Meningioma following cranial irradiation

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Summary: The case of a middle aged man who developed a meningioma directly underneath the site of a naevus treated with radiotherapy as a child, is presented. Epidemiological evidence and reports of similar cases suggesting meningiomas may be a sequel to irradiation, are reviewed.

Introduction

Meningiomas have been reported to follow radiotherapy treatments of various kinds, often with a long time interval, and a cause and effect relationship has been proposed. A causal relationship is supported by an increased incidence of these tumours in survivors of the atomic bombings in Japan (Seyama *et al.*, 1981) and also in patients who had had radiotherapy to the scalp for tinea capitis in post-war Israel (Modan *et al.*, 1974).

Case report

A 41 year old man presented with a grand mal fit. He had persistent post-ictal dysphasia and mild right brachiofacial weakness, and a large skin graft with some warty naevus tissue above was noted on the left temple. There were no stigmata of Van Recklinghausen's disease or other phakomatosis, and physical examination was otherwise normal. There was no family history of cutaneous, neurological, or any other disorder. His childhood records were obtained, and revealed that prior to excision and skin grafting he had had two courses of radiotherapy to the lesion on his temple, 30 years previously. The histology of the excised lesion was re-examined, and this showed a sebaceous naevus (and not a melanoma as had been suspected when he was a child). The remaining naevus was biopsied and again showed sebaceous naevus.

The radiotherapy had been given in the form of γ irradiation from direct application of radium. Firstly to a 33 cm² area of the temple and cheek over 79 hours with a calculated dose of 6000 rads. The following year the lesion had appeared to grow and was therefore excised with skin grafting. Five years later a recurrence of dark warty tissue above the graft was treated in a

similar fashion to the first treatment with a further 6000 rads to a 12 cm² area over the upper temple and into the hairline. It can be calculated that the meninges about 1 cm below would receive around 1500 rads. The patient had been discharged well from radiotherapy follow-up after 15 years.

A computed tomographic scan showed a tumour overlying the left frontal region (Figure 1). A craniotomy was performed and the tumour which proved to be a meningioma was excised whole, with one or two nodules which were embedded in the brain (Figure 2).

The tumour measured 4 × 2 × 2 cm. The histology was that of a vascular and syncytial meningioma. More than one area was clearly invading brain. There were up to 3 mitotic figures in one high power field, though most showed 0 or 1. There were several areas of necrosis and inflammation but no features of irradiation. Taken together it was felt that the appearances suggested the tumour may run a more aggressive course than usual even though the majority of the tumour cells appeared benign.

Discussion

There have been reports of meningiomas, as well as meningeal sarcomas (Bojsan-Moller & Knudsen, 1977) and less frequently gliomas (Anderson & Treip, 1984) occurring after a long time interval, in patients who had previously had cranial irradiation. These include treatments of cutaneous diseases such as in the large series of 11000 tinea capitis patients treated in post-war Israel with radiotherapy reported by Modan *et al.* (1974) and also port wine naevus (Bogdanowicz & Sachs, 1974). This tumour is also reported to follow radiotherapy for intracranial neoplasm such as pituitary adenoma (Spallone, 1982) and medulloblastoma (Iacono *et al.*, 1981).

The interval between the irradiation and diagnosis

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Figure 1 CT scan showing meningioma underlying previously irradiated area.

of the tumour is often, as in our case, very long: 15–30 years. If a causal relationship exists then one could expect further evidence from another group of irradiated patients – the survivors of the bombings of Hiroshima and Nagasaki, and this is indeed the case (Radiation Effects Research Foundation, Seyama *et al.*, 1981). In these patients the tumours – meningiomas as well as other intracranial neoplasms, occurred in significant excess in the group who received 100 rads or more at the time of the bombing. This is in fact a whole body dose and would have included more biologically active neutrons. It was estimated by Werner *et al.* (1968) that in the tinea patients, the dose absorbed by the brain was 140 rads (this treatment employed a superficial X-ray

Figure 2 Post-operative appearance showing skin graft and remaining naevus treated 30 years previously with radiotherapy.

machine). The dose of around 1500 rads in the case described above was higher than in these two groups of patients. It is interesting that males seem more susceptible than females, it being only males affected in Japan and there being more males than females affected in the Israeli cases.

It seems that meningioma should be added to the growing list of tumours which may be induced by ionizing radiation.

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