Successful identification and management of a SMART syndrome occurring 36 years after cranial radiotherapy

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For such a report no inform consent was needed.

Background

Radiation therapy (RT) is a cornerstone in the management of brain tumors.
SMART syndrome (stroke-like migraine attacks after RT) is a rare neurological disease believed to be a late-onset side effect of cranial RT and consists in stroke-like symptoms, epileptic seizures and migraine (Dossin et al., 2023; Shuper et al., 1995). This syndrome has been observed within a timeframe of 1 to 37 years after RT. Pathophysiology is believed to be multifactorial, involving white matter necrosis, vascular endothelial damage, demyelination, and gliosis (Ota et al., 2023; Turnquist et al., 2020).
Here, we report a case of SMART syndrome which was successfully managed with steroid pulse therapy (1000 mg/day, 5 days).

Clinical setting

In October 2023, a 51-year old man was addressed to our neurology department after a sudden worsening of a known left hemiparesis, 38.2°C of body-temperature, and bilateral fronto-temporal headache. From being independent in daily life, the patient was now in a wheelchair.

Thirty-six years before (1987), he had been treated for a grade 2 oligodendroglioma of the right posterior thalamus (Fig. A). He underwent tumor biopsy, ventriculoperitoneal drainage for increase intracranial pressure, and 15 fractions of 2 Gy whole-brain RT followed by 12 fractions of 2 Gy sequential boost on the tumor region (Fig. B). After the treatment, he developed epilepsy treated with carbamazepine XR 400mg/d and gabapentin 400mg/d ever since.

Upon admission, the patient presented with severe left hemiparesis and left facial palsy. Soon after, he developed focal seizures of the left arm for which levetiracetam 1500mg/d was introduced, allowing for seizure resolution. Cerebrospinal fluid and blood analyses did not show any abnormality. Electroencephalography displayed right frontal slowing, without any epileptic activity. Ophthalmologic examination did not show any sign of intracranial hypertension.

Magnetic Resonance Imaging (MRI) showed T2 FLAIR hyperintensity of the right parieto-occipital cortex (Fig. C). T1 post-gadolinium sequence showed gyral enhancement in the same region (Fig. D). Diffusion-weighted imaging sequence did not show any abnormality.

He was consequently treated with steroid pulse therapy (1000 mg/d, 5 days) (Jia et al., 2018; Ota et al., 2023). On 4th day of treatment, he was able to walk again with a return to his basis state. Six weeks later, the patient condition was stable without any relapse. Strength on the left side was back to its initial level (i.e., slight paresis without any facial asymmetry). Control EEG was unchanged.Control MRI displayed complete resolution of the T1 and T2 abnormalities (Fig. E-F).

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Figure

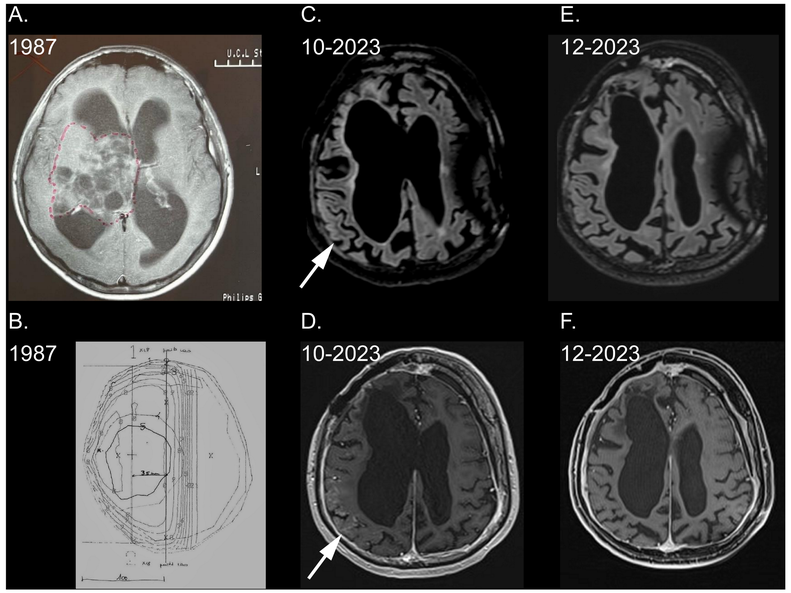

Figure A. T1 MRI sequence showing the tumour at the time of diagnosis (1987). B. Radiation dose distribution for the 24-Gy sequential boost (1987). C. T2 FLAIR MRI sequence showing hyperintensity of right parieto-occipital cortex (10-2023). D. T1 post-gadolinium sequence showing gyral enhancement (10-2023). E. T2 FLAIR MRI sequence showing vanishing of the hyperintensity of the right parieto-occipital cortex (12-2023). F. T1 post-gadolinium sequence showing disappearance of the gyral enhancement (12-2023).

Conclusion

In conclusion, we report here a case of SMART syndrome occurring 36 years after RT, which is one of the latest occurrences of this syndrome ever described (i.e., the longest being 37 years) (Ota et al., 2023). The patient was effectively managed with steroid pulse therapy, which allowed for complete resolution of the syndrome.
We believe that recognizing SMART syndrome in patients with a history of cranial RT, even after a prolonged period, is crucial to avoid misdiagnosis and subsequent improper treatment.