

# Radiation Induced Sarcoma of Pelvis

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## Abstract

Radiation-induced sarcomas are uncommon potential late sequelae of radiation therapy. These tumors are aggressive, occurring in bones or soft tissues in an irradiated area after a latent period of five or more years following radiotherapy. We report a case of radiation-induced osteosarcoma involving the pelvic girdle with latency period of 11 years following whole pelvis radiation treatment for carcinoma cervix.

## INTRODUCTION

Radiation induced sarcoma is an uncommon potential late sequelae of radiation therapy. These tumors are aggressive, occurring in bones or soft tissues in an irradiated area after a latent period of five or more years following radiotherapy. Histological proof of the tumor is necessary to distinguish it from other radiotherapy changes such as osteonecrosis. Long-term patient follow-up and a high index of suspicion are crucial for early detection and timely intervention. We present a 61-year-old lady who developed pleomorphic sarcoma of the right pelvis, treated with radiotherapy for squamous cell carcinoma of cervix 11 years back.

## CASE REPORT

A 61-year-old female successfully treated for stage II<sub>A</sub> carcinoma uterine cervix 11 years back, with pelvic external beam irradiation by AP/PA fields 50Gy/25# followed by low dose rate intracavitary brachytherapy 30Gy prescribed at point A, now presented with painful swelling over right gluteal region that was progressively increasing in size. Local examination showed an expansile swelling with tenderness in the right gluteal region extending up to lumbar region. Movements of right hip joint were restricted due to pain. Paresthesia was present on right leg and foot. Computed tomography (CT) of pelvis demonstrated 13 x 10 x 17cm heterogeneous mass causing bone destruction of the right iliac bone, right side of sacral vertebrae and spinal canal of the sacral vertebrae. The gluteal and obturator internus muscle are completely involved by the mass (figure 1).

## Figure 1

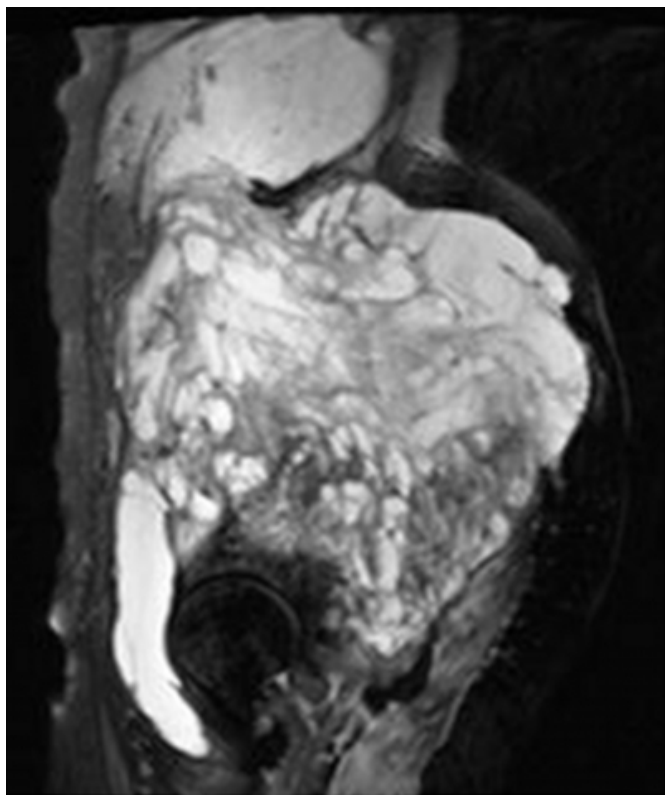
Figure 1 - CT pelvis demonstrated heterogeneous mass involving the right iliac bone causing destruction of the bone, extending into the right side of sacral vertebrae causing destruction. Gluteal and obturator internus muscle are completely involved by the mass.



CT of the lung revealed no lung metastases. MRI of pelvis showed large soft tissue mass arising from right ileum with extension superiorly up to lumbar vertebrae (L1 – L2) level, medially up to sacral canal at L5-S1 level and inferiorly to right gluteal region with hemorrhage, necrosis and bone destruction (figure 2).

**Figure 2**

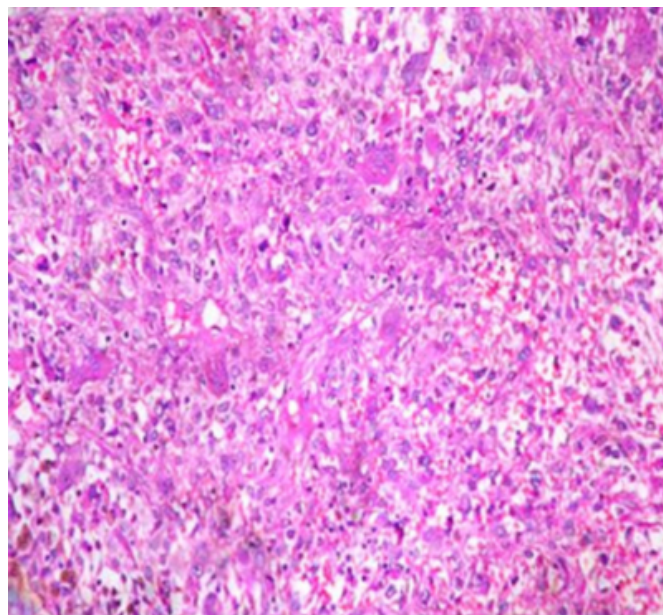
Figure 2 MRI pelvis demonstrating large soft tissue mass arising from right ileum with extension to lumbar vertebrae above and gluteal region inferiorly. Metastasis to sacrum noticed separately.



Open biopsy revealed features of pleomorphic osteogenic sarcoma (figure 3).

**Figure 3**

Figure 3 Open biopsy revealed features of pleomorphic osteogenic sarcoma (H&E, X10)



In view of very advanced disease for surgical resection and poor general condition to tolerate chemotherapy, the patient was offered only symptomatic treatment in the form of NSAIDS and opioids for pain management.

### **DISCUSSION**

Radiotherapy (RT) plays an integral part in treatment of cancer. The utilization of RT has increased over the past few decades as technology has evolved allowing for cure as well as organ conservation. Radiation-induced malignancy is a long term complication of radiation therapy. The potential of ionizing radiation to induce malignant neoforations was already observed in the early 20th century, only a short time after Roentgen first discovered x-rays. The first cases of radiation-induced skin cancers were reported by Frieben et al. in 1908.<sup>1</sup>

The rare occurrence of radiation induced sarcoma (RIS) is well known but the therapeutic benefit of initial radiotherapy for most cancers far outweighs the very small risk (0.03%-0.2%) of RIS. The vast majority of second primary solid tumors after radiation are sarcomas of bone and soft tissues and occur after a median latent period of 10 years.<sup>2</sup> Current estimates suggest that RT-induced sarcomas account for between 2.5 to 5.5% of all sarcomas.<sup>3</sup>

The most common histological subtypes of radiation-induced sarcomas are osteogenic, malignant fibrous histiocytoma, angio- and lymphangiosarcoma and spindle

cell sarcoma. Despite the low incidence of radiation-induced sarcoma, it is expected to be seen more frequently, due to an increased life expectancy with progressively improved survival in cancer patients as a result of increased effectiveness of cancer therapy and better treatment regimes; however the dose-effect relationship between radiation and sarcoma is controversial.<sup>4</sup> Radiation-induced sarcomas are aggressive, high-grade tumors, often with a poor prognosis.

In 1948 Cahan et al, in describing 11 cases of sarcomas arising from irradiated bones, established four criteria for the diagnosis of radiation-induced osteosarcoma. These criteria comprised of histological or radiological proof that there was no previous tumour in the involved bone, development of sarcoma in an irradiated area, latency period of at least five years or more and histological confirmation of the diagnosis.<sup>5</sup>

Orthovoltage radiation, largely used prior to 1960, resulted in a much higher absorbed dose in bone than in soft tissue and explained, that bone sarcomas occurred with greater frequency than did soft-tissue sarcomas.<sup>6</sup> With the technological advance in radiation therapy, this relation changed and thus, Cahan's criteria were revised by Murray et al. in 1999.<sup>7</sup>

Radiation must have been given previously and the sarcoma that subsequently developed must have arisen in the area included within the 5% isodose line.

There must have been no evidence that the sarcoma was likely to have been present before the onset of irradiation.

All sarcomas must have been proven histologically and must clearly be of a different pathology than that of the primary condition.

Latency period is necessary to differentiate a RT-induced sarcoma from a second primary because no accurate molecular or pathologic markers exist.

Some authors suggested the role of TP53 gene mutations, which are commonly accompanied by immunohistochemical p53 over expression, in the pathogenesis of postradiation

sarcoma.<sup>8</sup>

Surgical treatment, if possible, wide surgical resection to obtain broad tumor free margins offers the best treatment option. Radiation induced sarcomas tend to be diffuse and infiltrate along tissue planes that have been made indistinct by the effect of previous radiation. Positive margins result in a 50% reduction in survival. This suggests aggressive and wide excision to achieve complete curative resection is required to improve the chances of long survival. However, RIS is often located in anatomic areas that preclude radical surgery, and diagnosed in advanced disease rules out surgical management. In case of inoperability palliative chemotherapy can be considered as an option. Survival in radiation-induced sarcoma is generally worse than other sarcomas.

This case report points out the need for long term careful follow-up for cervix cancer patients, not only for local failures, but also for early diagnosis and treatment of uncommon but potential complication of radiation induced secondary malignancies.

### References

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