Limiting Factors of Limb Salvage Operation for Musculoskeletal Sarcoma

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Summary. Based on the therapeutic results of 158 musculoskeletal sarcomas treated by limb salvage operation, the limiting factors were analyzed. As a result, we concluded that the Surgical Staging System advocated by Enneking is not satisfactory as an indicator of surgical procedures in the treatment of musculoskeletal sarcoma. Also, the Functional Evaluation System does not adequately determine the appropriateness of the limb salvage operation. Therefore, in this analysis, a different standard was applied.

According to these criteria, two groups of limiting factors relating to postoperatively acquired functional deficit were determined. The first group included: (a) patients of younger age in bone sarcoma of lower extremities; (b) involvement of bone and vessel; and (c) extensive involvement exceeding three compartments. The second group of limiting factors, considered to be more important, involved local recurrence relating to inadequate surgical margin which comprised: (a) multicentric sarcoma; (b) skip metastasis; (c) venous invasion; (d) lymph node metastasis; (e) dissemination caused by pathological fracture or multiple inadequate surgery; and (f) the infiltrative character of the tumor. However, some of these limiting factors should be resolved by recent advances in surgical techniques.

Key words: Limiting factors—Limb salvage operation—Bone and soft tissue sarcoma

Introduction

Recently, limb salvage operations have become more commonly accepted procedures in the treatment of musculoskeletal malignancy of extremities. But there continues much spirited debate over when limb salvage operations should be performed. Therefore, in this paper, we attempted to analyze the limiting factors of limb salvage operations based on our clinical experience.

Material and Methods

In the 10 years beginning January 1977, we performed limb salvage operations for 158 musculoskeletal sarcomas of extremities. These 158 sarcomas included

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51 bone sarcomas and 107 soft tissue sarcomas. The 51 bone sarcomas comprised 27 osteosarcomas, 12 chondrosarcomas, and 12 other sarcomas. The 107 soft tissue sarcomas comprised 36 malignant fibrous histiosarcomas, 27 liposarcomas, eight synovial sarcomas, and 36 other sarcomas. According to the Surgical Staging System advocated by Enneking [1], the 158 cases fell into the following categories: 22 cases of IA, 21 cases of IB, 40 cases of IIA, 61 cases of IIB, and 14 cases of III. We principally performed curative wide resection, wide or marginal excision with preoperative adjunctive therapy, and ablation as radical surgical procedures for musculoskeletal malignancy.

Curative wide resection [2–4], which might be classified according to Enneking’s surgical classification as “extensive wide excision,” is indicated for almost all soft tissue sarcoma patients. In the remaining cases of soft tissue sarcoma (those in an advanced stage), ablation or excision with preoperative chemoradiotherapy is chosen. In the treatment of bone sarcoma, we principally perform a combination therapy with preoperative chemotherapy and curative wide resection for high-malignant lesions. However, for high-malignant sarcoma patients who respond effectively to preoperative chemotherapy and for low-malignant sarcoma, we usually carry out less extensive wide excision. Curative wide resection is based on biological barrier effects. These barriers include fascia, cartilage, periosteum, vessel sheath, epineurium, and joint capsule. In the operation, the tumor is removed en bloc on being enclosed with the barrier in transverse section. In longitudinal section, in which no barrier is formed, the surgical line is increased to at least 5 cm beyond the tumor boundary. To carry out the principle of curative wide resection, different procedures are required for lesions in superficial, intramuscular, intermuscular, and osseous locations. (Fig. 1)