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Proton beam radiotherapy for unresectable bone and soft tissue sarcoma

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Purpose: Radiotherapy is often performed to achieve the local control of unresectable bone and soft tissue sarcomas. The purpose of this study was to evaluate the results of radiotherapy for unresectable sarcoma and clarify the efficacy of definitive proton beam radiotherapy.

Materials and Methods: Between 2002 and 2014, 84 patients with unresectable sarcoma underwent radiotherapy. Cases of retroperitoneal liposarcoma and small round cell sarcoma in children were excluded, and the remaining 79 patients were the subjects of this study. There were 42 males and 37 females, with a mean age of 59 years (14-94). The mean follow-up period was 28 months (2-126). Among the subjects, 35 patients received systemic chemotherapy and 28 received intra-arterial chemotherapy. Forty-four (44) patients underwent 3D conformal radiotherapy with photons (CRT), whereas, 35 patients received high-dose proton beam radiotherapy (PBRT). We evaluated the overall survival rate and local control rate in all patients and compared the results between the CRT and PBRT groups.

Results: The overall survival rates for all patients at 1, 2 and 5 years were 73%, 49% and 27%, respectively, while the local control rates were 83%, 64% and 44%, respectively. The total radiation dose averaged 52.6 Gy in the CRT group (40-70) and 69.7 Gy (54-84) in the PBRT group. The 2- and 5-year survival rates were significantly higher in the PBRT group than in the CRT group (71% and 56% vs. 34% and 7%, $P < 0.0001$), as were the 2- and 5-year local control rates (78% and 58% vs. 56% and 28%, $P < 0.02$, FigureA). Serious complications were observed in six patients (skin ulceration with deep infection in four patients, gastrointestinal perforation in one patient and a fracture requiring amputation in one patient). Concomitant systemic chemotherapy tended to improve survival, although the difference was not statistically significant.

Conclusions: Although the PBRT group included many large (greater than 10 cm) tumors, PBRT enabled the use of a higher dose of radiotherapy, and, consequently, the local control rate was better in the PBRT group than in the CRT group (FigureB, enhanced CT of malignant SFT). PBRT with a dose of more than 60 Gy is an excellent alternative for unresectable sarcoma.

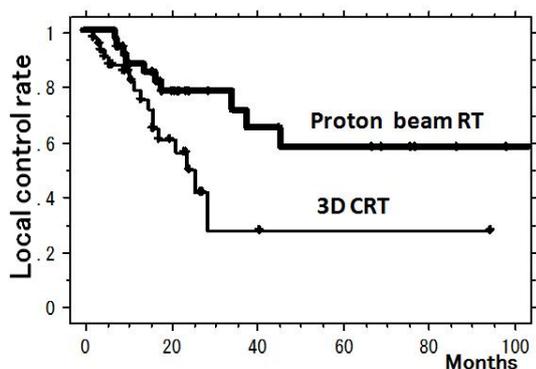


Figure 1. Local control rate of patients treated with PBRT and CRT

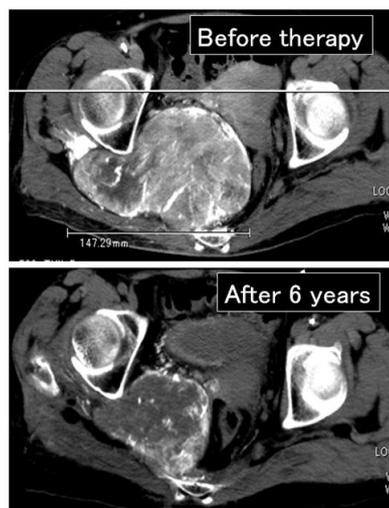


Figure 2. Enhanced CT of patient treated with 70Gy of PBRT