Introduction

Pituitary adenoma is a common benign tumour in the brain. Recently, its incidence has increased annually, accounting for 15–25% of all intracranial tumours (1). Meningioma is another common intracranial tumour that accounts for 15–25% of all central nervous system neoplasms (2,3). However, the coexistence of pituitary adenoma and meningioma is extremely rare and is even rarer in patients with no previous history of irradiation. Here, we present a case of recurrent non-functioning pituitary adenoma and left temporal lobe meningioma in a patient without a previous history of irradiation. As far as we know, this appears to be the first description of the coexistence of recurrent non-functioning pituitary adenoma and meningioma in a patient with no previous history of irradiation. We present the following case in accordance with the CARE Guideline (4).
total T4, 48.52 nmol/L (reference range, 66.00–181.00 nmol/L); free T3, 2.80 pmol/L (reference range, 2.80–7.10 pmol/L); free T4, 7.59 pmol/L (reference range, 11.46–23.17 pmol/L); thyroid stimulating hormone (TSH), 4.11 μIU/mL (reference range, 0.30–5.50 μIU/mL); luteinizing hormone (LH), 3.63 mIU/L (reference range, 10.87–58.64 IU/L in postmenopausal women); follicle-stimulating hormone (FSH), 10.18 mIU/mL (reference range, 16.74–113.59 mIU/mL in postmenopausal women); prolactin (PRL), 16.74 mg/mL (reference range, 2.74–19.64 mg/mL in postmenopausal women); and growth hormone (GH), 0.22 ng/mL (reference range, 0.06–5 ng/mL). Neurological examination showed that the uncorrected visual acuity was 0.2 in the left eye and 0.3 in the right eye; visual field examination revealed patchy defects.

After discussion with the patient and the patient’s family members, the decision was made to resect the recurrent pituitary adenoma and the left temporal lobe tumour simultaneously. The patient underwent a left frontotemporal craniotomy, and total removal of the temporal lobe tumour and pituitary adenoma was achieved using a microsurgical technique. The postoperative computed tomography scan performed 6 hours after the surgery showed no evidence of residual tumours (Figure 2).

The histology of the saddle region tumour revealed that it was a pituitary adenoma, and the immunohistochemical results were as follows: Ki-67 (1%+), Syn (+), CgA (+), CK8/18 (−), adrenocorticotropic hormone (ACTH) (−), GH (−), PRL (−), FSH (partly +), LH (−), and TSH (−) (Figure 3A). The histology of the temporal lobe tumour revealed that it was a meningioma of transitional type (Figure 3B).

After the surgery, the patient showed improvement in her lack of alertness and speech confusion. The visual impairment was slightly improved. Postoperatively, the patient was found to have hormonal dysregulation and needed thyroid hormone replacement therapy. She was
discharged with no significant neurological deficits. The timeline picture of the patient was shown in Figure 4.

**Discussion**

The coexistence of a pituitary adenoma and an intracranial meningioma is a very rare event (5,6), especially in patients with a history of pituitary adenoma and without a history of previous irradiation (7). Among the reported cases of coexistent pituitary adenoma and meningioma, planum sphenoidale, tuberculum sellae and the sphenoid wing meningiomas clearly predominate (5,7).

The aetiology of coexistent pituitary adenoma and intracranial meningioma is unknown. Coexistent meningiomas have been reported in patients with non-functioning pituitary adenoma, prolactinoma and Cushing disease after radiotherapy (8-10), but the coexistence of meningioma and these types of pituitary tumour has also been described in patients who were not previously irradiated (11), suggesting that the coexistence of meningioma and pituitary adenoma may not imply a relationship between the two diseases. Certain hormones, such as oestrogens and prolactin,
are recognised to have roles in stimulating the growth of meningiomas (12). In general, prolactinomas are the most common pituitary adenomas, but GH-producing tumours are the most commonly secreting adenomas that are found co-occurring with meningiomas (7). This evidence indicates that GH or somatostatin may stimulate the dura and arachnoid cells and may play roles in the occurrence or growth of meningioma (13); however, this statement has yet to be proven. In addition, it is possible that genetic alterations shared by these two tumours on the same chromosomes may explain their simultaneous occurrence (14-16).

The coexistent pituitary adenoma and intracranial meningioma in one patient presented a surgical and management challenge. In most previous reported cases, the coexistent pituitary adenoma and intracranial meningioma were managed independently, usually involving addressing the pituitary adenoma with a transsphenoidal approach and treating the meningioma separately with conservative measures or another surgical approach. When the pituitary adenoma and meningioma are contiguous, they can be removed in a one-stage operation using a single pterional approach or an endoscopic expanded endonasal approach. Compared to the surgical treatment of a single pituitary adenoma or meningioma, any of these surgical approaches have significant increases in the level of risk involved. Thus, adequate knowledge of the coexistent pituitary adenoma and meningioma is a very important precondition to planning the appropriate surgical approach and avoiding severe surgical complications.

Here, we present a case of recurrent non-functioning pituitary adenoma and temporal lobe meningioma in a patient without previous irradiation. To our knowledge, this is the first description of the coexistence of recurrent non-functioning pituitary adenoma and meningioma in a patient with no previous history of irradiation. In this case, we resected the recurrent pituitary adenoma and the meningioma simultaneously. The simultaneous removal of two tumours carries a higher risk than resection of the pituitary tumour and meningioma in two stages. Finally, the patient was discharged with no significant neurological deficits. There are two limitations to this study. First, the medical records and imaging data for the first operation were missing. Second, as similar cases are rare, the aetiology of coexistent pituitary adenoma and meningioma is unknown.

Conclusions
In conclusion, coexistent pituitary adenoma and temporal lobe meningioma is a very rare surgical entity, and diagnosis poses a therapeutic challenge. In this case, we used a single pterional approach for both tumours. The results prove that the treatment is feasible. The aetiology of coexistent pituitary adenoma and intracranial meningioma is unknown, and more cases and additional studies are necessary to explain such unusual findings.
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