Multiple meningiomas induced by cranial irradiation

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The role of radiation in the induction of central nervous system tumours has repeatedly been documented. Meningiomas induced by low doses of cranial irradiation have been described in many series of cases, but meningiomas induced by high doses of irradiation have still been reported in a limited number of cases.
We report the case of a 25 year old man who presented multiple meningiomas and who had received therapeutic dose of irradiation for a 4th ventricle ependymoma when he was 8 year old.

KEY WORDS: Meningioma, Multiple meningiomas, Radiation induced tumour, Radiation therapy.

Case Report

A case of a *25 year old man* with a history of a 4th ventricle tumour diagnosed when he was 8 year old is reported.
He underwent posterior fossa craniectomy and gross total excision of the tumour. The histological examination showed the tumour to be an ependymoma and the patient received therapeutic irradiation to the whole brain.
Since then, he remained free of symptoms and neurological deficits for 13 years when at the age of 21 years he presented focal seizures. A brain computed tomography scan (CT) showed a dura mater based mass in the frontal region, appearing consistent with meningioma of the frontal convexity, and a second one located in the midline, behind the coronal suture, representing a parasagittal meningioma (Fig. 1A). The patient firstly was operated on for the frontal meningioma, the mass (Fig. 1B) was completely removed and the histological diagnosis was endotheliomatous meningioma without anaplastic features. A second operation took place two years later and the parasagittal meningioma (Fig. 1C) was completely removed. The postoperative recovery was uneventful and the CT scan showed no residual tumour. The pathological examination showed meningioma (Fig. 1D) displaying features quite similar to them of the left frontal meningioma.

Discussion

Radiation therapy is of great value in the treatment of tumours but can have side effects including oncogenesis. The radiation induced tumours of the central nervous system, most frequently described, are meningiomas, sarcomas and more recently gliomas, especially malignant [1-3]. The first case of radiation induced meningioma has been reported in 1953. The casual role of radiation therapy in meningioma formation was firstly demonstrated by Modan in 1974 [1]. His epidemiological study showed a four-fold increase in incidence of meningiomas in a population of 11.000 Israelis who had received low doses of scalp irradiation for tinea capitis as children. More recent studies substantiated the relationship between low dose irradiation and induction of meningiomas [1]. Little experience has been reported on the induction of meningiomas by high dose cranial irradiation [1-3].
Our case offers to this growing experience.
This case fulfils the criteria of Caham regarding radiation induced tumours. The meningiomas were within the irradiated area of previous brain tumour of a different type, after a latent period of 12 to 20 years and the patient did not have evidence of neurofibromatosis or other phakomatosis.
Multiple meningiomas, according the famous study published by Cushing and Gisenhardt in 1938, are

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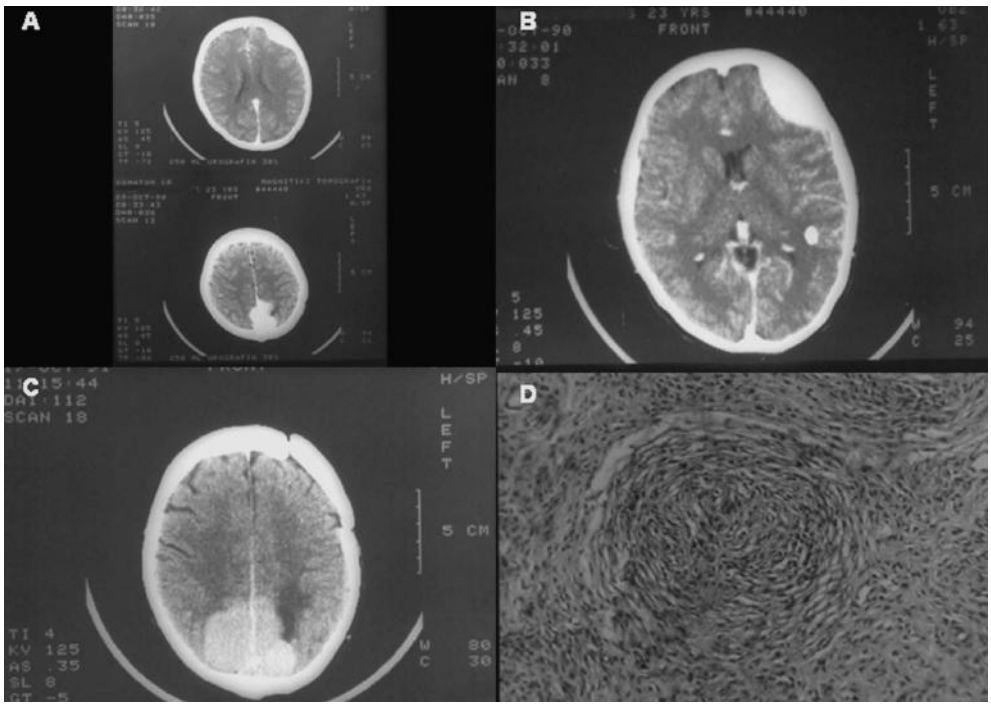

Fig. 1: (A) CT scan showing the meningioma of the frontal convexity and subsequently the parasagittal meningioma. (B) The meningioma of the frontal convexity before the surgery. (C) The parasagittal meningioma before the surgery. (D) Histopathology of the specimens revealed endotheliomatous meningioma.

"more than one meningioma and less than a diffusion of them" in the absence of neurofibromatosis [3]. In our case we considered multiple, the two meningiomas which presented subsequently, in different areas of the calvarium.

The review of the cases of the high dose radiation induced meningiomas indicates an inverse relationship between the dose of irradiation exposure and the time to tumour formation (average time 20 years) [1-5]. It is also presented that a very young age at the time of radiotherapy seems to predispose to the induction of malignant meningiomas [2,4].

In our case the time between the radiation given and tumour formation was 13 years, the patient was 8 year old at that time, while the tumours developed benign characteristics. The multiplicity in location of radiation induced meningiomas, and the younger age of patients at the time of presentation – in contrary with "spontaneous meningiomas" – are reported in the literature and found in our case [4].

Riassunto

Il ruolo della radiazione nella induzione di tumori del sistema nervoso centrale risulta ripetutamente ben documentato nella bibliografia scientifica internazionale. Dei meningiomi, in particolare, indotti da irradiazione cranica a basse dosi, sono stati ormai descritti moltissimi casi in molti studi, ma di quelli indotti da alte dosi di irradiazione cranica, il numero di casi riportato e documentato nella bibliografia internazionale risulta veramente limitato.

In questo nostro *case report*, presentiamo il caso di un uomo venticinquenne, il quale aveva ricevuto delle alte dosi di radiazione per la terapia di un ependimoma del quarto ventricolo cerebrale quando aveva otto anni, e che ha presentato a distanza di questo tempo dei meningiomi multipli intracranici.

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