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A Case Report of Postradiation Sarcoma*)

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ABSTRACT

This report describes a nine-year-old girl with postradiation sarcoma.

The patient was found to have rhabdomyosarcoma in the right hip when she was one year and eleven months old, and received surgery. In addition to chemotherapy, the lesion was irradiated with 3300 rad of 10 MeV electron beam. Six years and eight months after irradiation, postradiation sarcoma arised from the right iliac bone in the irradiated field. Postradiation sarcoma is considered to be an important disease because of its rare occurrence and generally unfavorable prognosis. Therefore, this case report is presented.

INTRODUCTION

The results of treatment for solid malignant tumors in children have been improved lately through the active introduction of multimodal therapy, and the number of long-term survival patients have been increasing. In recent years, however, problems of late effects due to such treatment have arisen. One such problem has been the arising of a second malignant neoplasm. We recently treated a patient with rhabdomyosarcoma who developed postradiation sarcoma in the irradiation field six years and eight months after the beginning of treatment. This case is reported herein.

CASE REPORT

Patient

A nine-year-old girl who was born on January 16, 1974. Family history and past history; Unremarkable.

Present illness; On December 11, 1975, the mother of the patient noticed a 3×3 cm tumor in the right hip while changing the baby's diaper. She visited a neighboring doctor, and the tumor was resected. On January 21, 1976, a 6×7 cm tumor again appeared at the same region and surgery was carried out under general anesthesia a second time on February 4. At the time of the second surgery, an extensive resection of the gluteral muscle was performed because the tumor had widely infiltrated into the muscle. The histological findings of the resected tissues are shown in Fig. 1. Alveolar-type rhabdomyosarcoma was diagnosed and microscopic residuals were pointed out at that

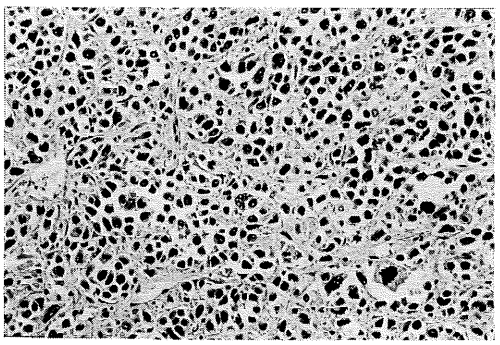

Fig. 1. Photomicrograph of the tumor resected on Feb. 4, 1976. (Alveolar Rhabdomyosarcoma)

*) 横山　隆，市川　徹，檜山英三，三好信和，小山　矩，上田一博：放射線誘発肉腫の1例

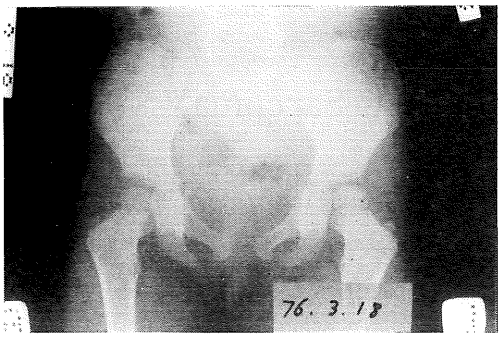

Fig. 2. X-Ray of the pelvis taken on March 18, 1976.

time. Therefore, the patient was referred to our department for further treatment and was admitted on March 18, 1976. Laboratory findings at the time of admission were almost normal range.

As shown in Fig. 2, no abnormalities were observed in x-ray findings of the pelvis.

On the basis of these findings, the patient was diagnosed as having Stage Ib alveolar-type rhabdomyosarcoma. Application of chemotherapy and radiation therapy was considered.

Therefore, chemotherapy using Vincristine and Cyclophosphamide was started immediately after admission. Together with this chemotherapy, irradiation therapy to the right hip 300 rad at one time using a 10 MeV electron beam, was begun on April 8, 1976. A total of 3300 rad was irradiated during this treatment, although irradiation was discontinued for a period of 16 days because of chickenpox. After irradiation, VAC therapy was started and repeated for about three years. After this therapy, oral medication only using CPM was continued for three months, and then all treatments were discontinued in April, 1979. After treatment,

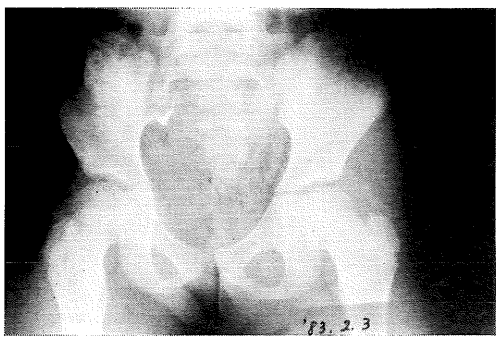

Fig. 3. X-Ray of the pelvis taken on Feb. 3, 1983.

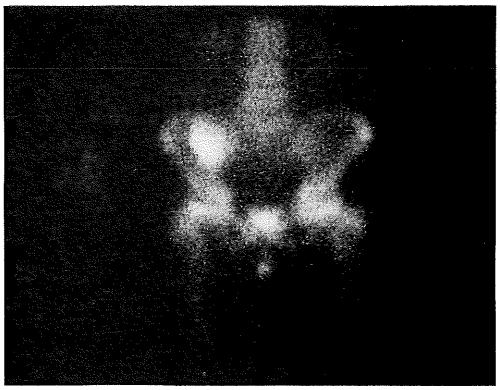

Fig. 4. ^{67}Ga Tumor scintiscanning

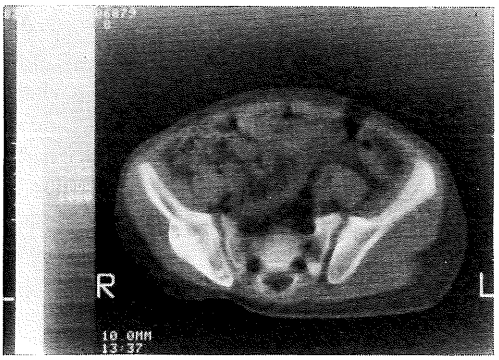

Fig. 5. CT scanning

the patient's course was regularly followed at our outpatient clinic.

In February, 1983, the patient visited our clinic with complaints of pain in the right lower abdomen and fever. She was admitted to our hospital for follow-up. The patient was diagnosed as having an urinary tract infection based on an increase in the white blood cell count and pyuria. No remarkable findings were observed in the right hip either by inspection and palpation at the time of admission. The x-ray films of the pelvis revealed spotted osteosclerosis in the right iliac bone, as shown in Fig. 3. ^{67}Ga scintiscanning was performed becasue the possibility of the changes in this region being malignant was considered to be high. As shown in Fig. 4, the malignant change was confirmed by the abnormal accumulation of ^{67}Ga in the area. As shown in Fig. 5, CT scanning of this region disclosed that the lesion was present in the subperiosteal bone itself. Based on these finding, the recurrence of rhabdomyosarcoma was suspected and surgery was carried out.

Surgical findings reveraled that a tumor was

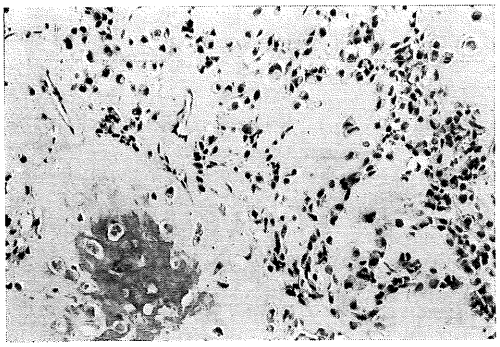

Fig. 6. Photomicrograph of the tumor resected on Feb. 18, 1983.
Pleomorphic atypical cells show chondroid matrix production, partially osteoid formation (suggestive of postradiation sarcoma of the bone)

present in the subperiosteal region. Pathological findings from a part of the excised tumor are shown in Fig. 6. Since the pathological findings lacked similarity to those obtained from the previous tumors, we diagnosed this tumor as postradiation sarcoma.

The patient was referred to the Department of Pediatrics for treatment with chemotherapy. As of now, March, 1984, the patient remains alive.

DISCUSSION

The results of treatment for solid malignant tumors in children have been improved markedly in recent years. For example, the survival rate of patients with Wilm's tumor has increased from 50% to 80% over the past 25 years[7]. In addition, the results of treatment for rhabdomyosarcoma, Ewing sarcoma and osteosarcoma have been significantly improved[8].

These improvements have been mainly due to multimodal treatment by the rational combination of surgical therapy, irradiation therapy, and chemotherapy. However, together with the increase in the number of long-term survival patients as a result of improved treatment, late effects due to such treatment in these long-term survival patients have begun to attract attention[9].

Among these late effects, Meadow described the following items[13]:

1) effects on soft tissues and bone
2) effects on intellectual development
3) effects on sex gland function
4) effects on other organs
5) araising of a second malignant neoplasm

A study on the incidence of second malignant neoplasms in children undertaken by the Late Effect Study Group reported that 102 of the 15435 children studied (0.67%) had second malignant neoplasms[8]. It has been considered that the incidence of second malignant neoplasm is higher in children than in adults[11]; however, the frequency itself is low. Nevertheless, prognosis is not favorable[13], so once it occurs, it is a great problem. About half of the patients developing second malignant neoplasms which are considered to occur due to irradiation are called postradiation sarcoma or radiation-induced sarcoma. Tumors induced by irradiation were first defined by Cahan[1], followed by various modifications[6,12]. The definition can be roughly described as follows:

1) The area irradiated should have been previously normal;
2) The recurrent tumor should have been in the path of irradiation;
3) There should have been a trouble-free interval of several years;
4) The histology of new tomor should be differentiated from that of original tumor.

Our patient conformed to this definition and was thus diagnosed as having postradiation sarcoma. Tumors which meet this definition more often occur in bone than soft tissues. Coia[5] mentions that this high incidence of neoplasm in the bone is due to its high absorption of radiation. Reporting on the kinds of postradiation sarcoma of the bone, Yoshizawa[19] noted that, on the basis of a study of 261 reported cases, osteosarcoma accounts for 59.1%, fibrosarcoma 25.1%, and chondrosarcoma 7.3%. There have been many reports on the latent period of second malignant neoplasm as a result of radiotherapy. Sabanas[16] states that this period is six years in weight-bearing bone and 14 years in non-weight-bearing bone. In addition, Cohen[4] mentions that the latent period is eight to nine years in children. With regard to the relationship between the incidence of postradiation sarcoma and radiation dose, Segerman[17] reports that the incidence is 2.5% in patients with retinoblastoma if the radiation dose is 6000 rad or less. It has been felt, however, that the survival rate of patients with retinoblastoma and the incidence of second malignant neoplasm induced by irradiation are

high. Castro[3] reports that the incidence is 0.2 % if 6800 rad is used. It is generally believed that it is 0.05 to 0.2% in cases of irradiation from 4000 to 7000 rad[15,18]. Since this incidence is not high, there is no controversy concerning the effectiveness of radiotherapy since it is considered that the beneficial effects of radiotherapy for malignant tumor as currently applied outweight its adverse effects.

On the other hand, chemotherapy was also used in our patient, and the carcinogenesis of chemotherapy has been pointed out[10]. Additionally, there have been reports noting that the incidence of second malignant neoplasms increases if chemotherapy is combined with radiotherapy[2]. We applied VAC therapy to our patient, but D'Angio[8] states that the combination of actinomycin D inhibits the arising of radiation induced-sarcoma. The effects of the combination of chemotherapy and radiotherapy on the arising of second malignant neoplasms should be studied in greater detail.

The prognosis for second malignant neoplasms is not favorable[13]. So it is expected that better methods of treatment and prevention for these neoplasms will be established as an increase in the number of long-term survival patients. However, the actual conditions of postradiation sarcoma in children have not yet been sufficiently studied in our country because children with this disease has been extremely rarely reported[14]. This problem will continue to impede further study.

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