



# Radiation-Induced Sphenoidal Osteosarcoma: A Fatal Complication Of Cavum Radiotherapy

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## **Abstract.**

Sphenoidal osteosarcoma radiation-induced is an extremely rare form of osteosarcoma. This pathology is observed in certain patients who have received radiotherapy focused on the nasopharyngeal region. Medical imaging is a useful tool for diagnosis, extension and follow-up of the disease. The prognosis remains very poor due to the rapid evolution of the disease, with an average survival estimated at 6 months. Treatment is based on a combination of surgical resection, radiotherapy and chemotherapy. We report a case of sphenoidal osteosarcoma radiation induced in a male patient with a history of cavum tumors.

**Key words:** - Osteosarcoma, Sphenoid, Radio-induced, Cavum

## **I. INTRODUCTION**

Sphenoidal osteosarcoma radiation-induced is an extremely rare form of osteosarcoma. This pathology is observed in certain patients who have received radiotherapy focused on the nasopharyngeal region. Medical imaging is a useful tool for diagnosis, extension and follow-up of the disease. The prognosis remains very poor due to the rapid evolution of the disease, with an average survival estimated at 6 months. Treatment is based on a combination of surgical resection, radiotherapy and chemotherapy. (1)

## **II. CLINICAL OBSERVATION**

20 years old patient has been treated for undifferentiated carcinoma of the nasopharynx since 2013, having received concomitant radio-chemotherapy with a favorable outcome. In September 2023, the patient presented with a large swelling of the left temporal soft tissues extending to the homolateral frontal region, associated with intense headaches and reduced visual acuity.

Questioning revealed: bilateral epiphora more accentuated on the left side, nasal obstruction, bilateral purulent rhinorrhea. A Clinical examination: Left frontotemporal tumefaction extending to the homolateral parotid region, hard, fixed with no inflammatory signs opposite, measuring approximately 8 cm in length non-axial left exophthalmos, trismus at two fingertips .

On nasofibroscopy: filling of both nasal cavities by a tumoral process reaching as far as the nostril vestibule, preventing exploration. An MRI was ordered showing: locally advanced lesional process of the middle stage of the skull base with sphenoidal epicenter lateralized to the left, invading: the orbital apex with optic nerve compression, the maxillary and left ethmoidal sinuses, the left retromolar trigone, and the deep spaces of the face with intracranial extension.( Figure1)(Figure2)

A biopsy was performed, demonstrating a morphological appearance compatible with osteoblastic and osteogenic osteosarcoma.

The patient subsequently underwent palliative chemotherapy, having subsequently died.

### III. DISCUSSION

Four criteria to be considered radiation induced sarcoma : (1) the second neoplasm should appear in the irradiated field and be proven histologically; (2) a period of latence of at least several years must have passed between radiation exposure and development of the second neoplasm; (3) there must be histologic and radiographic evidence of the pre-existing condition and its nonmalignancy in addition to microscopic proof of a tumor; and (4) the second tumor must be histologically different from the first tumor.(2)

The pathogenesis of post-irradiation sarcoma is unknown. Many predisposing factors have been suggested: radiation dose, age of the patient at radiation exposure, association with chemotherapy. Documentation of new mutations in genes implicated in malignant transformation after radiation therapy.(3)

Nasopharyngeal carcinoma is the fifth most common malignant tumour seen in males and the tenth most common in females in Singapore. The average annual incidence between 1995 and 2000 was 14.3 cases per 100,000 males and 4.7 cases per 100,000 females. In comparison, the incidence in the US for the same period of time was less than 1 case per 100,000 in both sexes. In general, a radiation dose of at least 30 Grays is required for the development of radiation-induced osteosarcoma.7,8 Our patient received 70 Grays. (4)

In view of the large number of cases treated for this particular malignancy, it is not surprising that post-irradiation maxillary, temporal and sphenoid malignancies are now being reported in this population.

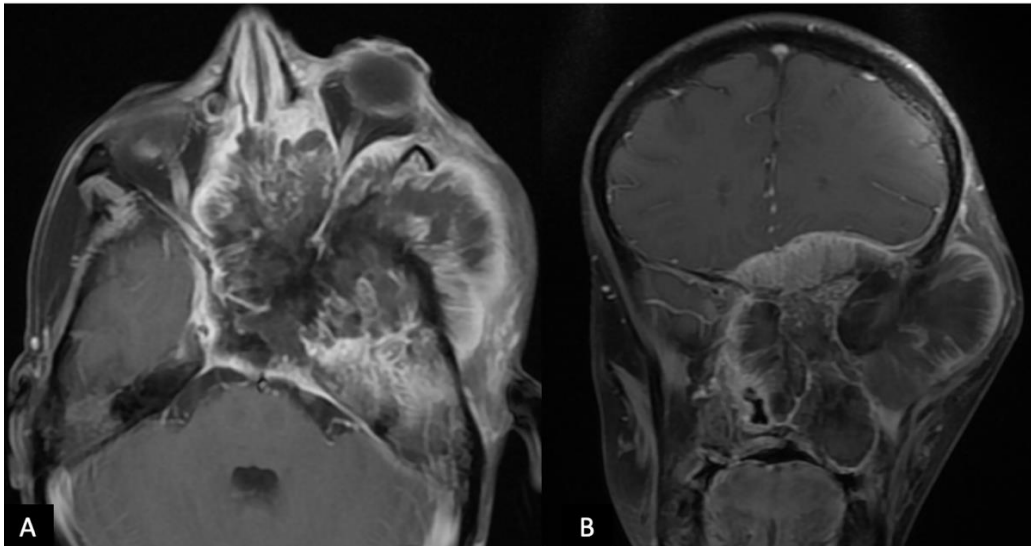
There is no specific radiological sign to distinguish a primary bone sarcoma from a secondary (radiation-induced) bone sarcoma. (5) Sclerosis of the bone margins, more marked in the secondary cases. Due to the low frequency of radiation-induced sarcomas, it is not yet possible to describe these lesions on CT or MRI scans; however, these examinations can be used to assess tumour extension to surrounding soft tissues. This extension to the soft tissues is not systematic in all secondary bone sarcomas. Treatment of radiation-induced sarcomas is difficult, as they are radio- and chemo-resistant. Only patients can be offered comfort surgery, which pain, but it is never curative.(6)

### IV. CONCLUSION

Radiation-induced osteosarcoma of the skull base after treatment of nasopharyngeal carcinoma is a rare. Complete surgical excision, if possible, can optimize survival of these patients when the tumor is detected at an early stage.

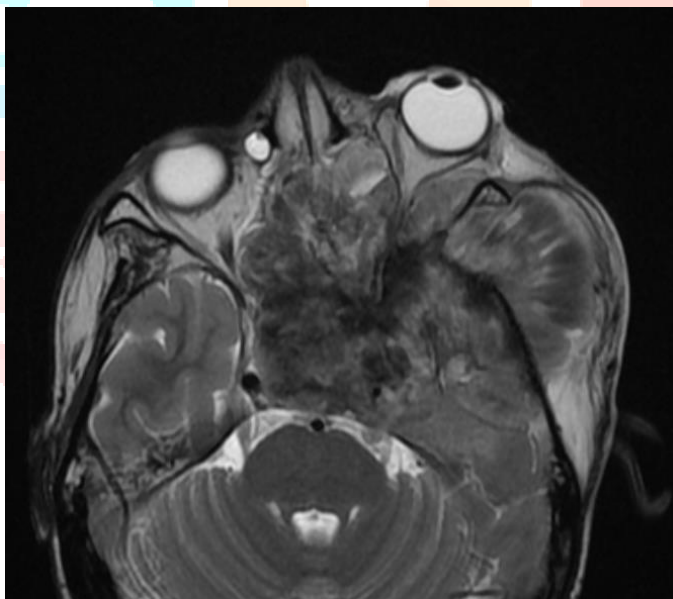
**Figures:**

Figure 1



(A) T1 FS axial sequence after gadolinium injection (B) T1 FS coronal sequence after gadolinium injection showing large, contrast-enhancing process centred on the left sphenoid, with extensive locoregional invasion

Figure 2



T2 axial sequence showing a tissue process with spiculated contours and heterogeneous T2 signal, with envelopment of the optic nerve and grade 3 left exophthalmos

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