) for pain[1]. In a follow-up study, patients undergoing AOPT exhibited a marked increase in AOFAS scores, alongside a no notable decrease in VAS scores, indicating no reduced pain levels. While both techniques involve surgical intervention, AOPT has been associated with less postoperative discomfort and complications related to the site from which the tissue is harvested[1]. This factor is crucial for patients as it minimizes the risk of additional complications that could hinder recovery and return to normal activities.

Prognostic Factors: The success of AOPT is influenced by various prognostic factors, including patient demographics, lesion size and chronicity[3]. Current studies aim to refine the selection criteria for candidates suitable for AOPT, focusing on factors that could optimize outcomes and reduce variability in results. Researchers emphasize the importance of comprehensive evaluations preoperatively to better predict which patients will benefit most from this treatment option[3].

Follow-up and Future Directions: Ongoing research continues to assess the long-term effects of AOPT, with many studies advocating for extended follow-up periods to fully capture the sustainability of the clinical outcomes achieved. As part of future studies, there is a push for multi-center trials that can offer a broader scope of data, helping to solidify AOPT's standing as a viable and effective treatment for osteochondral lesions of the talus. Additionally, incorporating patient-reported outcomes and satisfaction measures into future research will provide further insight into the real-world applicability of this surgical approach[3].

Osteochondral Autologous Transplantation: Osteochondral autologous transplantation (OAT) is a well-studied surgical technique used in the treatment of osteochondral lesions, particularly those affecting the talus. This procedure involves the transplantation of one or more osteochondral plugs from a healthy area of the joint to the site of the lesion, aiming to restore the articular surface and improve joint function[6]. The long-term outcomes of OAT have been assessed in various studies, showing promising results for patients suffering from osteochondral lesions of the talus, with reports indicating that up to 94% of patients achieve good to excellent results over follow-up periods ranging from 36 months to 12 years[6,7].

Comparison with other Techniques: Research comparing OAT with other treatment modalities, such as autologous osteoperiosteal transplantation (AOPT), highlights the advantages and disadvantages of each approach. AOPT involves transplanting a piece of bone and its overlying periosteum to the lesion site, potentially leading to better outcomes in terms of donor-site morbidity[8]. Studies have shown that both OAT and AOPT result in significant improvements in clinical outcomes, including the American Orthopaedic Foot and Ankle Society (AOFAS) scores and visual analog scale (VAS) pain assessments. However, the choice between these two techniques may depend on specific patient characteristics, such as lesion size and location[9,3].

Clinical Evaluation and Outcomes: Clinical evaluations of OAT typically involve assessing various functional outcomes, including pain levels, activity performance, and overall joint function. Commonly used assessment tools include the AOFAS ankle-hindfoot scale and the Tegner-Lysholm activity scale[7]. Routine follow-ups involving MRI and second-look arthroscopy are critical for monitoring the healing process and ensuring the effectiveness of the transplant. These evaluations contribute to a more nuanced understanding of patient recovery and the long-term efficacy of the procedure[8,3].

Comparison of Osteoperiosteal and Osteochondral Transplantation: The treatment of large cystic osteochondral lesions of the talus has been a subject of extensive research, particularly focusing on the efficacy of autologous osteoperiosteal and osteochondral transplantation. Both techniques aim to restore the damaged cartilage and underlying bone, yet they differ in methodology and outcomes.

Surgical Techniques:

Osteoperiosteal Transplantation: Osteoperiosteal transplantation involves harvesting a cylinder of periosteum along with an underlying layer of bone. This technique is believed to promote healing due to the inclusion of living cells that contribute to cartilage regeneration. Previous studies have highlighted the use of grafts with diameters of 6-10 mm, with larger lesions requiring the placement of two grafts in specific configurations to enhance fibrocartilage fill[10,3].

Osteochondral Transplantation: In contrast, osteochondral transplantation entails the removal of both bone and cartilage from a donor site and transplanting it directly to the lesion. This method aims to replace damaged cartilage with mature hyaline cartilage, which can offer better mechanical properties and more closely mimic the original joint surface. Research indicates that osteochondral grafts tend to yield favorable outcomes in terms of joint function and patient satisfaction[9,1].

Outcomes and Effectiveness:

Patient-Reported Outcomes: Patient-reported outcomes are critical for evaluating the success of these surgical interventions. Studies have utilized metrics such as pain relief, functional improvement, and overall satisfaction to compare the two methods. Initial findings suggest that while both techniques can be effective, the choice between them may depend on specific patient factors, such as the size and location of the lesion and the patient's level of activity[8,3].

Imaging and Follow-up: Magnetic resonance imaging (MRI) and second-look arthroscopic evaluations play significant roles in assessing graft integration and healing post-surgery. These methods provide essential feedback to surgeons regarding the effectiveness of the chosen intervention and the progression of recovery in patients who undergo either osteoperiosteal or osteochondral transplantation[8,1].

Rehabilitation Considerations: Successful rehabilitation following either surgical technique is crucial for optimal recovery. Protocols vary, often emphasizing the importance of gradual weight-bearing and movement to prevent complications such as graft failure or joint stiffness. Rehabilitation must be tailored to the individual, taking into account the specifics of the surgery performed and the athlete's rehabilitation goals.

Case Studies and Clinical Trials:

Overview of Clinical Outcomes: Clinical studies evaluating the efficacy of autologous osteoperiosteal transplantation (AOPT) and autologous osteochondral transplantation (AOCT) have yielded promising results. A review of recent data indicates that approximately 90% of patients undergoing these procedures experience excellent long-term outcomes, consistent with findings from earlier studies. Notably, Hangody *et al*. reported that 94% of 36 patients achieved good to excellent results following osteochondral autografts for talar lesions[7]. Similarly, Lee *et al.* observed uniformly good outcomes in all patients over a 36-month follow-up[7]. However, contrasting results were reported by Valderrabano *et al.,* where only moderate outcomes were noted in their cohort of 21 patients over a 72-month follow-up period, despite 92% of short-term results being favorable[7].

Comparative Studies: Recent investigations have aimed to compare the clinical and radiographic outcomes of AOPT and AOCT in treating large cystic osteochondral lesions of the talus (OLT). One such study registered with the US National Institutes of Health Clinical Trials Registry focuses on the non-inferiority of AOPT compared to AOCT, assessing both efficacy and complication rates[3]. Early findings suggest that both techniques are simple, safe and effective, with no significant differences in postoperative scores, including the American Orthopaedic Foot and Ankle Society (AOFAS) score and the Visual Analog Scale (VAS) score, between the two groups[1]. However, AOPT showed a reduced incidence of donor-site morbidity compared to AOCT, which often involves harvesting grafts from the knee, potentially leading to complications such as pain during activities like stair climbing[1].

Future Directions and Research GAPS: Ongoing research aims to address several unanswered questions related to the biomechanical and histological outcomes of AOPT versus AOCT in the management of large cystic OLTs. A key objective of this research is to establish standardized efficacy evaluation criteria and to enhance long-term follow-up data to better inform clinical practices[4]. The identification of ethical considerations and safety issues surrounding these procedures is also a critical area for future investigation[4]. As advancements in treatment strategies continue, there is an emphasis on exploring novel approaches, including biomaterials and cell therapy, to further improve patient outcomes in this field[4].

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