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Early onset radiation induced sarcoma of scalp: A case report

F. Amouzegar Hashemi, A. Maddah Safaei*, E. Esmati

Department of Radiation Oncology, Cancer Institute, Imam Khomeini Hospital, Keshavarz Blvd, Tehran, Iran

► ***Case report***

**** Corresponding author:***
Dr. A. Maddah Safaei,
Fax: *+98 21 66581633*
E-mail: *afsan1980@ymail.com*

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ABSTRACT

Radiation induced sarcoma is a rare but recognized complication of radiotherapy and is associated with poor prognosis, frequently occurs 5 years after completion of treatment. We report radiation-induced sarcoma in a 42 years old male, involving the left parietooccipital scalp region following treatment of brain tumor with craniotomy and post-operative radiation with ^{60}Co machine. Diagnosis of radiation induced sarcoma was confirmed by history, latency period and biopsy. This Radiation induced malignancy was diagnosed only 2 years after completion of Radiotherapy for primary lesion.

Keywords: *Radiation induced sarcoma, brain tumor, glioblastoma multiform.*

CASE PRESENTATION

A 42 years old man presented with a painful mass in left parietooccipital scalp since Nov 2012. Physical exam findings included a 4-5 centimeter tender mass on left parietooccipital scalp (figure 1). He had previously undergone left parietal craniotomy for resection of a left temproparietal mass on Feb 2009. Primary pathologic report described a 5×3.5×1 centimeter mass with diagnosis of Glioblastoma multiform. At that time, he received adjuvant external beam radiation therapy with cobalt-60 machine using 2D technique with two lateral opposed fields. At first phase of radiation, 46 Gy in 23 fractions was given to pre-surgical tumor and edema with 3 centimeter margin, then the remaining 14 Gy of dose, prescribed to tumor bed with 2 centimeter margin in 7 fractions with concurrent temozolamide (100mg daily, throughout radiotherapy). Four weeks after completion of radiotherapy, temozolamide was prescribed with doses of 300 milligram per day for 5 consecutive days in 28 days intervals for 6 cycles. After completion of treatment, the patient was stable and under close observation with serial MRI follow-up at six months interval. Second follow-up MRI was done on July 2012 which revealed a hypersignal Temporal mass that showed no changes in comparison to initial MRI after surgery and prior to radiotherapy.

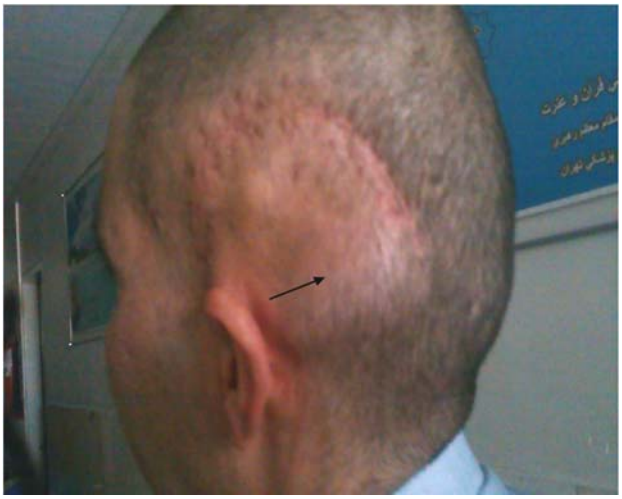

Figure 1. A 4 to 5 centimeter mass on left parietooccipital scalp (black arrow), The scar of craniotomy and radiation induced alopecia clearly shows previous radiation field.

Last MRI on January 2013, revealed an extra-dural thick irregular peripheral enhancing lesion involving bone without intracranial extension on left parietal scalp (figure 2). These findings were most consistent with an abscess or radiation induced tumor.

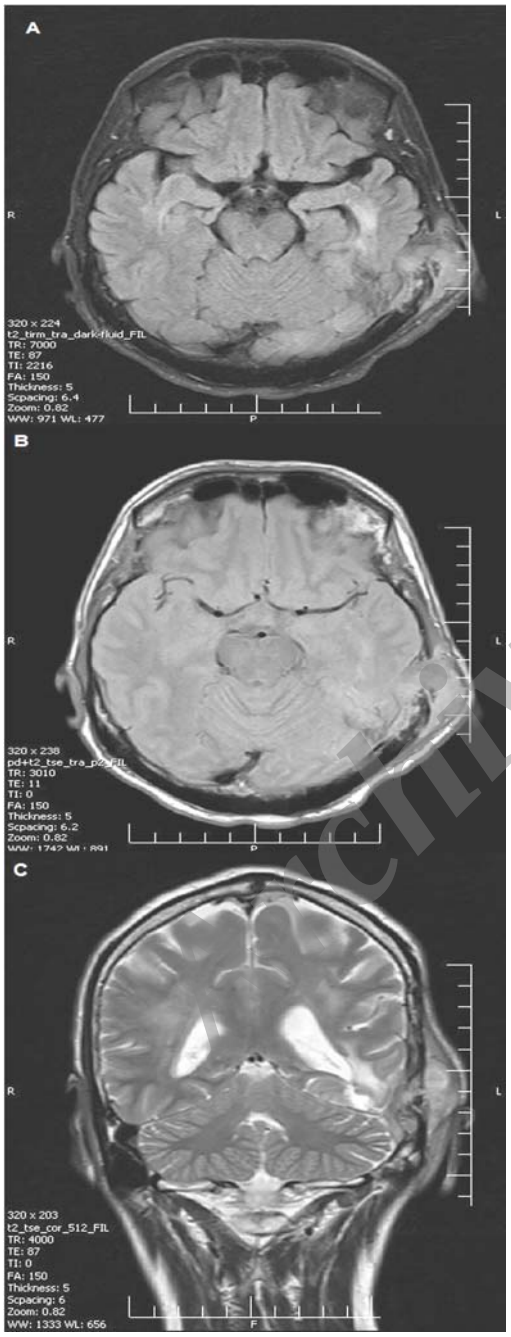

Figure 2. Irregular enhancing lesion involving bone without intracranial extension on left parietal scalp (A: T1 weighted Axial Section; B: T2 weighted Axial Section; C: T2 Weighted Coronal Section).

Surgical consultation was obtained and mass excision was performed on Feb 2013. The pathological report described a five centimeter mass lesion with diagnosis of Fibrosarcoma superimposed on surgical scar with invasion to epicranial soft tissue and skin. We reviewed both 2009 and 2013 pathological reports and tissues to be ensured about diagnosis. Re-examination of primary brain tumor confirmed glioblastoma multiform and Re-examination of recurrent scalp mass, demonstrated no glioblastoformic elements, and was negative for GFAP, SMA and EMA Markers and was positive for Vimentin. This histopathological and Immunohistopathological reports yielded diagnosis of Fibrosarcoma. The MRI which was taken after excision of scalp tumor demonstrated a heterogeneous enhancement in favor of remnant lesion, so the patient underwent reexcision and then reirradiation.

DISCUSSION

Radiation-induced tumors were originally explained by Cahan *et al.* in 1948. They described four characteristic for a tumor to be classified as such, including:

1- History of radiation therapy
2- The development of neoplasm within the field of radiation beams
3- Time relapse between radiation and tumor development and
4- No other predisposing condition to tumor development [1].

Radiation induced Sarcomas is a rare complication of radiation, with an incidence of 0.03 to 0.3% [2]. Spontaneous development of malignancies in the form of sarcomas is related to the carcinogenic effect of radiotherapy with a dose range from 16 to 120 Gy and the risk rises after the total dose of 55 Gy or above. Risk factors for developing Radiation-induced Sarcomas are young age at onset of radiation treatment and treatment-related factors, including high radiation dose and simultaneous chemotherapy with alkylating agents. Radiation

above 50Gy causes cell death, while lower doses (<30Gy) can cause genomic instability and damage of cell repair mechanisms [3].

In a retrospective review of 160 patients with radiation induced sarcomas, 26% of tumors were induced after radiotherapy of breast cancer, 25% after lymphoma and 14% after pelvic radiotherapy for cervical cancer. Also radiation induced sarcomas showed a large spectrum of histological subtypes; 87% of sarcomas were high grade and most common pathologies were osteogenic sarcoma, fibrous histiocytoma and angiosarcoma [4].

The incidence of radiation-induced sarcomas of the head and neck is likely to rise due to improved survival in head and neck cancer patients. Patel reviewed 69 cases reported in the English medical literature since 1966, and this group was compared survival results of these cases with 124 patients with a diagnosis of head and neck sarcoma at the Royal Marsden hospital. There was no site preference for radiation induced sarcoma and malignant fibrous histocytoma was the most pathologic diagnosis in both groups. The period of time between irradiation and diagnosis of sarcoma was 9-45 years (median of 17 years).

Radiation induced sarcoma after irradiation of brain tumor is very rare but is known entity which often demonstrates very late but rapid and aggressive growth similar to other location. [6] Our patient fulfills all of the criteria for establishment of radiation induced sarcoma. With presence of induration and fibrosis within radiation field, the clinical diagnosis of radiation induced sarcoma can be difficult.

Latency from radiation to time of diagnosis is mostly more than 5 years but very few reported cases of radiation induced sarcomas with 1 to 2 years latent period can be found in literature [7]. Our case is one of the rare controlled glioblastoma multiform cases with more than thirty months progression free survival (the median survival of GBM approximately is 12 to 16 months in the literature) who became complicated with another radiation induced sarcoma instead of recurrence of primary GBM.

As our case, the both primary and secondary sampled tissues should be reexamined to ensure that both are diagnosed correctly. Electron microscopy and Immunohistochemistry can be useful in differentiating sarcomatous appearing epithelial lesions from true soft tissue sarcomas and can be helpful in selecting treatment.

CONCLUSION

Physicians and radiation oncologists who follow the previously irradiated patients should consider the possibility of a radiation induced sarcoma when they encounter to a new suspicious lesion in previously irradiated field, regardless of the interval between radiotherapy and the new lesion.

Conflict of interest: *Declared none.*

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