Case Report

Postirradiation Sarcoma of the Sphenoid Bone – A Case Report

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Abstract

Introduction: The development of secondary tumours as a result of radiation therapy is a rare but serious complication. Clinical Picture: This is a case report of a 45-year-old Chinese male who developed postirradiation sarcoma of the sphenoid bone in less than 5 years after radiation therapy for Stage T3N1M0 nasopharyngeal carcinoma. Discussion: In the literature, the only case of postirradiation osteosarcoma of the sphenoid bone was after radiation therapy for craniopharyngioma. There was no previously reported case of postirradiation sarcoma of the sphenoid bone after radiation therapy for nasopharyngeal carcinoma. Conclusion: This is the first case of postirradiation malignant fibrous histiocytoma of the sphenoid to be reported. Of about 3000 patients treated with radiotherapy for nasopharyngeal carcinoma over a 10-year period in Singapore, only 1 patient developed postirradiation tumour of the sphenoid bone.

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Key words: Malignant fibrous histiocytoma, Nasopharyngeal carcinoma, Secondary tumours

Introduction

Radiation-associated tumours of the temporal and maxillary bone have been reported in patients treated with radiotherapy for nasopharyngeal carcinoma.[1,2] There was no previously reported case of postirradiation sarcoma of the sphenoid bone after radiation therapy for nasopharyngeal carcinoma. The only case of postirradiation osteosarcoma of the sphenoid bone reported was after radiation therapy for craniopharyngioma.[3] This is the first case of postirradiation tumour of the sphenoid bone to be reported after radiation therapy for nasopharyngeal carcinoma. In view of the large number of cases treated for nasopharyngeal carcinoma, it is not surprising that postirradiation maxillary, temporal and sphenoid malignancies are now being reported.

Case Report

A 45-year-old Chinese male first presented in June 1995 with a right parotid lymphadenopathy of 2-month duration and tinnitus in the right ear. Clinical examination of the ear, nose and throat revealed a mass in the right nasopharynx. Biopsy of the mass revealed undifferentiated carcinoma (Fig. 1). Computed tomographic (CT) scan of the postnasal space showed a mass in the right side with parapharyngeal and paranasal sinus involvement. He was diagnosed to have stage T3N1M0 nasopharyngeal carcinoma [TNM Tumour Staging: Extent of tumour (T), extent of spread to lymph nodes (N), presence of metastasis (M)] and was treated with radiotherapy (70 Grays over 35 sessions).

About 1 year later, he developed metastases to the right superior pubic ramus, anterior acetabulum, femoral head and was treated with local radiotherapy (50 Grays). In 1998, he had metastases to vertebra L2 (lumbar vertebra 2) for which he was given local radiotherapy (50 Grays). Over a period of 1 year starting from January 1999, he developed T9, T11, T12, L2, L5 and left iliac bone metastases. Radiotherapy to L5 and left ilium was given (50 Grays). Further bone scan and magnetic resonance imaging (MRI) of the spine revealed progressive metastatic involvement of the spine from T9 up to T4 with no spinal cord compression. There were no metastases to the liver and no evidence of tumour recurrence in the nasopharynx. He was treated with radiotherapy to T9 (50 Grays) about 1 year after the last radiotherapy to L5 and ilium. In view of the paucity of symptoms, the T4 to T12 metastases were being observed and chemotherapy was deferred.

In December 1999, the patient was admitted for syncope

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and a full work-up was done. CT scan showed an enhancing mass in the right sphenoid sinus associated with osseous destruction, suggestive of tumour recurrence involving the sphenoid bone and sinus. MRI was suspicious of tumour recurrence within the right sphenoid sinus with probable involvement of foramen ovale. Magnetic resonance angiogram (MRA) revealed a tumour closely related to the petrous and cavernous portions of the right internal carotid artery without displacement or narrowing of the vessel. Endoscopy, examination and biopsy under anaesthesia revealed an irregular mass at the site of the right sphenoid ostial region which had eroded the ostial and the anterior wall of the sphenoid sinus (Fig. 2). Tuberculous and fungal cultures were negative and histology confirmed high-grade sarcoma consistent with malignant fibrous histiocytoma (Fig. 3). There was no osteoid component found in the specimen. Immunohistochemical stains for epithelial markers were negative ruling out recurrence of nasopharyngeal carcinoma. After discussing the unresectability of the tumour with the patient, and the palliative intent of chemotherapy or radiotherapy, the patient decided to receive supportive care.

A further MRI in June 2000 showed an abnormal mass in the right sphenoid invading the cavernous sinus encasing the right internal carotid artery, indicative of tumour progression (Fig. 4). Within 2 months, he presented with right visual impairment and pain due to tumour invasion of the orbit. The patient received chemotherapy with palliative intent consisting of single agent ifosphamide at 5000 mg/m^2 with mesna. He derived brief pain relief and tumour stabilisation. However, after 4 cycles of treatment, the tumour showed radiological progression and he was managed conservatively. The patient died 2 weeks thereafter from progressive disease.

Discussion

Prolonged survival as a result of successful radiation therapy for neoplasms is occasionally associated with the development of secondary malignant tumours in the radiation field. Meningiomas,[4] gliomas,[5] and sarcomas[6-15] have all been reported as radiation-induced tumours. Most reported radiation-induced osteosarcomas of the skull arise from the facial bone or paranasal sinuses after radiation therapy for retinoblastoma.[7,8,10,12,16] In these cases, a genetic predisposition to develop the second neoplasm after radiation therapy might exist in the patients with hereditary retinoblastoma.[8]

Radiation-associated tumours of the temporal bone of 7 patients previously irradiated for nasopharyngeal neoplasm have been reported by Goh et al.[1] While another 4 cases of postirradiation osteosarcoma of the maxillary bone in patients treated for nasopharyngeal carcinoma were reported by Dickens et al.[2] Another study reported 5 cases of radiation-induced tumours of the temporal bone.[17] The histological subtypes of these tumours include squamous cell carcinoma, osteosarcoma, fibrosarcoma and chondrosarcoma.[1,17] After radiation therapy for hypothalamic-pituitary lesions, fibrosarcomas within the radiation field have occasionally been reported. Terry et al[14] reported 3 cases of radiation-induced fibrosarcomas developing within primary chromophobic adenomas of the pituitary. Other case reports have also described the same condition.[6,11,15] In contrast, only 3 cases of osteosarcomas of the frontal and temporal bones after radiation for hypothalamic pituitary lesions have been reported.[13,15] Two cases of radiation-induced calvarial osteosarcomas have been reported; 1 after radiation therapy for pituitary adenoma[18] and the other for cerebellar astrocytoma in childhood.[19]

Only 1 case of postirradiation osteosarcoma arising from the sphenoid bone has been reported following radiation therapy for craniopharyngioma.[3] There has been no previously reported case of sarcoma of the sphenoid bone which arose after radiation therapy for nasopharyngeal carcinoma.

Nasopharyngeal carcinoma is the fifth most common malignant tumour seen in males and the tenth most common in females in Singapore.[20] The average annual incidence between 1995 and 2000 was 14.3 cases per 100,000 males and 4.7 cases per 100,000 females.[20] In comparison, the incidence in the US for the same period of time was less than 1 case per 100,000 in both sexes. More than 300 new cases of nasopharyngeal carcinoma are seen in Singapore annually. The initial effective treatment is radiotherapy, the usual dose being 60 Grays or more in total, the high dose zone targeted at the primary tumour and regional lymphatics, inclusive of the whole sphenoid body and the posterior half of the maxilla in all cases. Some other cases may need further intracavitary booster radiation. In view of the large number of cases treated for this particular malignancy, it is not surprising that postirradiation maxillary, temporal and sphenoid malignancies are now being reported in this population.

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. Concerning the latent period, Skolnik et al[12] stated that it ranged from 3.5 to 18 years, with a mean interval of 9 years after radiation therapy to the skull. In another study, the latent period between radiotherapy for nasopharyngeal carcinoma and the presentation of temporal bone tumours ranged from 5 to 30 years with a mean of 12.9 years.[1] There are no differences in the latent period for radiation-induced osteosarcomas of the skull[10,12,15] and those of long bones.[16] Our patient

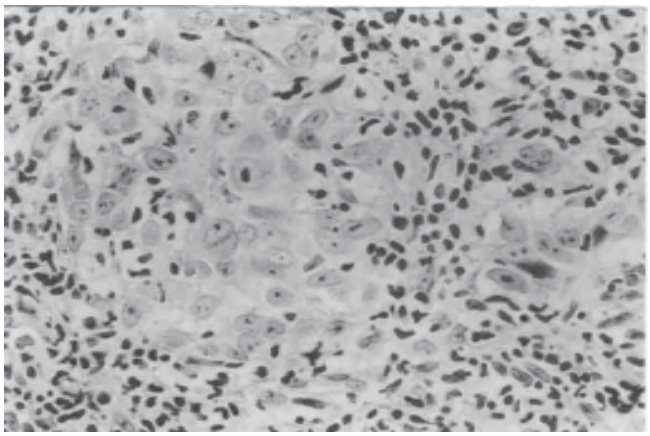

Fig. 1. Nests of undifferentiated nasopharyngeal carcinoma cells within a lymphoid stroma, H & E (x550).

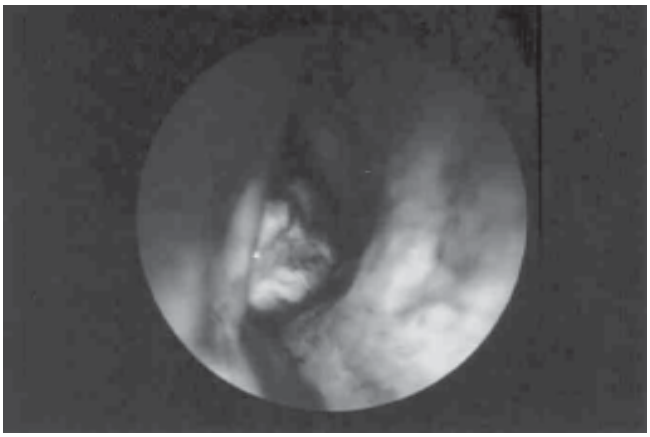

Fig. 2. Endoscopic view showing an irregular fleshy tumour at the site of the right sphenoid ostial region which filled up at least one third of the right sphenoid cavity. The tumour had eroded the ostial and the anterior wall of the sphenoid sinus.

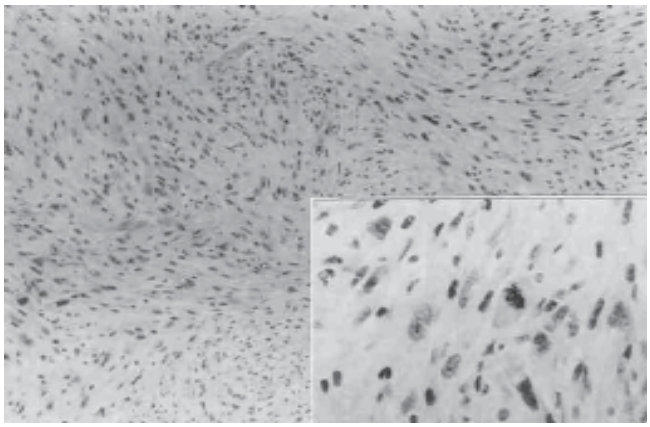

Fig. 3. Interlacing bundles of spindle cell sarcoma with pleomorphic nuclei and prominent nucleoli, H & E (x140). The tumour cells were positive for vimentin and CD68 and negative for smooth muscle actin, S100 and cytokeratin. Inset shows tumour with a prominent mitotic figure, H & E (x300).

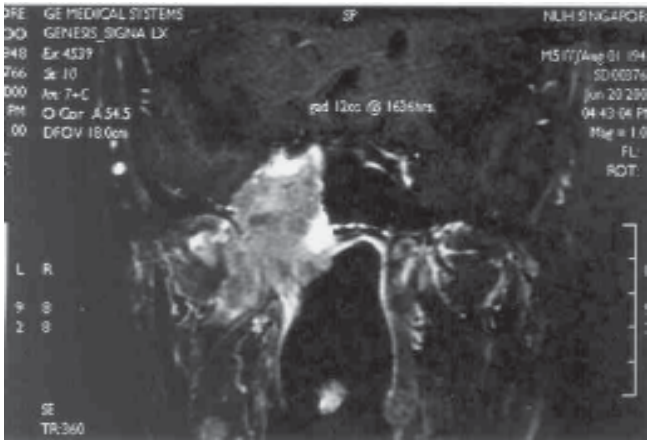

Fig. 4. MRI showing an abnormal mass in the right sphenoid invading the cavernous sinus encasing the right internal carotid artery, indicative of tumour progression.

developed the second tumour in less than 5 years after radiation therapy. The latent period is considered quite short [deep X-ray radiotherapy (DXRT) started in June 1995, second tumour diagnosed in January 2000]. The previously reported case of postirradiation sphenoid osteosarcoma arose 15 years after radiation therapy for craniopharyngioma.[3]

Cahan et al[8] have discussed 4 criteria for the diagnosis of radiation-induced sarcoma of bone:

1. the origin of the neoplasm in the radiation field;
2. the non-malignant nature of the initial bone condition; Modified by Arlen et al[7] for postirradiation sarcoma of the bone, "the tumours developed in bone not known to have a primary malignant osteoblastic lesion when the radiotherapy was given".
3. the histological diagnosis of the neoplasm; and
4. a relatively long, silent latent period.

Our case fulfills these criteria.

Although we have not excluded the possibility of primary osteosarcoma of the spine (post-mortem examination and biopsy of the metastatic sites in the spine were refused by the patient), the bony metastases in the spine and sacroiliac regions in our patient were temporally and clinically consistent with involvement by nasopharyngeal carcinoma.

There have not been large studies on the effectiveness of the treatment of postirradiation osteosarcoma. However, there has been 1 reported case of effective chemotherapy in postirradiation osteosarcoma after radiation therapy for meningioma.[19]

It is well known that metastases, especially to the lungs, are common in osteosarcomas of the long bones, regardless of whether they arise spontaneously or after radiation therapy.[12] In contrast, radiation-induced osteosarcomas of the skull do not exhibit this tendency.[12] These tumours, however, often carry a poor prognosis because of rapid local growth.[12]

In a study by Huvos and Woodward,[21] the cumulative disease-free survival rate for postirradiation malignant fibrous histiocytoma patients at 3 years was 58%. The cumulative disease-free survival rate at 5 years for patients with postirradiation osteosarcoma was 17%, with a median survival estimate of 1 year. In a review of 78 Mayo Clinic cases, about 30% of the patients with sarcomas of the craniofacial bones survived 5 years without recurrence.[22]

Conclusion

This is the first case of postirradiation malignant fibrous histiocytoma of the sphenoid bone. This is also the first case of postirradiation tumour of the sphenoid bone reported after radiation therapy for nasopharyngeal carcinoma. Patients with nasopharyngeal carcinoma are obviously at greater risk of developing such tumours in view of the large number of patients treated with radiotherapy for nasopharyngeal carcinoma and the inclusion of the sphenoid in the maximum dose area. The degree of risk is difficult to assess accurately. Of about 3000 patients treated with radiotherapy for nasopharyngeal carcinoma over a 10-year period in Singapore, only 1 patient developed postirradiation tumour of the sphenoid bone. This is a very low incidence rate and does not mitigate against the use of radiotherapy in the management of nasopharyngeal carcinoma in view of its efficacy.

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