

## Olfactory neuroblastoma following treatment for pituitary adenoma

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**Abstract** Olfactory neuroblastoma is extremely rare as a second neoplasm. We report an unusual case of olfactory neuroblastoma in a 59-year-old woman who had undergone two operations and received 54 Gy of irradiation for pituitary adenoma 20 years ago. At the time of admission, the patient presented with nasal obstruction and frequent epistaxis. Imaging studies showed a large mass in the nasal cavities and ethmoid sinus, extending to the intracranial area, with no evidence of any recurrence of the previous pituitary adenoma. The tumor was completely excised via a trans-cranial and trans-nasal approach. A diagnosis of olfactory neuroblastoma was established, and the patient was given postoperative chemotherapy. Although relatively uncommon, second neoplasms are an important consideration in the differential diagnosis of patients with new or recurring symptoms after treatment for pituitary adenoma. Furthermore, it is likely that radiation played a critical role in the development of olfactory neuroblastoma in our patient.

**Keywords** Olfactory neuroblastoma · Pituitary adenoma · Radiation-induced neoplasm · Second neoplasm

### Introduction

The treatment outcomes of patients with brain tumors are improving because of recent advances in diagnostic and therapeutic modalities. However, patients are still at risk of

developing a second neoplasm, which is defined as another tumor arising in close proximity to, or remote from, the primary tumor at a different point in time and with an independent oncogenesis. In addition, the development of a second neoplasm may or may not be related to the treatment of the previous neoplasm, because genetic risk factors or other external carcinogens may also be involved.

The risk of a second neoplasm developing in patients treated for pituitary tumor is higher than that in the normal population [1, 2] and, in fact, a variety of second tumors such as glioma [1–4], meningioma [1, 4–7], ependymoma [5], primitive neuroectodermal tumor [4], and sarcoma [1, 4] have been reported in the literature. Radiation effects are generally accepted to be a crucial factor in the development of the second tumor, although the exact mechanism by which this occurs remains unclear [3, 8].

Here, we present an unusual case of olfactory neuroblastoma occurring in a patient 20 years after undergoing surgery, radiation, and bromocriptine treatment for pituitary adenoma and we also discuss the role of adjuvant therapy in tumor development.

### Case report

In 1984, a 36-year-old woman was diagnosed with pituitary adenoma. She underwent tumor resection via a transsphenoidal approach at a local hospital. Three years later, the patient was admitted to our institute with a recent history of headache and developed a visual field defect. Visual field examination showed bitemporal hemianopia. Imaging studies revealed tumor recurrence (Fig. 1). She was treated with subtotal tumor resection via a left frontal approach. Prolactinoma was confirmed by histopathological examination (Fig. 2). She received

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