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Bone grafts versus synthetic bone substitutes in the treatment of benign bone tumors

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Abstract

Benign bone tumors represent an important chapter in the pathology of the musculoskeletal system, most commonly affecting young people under the age of 30. The most common benign bone tumors diagnosed in orthopedic surgery are: osteochondroma, osteoid osteoma, osteoblastoma, giant cell tumor, bone aneurysmal cyst, and fibrous dysplasia. An important feature is the lack of secondary determinations.

Depending on the type and the location of the benign bone tumors, treatment can be non-surgical or surgical.

Patients included in the study were between 25 and 55 years old with an average age of 40.

In both cases, the radiological image remains the routine investigation in the periodic postoperative control.

The purpose of this study was to compare the surgical treatment (curettage-filling) with synthetic bone substitute, compared to autograft in patients with benign bone tumors.

Keywords: synthetic bone substitute, autograft, benign tumors, bone, treatment

Introduction

Benign bone tumors represent an important chapter in the pathology of the musculoskeletal system, most commonly affecting young people under the age of 30 [1]. The most important clinical criteria essential for the diagnosis are age, sex, and location [2].

At the same time, the most common benign bone tumors diagnosed in orthopedic

surgery are: osteochondroma, osteoid osteoma, osteoblastoma, giant cell tumor, bone aneurysmal cyst, fibrous dysplasia [3]. An important feature is the lack of secondary determinations [1].

Depending on the type and the location of benign bone tumors, the treatment can be non-surgical or surgical [2].

In some cases, the treatment consists of "watchful waiting", but if the patients present

persistent pain, surgical treatment is decided [4].

The main objective of the surgical treatment is to restore the local anatomy, reduce pain and restore limb.

Bone grafts have an important role in the treatment of bone defects caused by tumors, infections, trauma, and prosthetic revision surgery [5-7].

In current practice, in orthopedics, the filling of bone defects is done with the help of autografts or synthetic bone substitute.

Autografts are considered the “gold standard” in terms of grafting materials, due to the properties of osteogenesis, osteoinduction and osteoconduction [6,8], but also has some disadvantages: increased risk of infection, performing a new surgical incision.

The synthetic bone substitute is an alternative to autografts, but it needs to have three important characteristics: biocompatibility, osteoconduction and osseointegration. Synthetic materials that have these characteristics are made of calcium, silicone, or aluminum [9,10].

The purpose of this study was to compare the surgical treatment (curettage-filling) with

the synthetic bone substitute, compared to autograft in patients with benign bone tumors.

Materials and methods

Retrospective cohort study that included 18 patients, over a period of 3 years (2019-2021). Patients were admitted and treated in the Division of Trauma and Orthopaedic Surgery of Bucharest University Emergency Hospital.

From January 2019 until December 2021, all patients within this study, who had benign bone tumors, both in the upper and lower limb, were surgically treated by curettage and filling.

The filling of the bone defects was performed with synthetic bone substitute or autograft according to the surgeon’s indications, the patient’s preferences, and the size of the remaining defect.

The patients were divided into two categories as follows: in the first group, there were 12 patients in whom the filling technique was performed with synthetic bone substitute, and the second group included 6 patients in whom the filling technique was performed by autograft (Fig. 1).

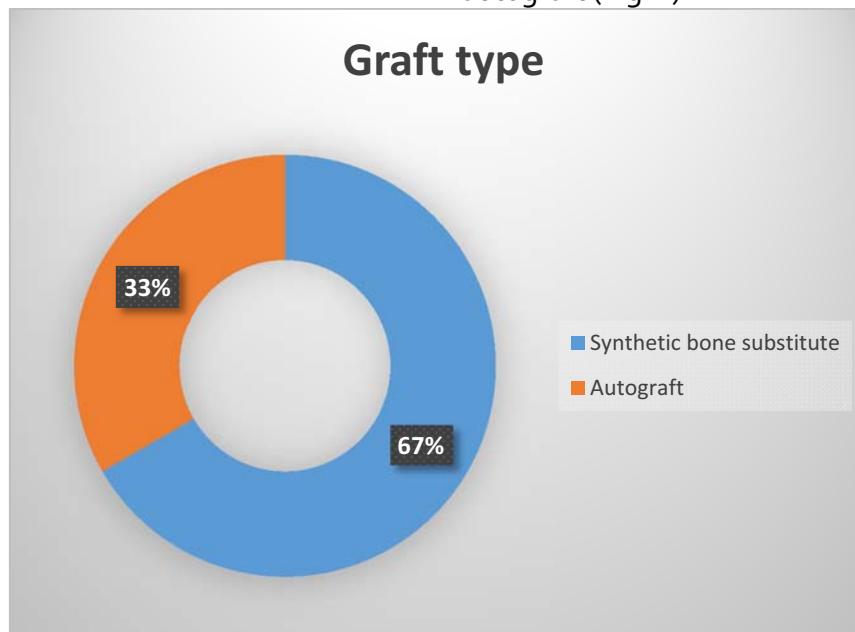


Fig. 1 Distribution by groups according to the type of the graft

Patients were evaluated, both pre- and post-operatively by clinical and imaging examination, with antero-posterior and profile radiographs and CT scans (Fig. 2,3).



Fig. 2 Preoperative radiographs



Fig. 3 Autograft filling (left) and filling with synthetic bone substitute and reinforcement (right)

Patients who did not show up for regular check-ups were excluded from the study.

During the evaluations, both during the hospitalization period and during the periodic controls, possible local complications were looked for in both groups.

Patients were evaluated postoperatively, at 6 weeks, 3 months, and 6 months after surgery.

The study was approved by the ethics committee, obtaining the informed consent of all patients included in the study.

Surgery/ surgical technique

The surgery was performed in both groups under general anesthesia or spinal anesthesia. The surgical approach, both for autograft filling and for filling with synthetic bone substitute, was performed depending on the anatomy and location of the benign bone tumor. Autografts were harvested from the iliac wing.

The curettage of the bone tumor was performed under X-ray control, then the remaining bone defect was filled with artificial bone substitute or autograft; bone grafts were stabilized by compaction.

In some cases, because the benign bone tumor formation was large, with a large remaining bone defect, after curettage and filling, surgery required reinforcement using osteosynthesis materials: DHS (Dynamic Hip Screw) to the proximal femur or DCS (Dynamic Condylar Screw) to the distal femur to prevent further fracture.

Results

The patients included in the study were between 25 and 55 years old, with an average age of 40.

The election investigation was represented by the radiological image in the antero-posterior and lateral incidence.

The type of bone graft used was the iliac crest autograft or the synthetic bone substitute for good integration.

No differences in graft integrity or septic complications at 3-month and 6-month controls were reported.

No local recurrences were registered 1 year after surgery in both groups.

The functional result of the patients, in those who underwent autograft filling and in those with a synthetic bone substitute, was good.

Conclusions

Given the small number of patients, no statistics could be made because it required a larger group of patients.

The evolution of the patients from a functional point of view and from the point of view of the integrity of the graft was similar in both groups regardless of the type of graft used.

In both cases, the radiological image remained the routine investigation in the periodic postoperative control.

Conflict of Interest statement

The authors state no conflict of interest.

Informed Consent and Human and Animal Rights statement

Informed consent has been obtained from all individuals included in this study.

Authorization for the use of human subjects

Ethical approval: The research related to human use complies with all the relevant national regulations, institutional policies, is in accordance with the tenets of the Helsinki Declaration, and has been approved by the review board of University Emergency Hospital Bucharest, Bucharest, Romania.

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Disclosures

None.

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