

Comparison of medium-period outcomes of allografts and autografts used in repair of bone defects in patients who were treated in our department due to skeletal system tumors

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Abstract

Objective: In orthopaedic oncology, reconstruction with autograft or allograft of bone defects which develop following tumor resection or curettage is a commonly used method. Bone generally has the ability to regenerate completely but requires a very small fracture space or some sort of scaffold to do so. Successful results of allografts or autograft in reconstruction of bone defect after tumor resection encouraged its utilization in post-traumatic defects. In this study, prospective representation of clinical and radiological medium-period outcomes of used autografts and allografts is aimed.

Materials and Methods: 45 patients who were treated, for whom reconstruction was performed by using allograft or autograft following tumor excision or curettage between the years 2005-2015 in Inonu University Faculty of Medicine were included in the study. Patients were evaluated in regard to age, gender, tumor localization and union. Obtained data were analyzed by SPSS software version 15.0

Results: During follow-ups of the patients; union was radiologically observed in an average of 6.1 months in 43 (91%) patients (in 21 autografts it was 5.8 months, in 22 allografts it was 6.5 months). Nonunion occurred in 2 (9%) patients. No statistically significant difference was determined between groups with allografts and autografts ($P>0.05$).

Conclusion: No difference was determined between use of either autogenous or allogeneous grafts in segmental or cavitary bone defects, and reconstruction is a method with high success.

Keywords: Allograft; Autograft; Bone Tumors.

INTRODUCTION

Grafting in orthopaedic surgery is used generally for treating bone defects which develop during reconstructive procedures following musculoskeletal system tumor surgery, as well as for trauma, bone infections, congenital abnormalities and revision arthroplastic surgery (1, 2).

As bone grafts; autografts and allografts are used most commonly. Grafting materials used may possess one or more of osteoingrative, osteogenetic, osteoconductive or osteoinductive features (3). Graft which is grafted from one localization to another one on the same

individual is called autograft, whereas allograft or allogeneic graft is the tissue transfer performed between individuals who are genetically different, but of the same species (4). Bone loss is commonly encountered following resection, curettage, osteolysis or infection of bone tumors (5, 6).

Use of adjuvant treatments have been gradually increasing owing to technology-assisted tumor imaging, and extremity-preserving surgical applications have become more common and reconstruction of defects with grafts have been becoming widespread. Autogenous bone graft was initially used as reconstruction with fibula during resection of radius with tumor (7, 8). Although there is an opinion that autogenous bone grafts lead to better outcomes compared to allografts, it has been supported by many studies that allografts lead to results as better as autogenous grafts do (8-10). Lack of donor site morbidity, possibility of supply with different lengths and unlimited resource are among recognized advantages of use of allografts. The aim of this study, patients for whom autogenous or allogeneous grafting was performed for reconstruction of bone defects formed in orthopaedic oncology were evaluated (Figure 1).

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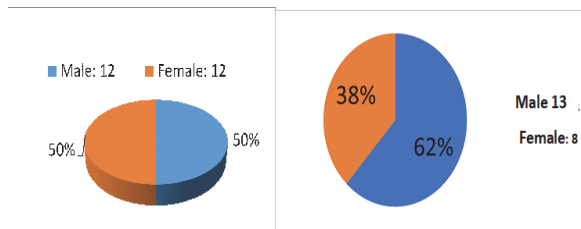


Figure 1. Distribution of patients for whom allograft and autograft were performed.

MATERIALS and METHODS

After the approval of ethics committee number 2017/1-6 from Inonu University Committee on Scientific Research and Publication Ethics was obtained for this study, 45 (25 male, 20 female, median age: 34,50; min-max: 9-60) who were operated in our department due to oncological reasons between the years 2005-2015 were examined. For defects of the patients, reconstruction by using autogenous or allogeneous bone graft was performed. Allograft was used for 24 of the patients and autograft was used for 21 of the patients. Lesions of the patients (median age 34,1; min-max 9-60) for whom allograft was used were in various anatomical localizations from humerus to phalanges, and all were benign cavitory lesions. All of the allografts used in the surgery were first frozen and then dried. All were first kept within Ringer Lactate solution under room temperature and then applied (Figures 2, 3).

Iliac wing and metaphysis of radial distal edge were used as graft resources in 21 (median age: 34,76; min-max 18-60) for whom autograft was applied. Types of lesions were benign cavitory lesions, with simple bone cysts being the most common (Figure 4, 5).

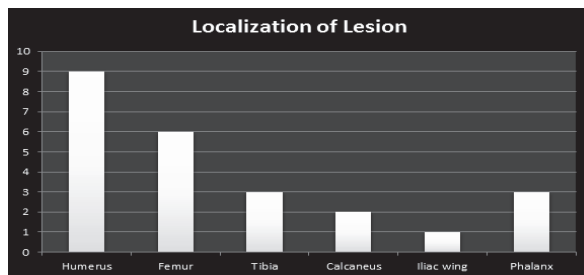


Figure 2. Localizations in patients for whom allograft was applied

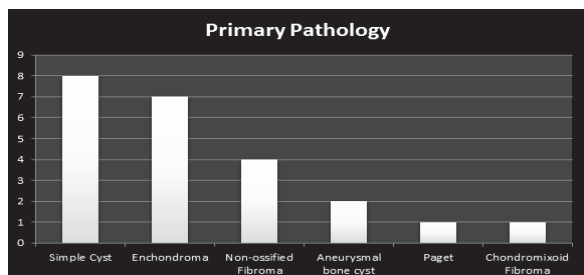


Figure 3. Number of patients, for whom allograft was applied, with primary pathology

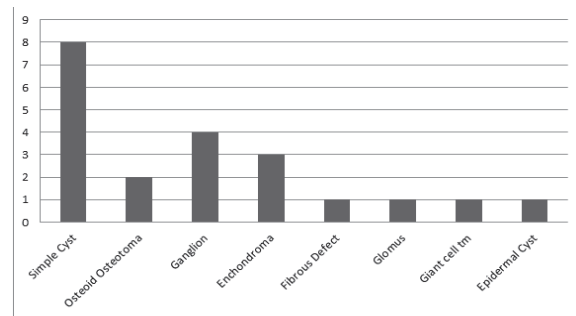


Figure 4. Patients with primary pathology in patients for whom autograft was applied

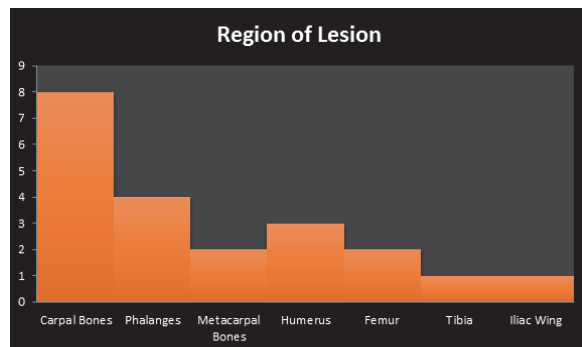


Figure 5. Frequencies of localizations of lesions in patients for whom autograft was applied

24 allografts and 21 autografts which were applied for 45 patients (25 male, 20 female; median age 34,50 ; min-max: 9-60) for which the follow-up duration was determined to be at least twelve months were evaluated. All of the defects were cavitory. Information concerning age, gender, pathological diagnosis, anatomical localization and complications was obtained by examination of files and graphs of the patients. Mean follow-up duration was 21 months (18.2 months in allograft group, 22.3 months in autograft group). Obtained data were evaluated in SPSS 15.0 program by using Mann-Whitney U-test and chi-square test.

RESULTS

During follow-ups of the patients; union was radiologically observed in an average of 6.1 months in 43 (91%) patients (5.8 months in 21 autografts, 6.5 months in 22 allografts). Nonunion occurred in 2 (9%) patients. No statistically significant difference was determined between both groups for which allografts and autografts were applied ($P > 0.05$). For these two patients which had persistent cavitory lesion until 1st year after application of allograft, allograft was re-applied in the second surgery and union was obtained. Infections did not occur in any of the patients as a complication.

DISCUSSION

Use of an autograft is grafting of osteogenic bone and bone marrow cells, osteoconductive collagen and mineral matrix, and matrix proteins and osteoinductive matrix proteins within the autogenous cancellous bone

to another site. In the studies conducted, it has been revealed that primitive osteogenic cells transform into osteoblasts after autografting (9).

As a resource for an autograft; autogenous cancellous bone graft can be obtained from iliac wing, radial distal end, tibia and parts of other bones, with iliac wing and radial distal end being the preceding ones (10-13). Morbidities regarding iliac wing, which is the most common site where a graft is obtained, are commonly encountered. Major complications have been reported to be 8.6% (14). Being able to obtain limited amount in autografting may pose a problem compared to allograft in regard to its use (15).

Negative aspects of the technique for the patients are that it may lengthen the duration of surgery, it is hard to be prepared in appropriate shape and size and it may leave a surgical scar in the site where the graft is obtained.

Allografts include a chemical area to which progenitor cells and endothelial cells are attached, as well as growth factors within the free bone matrix (16). Demineralization enhances bioavailability of the growth factors within the allograft bone matrix. Additionally, transmission of HIV infection is also prevented via the demineralization performed (17).

Risk of transmission of immunogenic antigens and viral diseases is reduced by washing steps during modern procedures of allograft bone obtaining.

In the retrospective study conducted by Tomford and colleagues of 303 cases for which dried and frozen allografts were applied, they determined bacterial infection with a rate of 6.9% (18).

Much more extremity-preserving surgeries are being performed with aid of advancements in diagnosis, evaluation and treatment of musculoskeletal system tumors, and, thus, the need for reconstruction with grafts exactly similar to the bone tissue has arisen for reconstruction of the developed defect in order to obtain satisfactory functional outcomes

In our study, cavitory defects which developed following orthopaedic oncological surgeries were reconstructed with allografts and autografts.

In our study, whereas graft infection and breakage were observed in none of the groups, it was determined that cavitory region, which may have been considered as recurrence, was not filling in two patients and one case in which union could not be achieved was detected. Some of the patients required fixation along with bone grafting. Painless functional outcomes were obtained in all of the patients.

In regard to filling of cystic cavities, union rates were determined to be similar between autograft (47%) and allograft (53%) groups. In conclusion, autografts or allografts can be used with the same success rates in

reconstruction of defects which develop following tumor resection or curettage in orthopaedic oncology.

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