

Clinical outcomes of patients reconstructed with heat-treated autograft after resection of malignant musculoskeletal tumors

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Background

Limb salvage surgery after resection of bone and soft-tissue tumor results in a large residual bone defect. Several procedures have been developed to reconstruct the bone defect. Mega-prosthesis is one of the useful reconstructive tools and widely used, however, there are several problems including short- to long-term infection and mechanical failure such as stress shielding, loosening, wear, and breakage. In clinical setting, the most commonly-used biological reconstruction after musculoskeletal tumor resection is allografting. The advantage of allograft is to save bone stock, however, the use is limited by availability, the possibility of virus infection, and religious reasons, particularly in Asian countries. Instead, heat-treated autograft of resected specimen has been widely used in Japan because of the advantages that provide precise fit and biological compatibility. However, there are several complications associated with heat-treated autograft, including infection, fracture, and non-union.

Questions/Purposes

We evaluated the clinical outcomes and complications in patients, who received reconstruction with heat-treated autograft following resection of malignant musculoskeletal tumors.

Patients and methods

We retrospectively reviewed 64 patients with heat-treated autograft after resection of primary malignant bone and soft tissue tumors at our institutions between 1992 and 2013. Mean follow-up duration was 7.9 years. We reviewed characteristics of patients, clinical outcomes, and complications. There were 36 males and 28 females with a mean age of 29 years. There were 44 patients with bone tumor and 20 with soft tissue tumor. The most common diagnosis was osteosarcoma in 33 patients. The resected bone was heated in saline at 70 degrees for 15 minutes. The site of bone graft was a femur in 27, a tibia in 24, a humerus in 8, and others in 5. The analysis included 30 intercalary grafts, 23 inlay grafts, 6 composite grafts with prosthesis, and 5 osteochondral grafts. Among them, vascularized fibular graft was used for the reconstruction with heat-treated autograft in 20 intercalarys and 2 composites. The mean length of autograft was 12.2 cm, ranging from 3.5 to 26 cm. The postoperative functional evaluation using MSTS-ISOLS score was available in 46 patients.

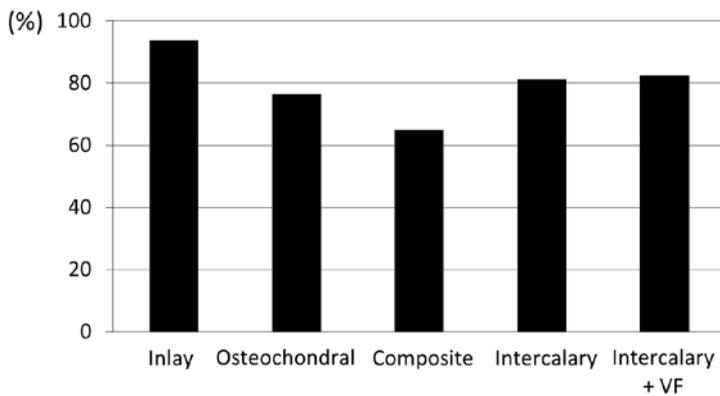
Results

The mean duration to bone union between host and heat-treated autograft was 9.7 months. In complications, infections occurred in 9 (14 %) patients, fractures in 7 (11 %), non-union in 14 (22 %), and bone absorption in 11 (17 %).

Five grafts (8%) were removed due to complications. All inlay, osteochondral, and composite grafts adjacent to host bone were incorporated with the host bone, whereas intercalary grafts had a lower rate of bone union (53%). Combination with vascularized fibular graft significantly reduced the risk of non-union ($P = 0.02$) and bone absorption ($P < 0.001$) in patients reconstructed with intercalary grafts. No recurrent tumor occurred within any grafts. The mean MSTS-ISOLS functional score of patients with inlay grafts was 93%, which was highest in all graft types. In patients reconstructed with intercalary grafts, the mean MSTS-ISOLS score was over 80%.

Conclusion

This study suggests that the reconstruction with heat-treated autograft is a useful procedure with a low complication rate, especially in patients reconstructed with inlay grafts. A previous study showed a relatively high non-union rate (42%) in patients reconstructed with intercalary heat-treated autograft, which was comparable with the outcomes of intercalary grafts in the current study. Our results demonstrated that the combined use of heat-treated autograft with vascularized fibula improves the outcome after intercalary resection, although a longer follow-up of a greater number of patients would be required to confirm this.



MSTS functional evaluation (46 pts.)