Over 10 Years Clinical Outcome of Tumor-Devitalized Autografts in Limb-Sparing Surgery for Bone and Soft Tissue Tumors: A Nationwide Multicenter Study<br class="t-last-br">

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INTRODUCTION:

Tumor-devitalized autograft treated by deep freezing, pasteurization, and irradiation is one of the biological reconstruction methods following the tumor excision. The advantages include no requirement of bone bank, biological reconstruction, no disease transmission, less immunological response, soft tissue and ligament attachment, and availability of massive bone stock. The long-term durability has not been clarified. This retrospective multicenter study aimed to analyze over 10 years the clinical outcome in three types of tumor-devitalized autograft.

METHODS:

The inclusion criteria were the patients treated by intercalary or composite tumor-devitalized autografts of long bone from 1993 to 2016 in 26 tertiary sarcoma centers, followed for at least 10 years. The exclusion criteria was osteoarticular graft. Complications, event-free survival, graft survival, and functional outcome were investigated.

RESULTS:

We collected the data of 337 patients, and 111 patients (55 male and 56 female) met the inclusion criteria with a mean age of 30.3 (ranged, 4 to 75) years. The mean follow-up period was 184 (ranged, 121 to 348) months. This study included primary bone tumors (5 benign and 169 malignant tumors) in 174, soft tissue sarcomas in 59, and metastatic tumors in 17 patients. The tumor site was femur in 57, tibia in 46, and upper limb in 8 patients. The most common histology of malignant bone tumors was 52 osteosarcoma (46.8%), followed by 11 chondrosarcoma (9.9%) and 9 Ewing sarcoma (8.1%). The types of devitalization were freezing in 30 (27.0%), pasteurization in 32 (28.8%), and irradiation in 49 (44.1%) patients. The graft types were intercalary in 76, composite prosthetic in 29 patients, and hemicortical reconstruction in 6 patients. The cumulative incidence of the event was 36.9% in 5, 45.9% in 10, and 50.5% in 15-years (Fig.1). Fifty-six events needed the additional surgery. The frequent events were infection in 14 (4: < 2 years, 10: > 2 years) following implant failure in 10, local recurrence from surrounding tissues in 9, and fracture in 7 patients. The most frequent event was a structural failure in the femur: 13 of 32 (40.6%) and infection in the tibia:7 of 22 (31.8%). Long resection (>15cm) was significantly correlated with the incidence of an event by uni- (p=0.004) and multivariate analysis (p=0.004). Graft survival was 88.3% in 5, and 82.9% in 10 and 79.6% in 15 years (Fig.2). The cause of graft retrieval was an infection in 9 (2: < 2 years, 7: > 2 years), local recurrence from surround tissue in 3, nonunion, and implant failure in 2 patients each. Age (> 40 y.o) and long resection (>15cm) were significantly correlated with grafted autograft failure by uni- (p=0.004, p=0.044) and multivariate analysis (p=0.003, p=0.007). Sixty-one of 76 intercalary grafts were available for bony union analysis and 37 patients (60.7%) of 61 intercalary grafts achieved bony union within two years. The vascularized fibular graft was significantly related to the union rate (p=0.031). There was no significant difference in the incidence of the event (Fig.3) and graft survival (Fig.4) between the three types of devitalizing methods.There was no significant difference in the incidence of the event (Fig.3) and graft survival (Fig.4) between the three types of devitalizing methods. MSTS (Musculoskeletal tumor society) score was available in 97 patients, and the mean score without the emotional acceptance was 84.8% (ranged, 28 to 100).

DISCUSSION AND CONCLUSION:

Tumor-devitalized autograft provided a long-lasting grafted bone survival and favorable limb function. Although the incidence of complications was relatively high, those could be managed by additional surgeries. The most frequent complication and most cause of graft retrieval was an infection. Those results were comparable with allografts; therefore, tumor-devitalized autografts could be a useful biological reconstruction.

Fig. 1. The cumulative incidence of events showed 36.9% in 5, 45.9% in 10, and 50.5% in 15-years.

Fig. 2. Graft survival showed the cumulative survivals were 88.3% in 5, and 82.9% in 10, and 79.6% in 15 years.

Fig. 3. The cumulative incidence of events showed no significant difference between the three types of devitalizing methods.
Fig. 4. Graft survival showed no significant difference between the three types of devitalizing methods.