

Reconstruction of Periacetabular Bone Tumor by Irradiated Autograft

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Background: Treatment of periacetabular malignant bone tumors represents one of the most difficult areas in musculoskeletal oncology, and periacetabular reconstruction following tumor resection for limb saving is extremely challenging. We attempted a reconstruction method in four patients by using an extracorporeally irradiated autograft,

Patient and method: Between 1996 and 2013 we treated four patients with malignant periacetabular bone tumors. The mean age of patients was 28 years (range 14-44 years), with two men and two women. Of the four patients, two had a Undifferentiated

high-grade pleomorphic sarcoma of bone, one had an Osteosarcoma and one had a chondrosarcoma.. The surgical stage was three cases of IIB and one case of IIA according to the Musculoskeletal Tumor society (MSTS) classification. Three patients except one patient with chondrosarcoma received systemic neoadjuvant chemotherapy. After wide resection with 3cm margin was performed, two cases were reconstructed by combining a free vascularized fibula graft (FVFG) with an extracorporeally irradiated autograft, one case was reconstructed by hip prosthesis and irradiated autograft, and one case was used irradiated autograft only. Extracorporeal irradiation was performed with 60Gy as a bolus single dose.

The mean period of follow up was 87 months (25 to 237) after resection of the tumor and reconstruction. Patient function was assessed according to MSTS criteria.

Results: Although a wide surgical margin was obtained in all patients, local recurrence was seen in the woman with an undifferentiated pleomorphic sarcoma of bone, and she died 25 months after surgery. The mean MSTS functional score was 61% (range 13 to 86). The lowest score obtained was in a patient with local recurrence. The most notable complications consisted of osteoarthritic change in two, late superficial infection in one,

migration of hip prosthesis in one.

Case presentation: Case1. A 14 year-old boy had an osteosarcoma of the right acetabulum. The surgical stage was defined as IIB according to the MSTS classification.

The patient received neoadjuvant chemotherapy comprising doxorubicin, cisplatin and methotrexate. With the estimation of a good response to chemotherapy, limb-sparing surgery with wide excision and implantation of an irradiated autograft and FVFG were

performed. All neurovascular structures were preserved. The right pelvic bone was resected according to Enneking and Dunham type I to III. The attached soft tissue was stripped away but the capsule of the hip joint and insertion of the hip flexor and abductor muscle were preserved. Extracorporeal irradiation was performed with 60 Gy.

During irradiation, FVFG was harvested. The irradiated pelvis was re-implanted into its original site in the recipient and rigidly fixed with pelvic reconstruction plates and screws. Double-barreled FVFG was placed along the medial wall of the irradiated pelvis and fixed with cortical screws. The vascular pedicle was anastomosed to the superior gluteal vessels. The capsule and rectus femoris, hamstrings and gluteus muscle were repaired to the preserved attachments using bone anchoring screws. The operation time

was 12.5 hours and intraoperative bleeding was 3,700ml. Post operative chemotherapy was performed. At 59 months follow-up, hip movement was slightly restricted and the MSTS functional score was 86%. Although his right hip joint showed severe degenerative change resulting in osteoarthritis, he did not need crutches and he can jog for short distance.

Discussion: For wide resection and reconstruction of the malignant pelvic bone tumor, Enneking and Dunham classified tumor resection according to whether the ilium (type I), periacetabular region (type II) or pubis (type III) was excised. Among these, periacetabular reconstruction after malignant bone tumor resection for limb conservation is extremely challenging because of the loss of the hip joint. The aim of reconstruction is to provide a functional, pain-free and cosmetically acceptable lower limb. A variety of reconstructive procedures for massive periacetabular bone loss at limb-sparing surgery are currently available, including custom-made prosthesis, saddle prosthesis, arthrodesis, pseudoarthrosis, allograft and processed autograft. However, the functional outcomes remain unsatisfactory and there is a high incidence of major complication. In an attempt to overcome obstacles, we used extracorporeally irradiated

autograft to restore the hemi pelvis after periacetabular resection. The theoretical advantages of using high-dose irradiation of bone include the total destruction of tumor cells, preservation of bone stock and absence of donor morbidity. Moreover, extracorporeally irradiated autografts do not contain foreign infectious agents, there will always be a perfect fit both at the host-graft junction and the hip joint.

Conclusion: Periacetabular reconstruction with an extracorporeally irradiated osteoarticular graft was safe and reliable for primary, limb-sparing surgery. It is best indicated for patients in whom very acceptable function can be expected.