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# Lytic skull metastasis secondary to thyroid carcinoma in an adolescent

## 青春期甲狀腺癌二次細胞溶解的頭顱轉移

We report an unusual case of skull metastasis secondary to thyroid carcinoma in an adolescent girl. The 18-year-old presented with an occipital scalp swelling of 5 years' duration. She reported having thyroid surgery in mainland China 10 years previously. Radiological investigations on presentation demonstrated a lytic hypervascular skull lesion. Preoperative angiography and embolisation was followed by surgical excision. Pathological examination showed the lesion to be a thyroid carcinoma with a predominantly follicular pattern and a completion hemithyroidectomy was subsequently performed. Computed tomography of the thorax showed small micronodules in both lung fields compatible with metastases. The patient was given whole body iodine-131 internal radiation treatment and subsequently commenced thyroid-stimulating hormone-suppressive treatment with thyroxine. The management of thyroid carcinoma and subsequent skull metastasis in children and adolescents is reviewed and controversial points are highlighted.

我們報告了一個關於青春期少女的甲狀腺癌二次頭顱轉移的不尋常病例。患者18歲出現枕骨頭皮腫脹，歷時五年。她自訴十年前在中國大陸作過甲狀腺手術。放射檢查證明腦骨有細胞溶解酶的血管過多損傷。外科手術前進行了血管造影和栓化，然後實施了外科切除。病理檢查顯示傷害是前顯性小囊式甲狀腺癌，隨後作了完整的單側甲狀腺切除手術。電腦化的胸腔X光斷層攝影顯示在兩肺區有與癌轉移一致的小微節。對患者作了全身碘131內輻射治療，接用甲狀腺素進行了甲狀腺刺激素抑制治療。本文回顧了甲狀腺癌和兒童及青春期併發的腦轉移的治療處理，並闡述了具爭議的不同觀點。

### Key words:

Neoplasm metastasis;  
Occipital bone;  
Skull neoplasms;  
Thyroid neoplasms

### 關鍵詞：

瘤轉移；  
枕骨；  
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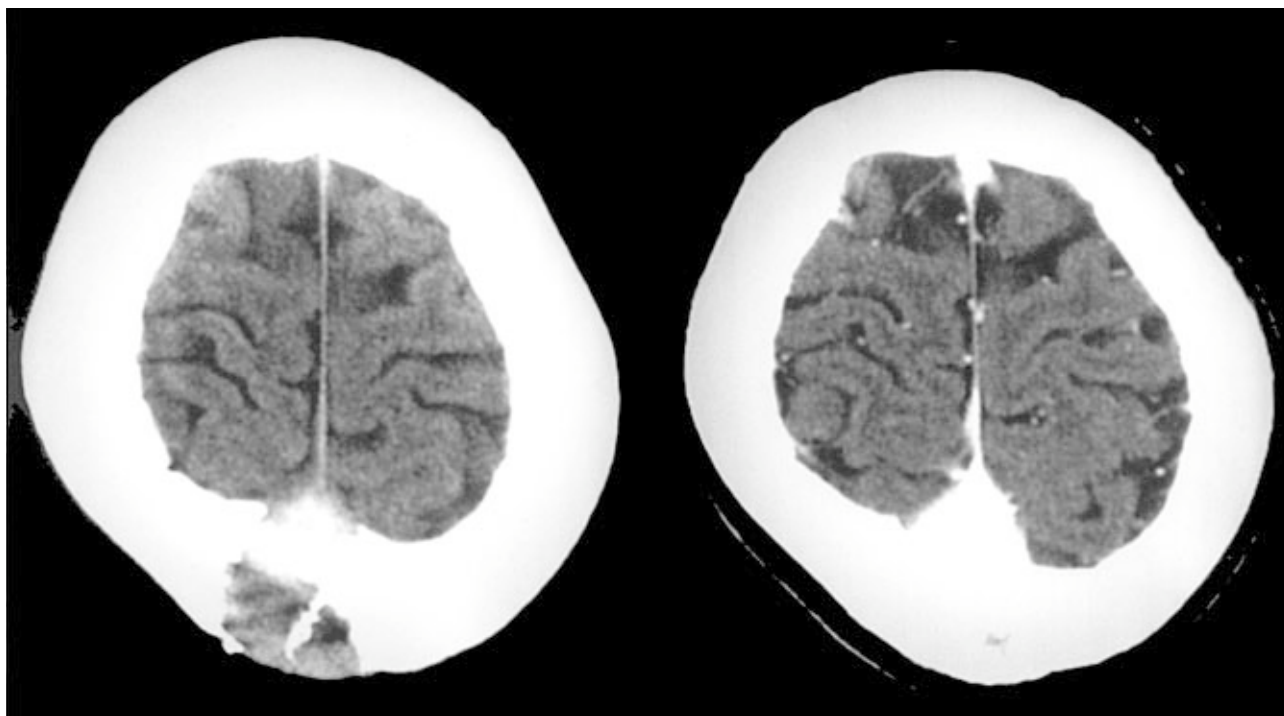
### Introduction

Skull metastasis must be kept in mind when considering the differential diagnosis of a skull tumour. We report the case of an 18-year-old girl with a metastatic thyroid follicular carcinoma of the skull.

### Case report

The 18-year-old patient presented with a swelling in the occipital region of the skull. She reported a history of thyroid surgery for a benign thyroid nodule when she was 8 years old. No adjunctive treatment was given for the thyroid lesion. The patient had remained well until 5 years before presentation when she incidentally noted the swelling which then gradually increased in size over the following 5 years.

On presentation, the patient was clinically euthyroid. She had a thyroidectomy scar but no abnormal thyroid mass or palpable cervical lymph nodes. A 4-cm hard mass attached to the midline occipital skull bone was evident. No thrill or bruit were detected on cardiovascular examination. Blood results, including a complete blood count, erythrocyte sedimentation rate, calcium/phosphate level, and thyroid function tests, were all within normal limits. Computed tomography (CT) of the head demonstrated a lytic lesion through both inner and outer tables of the skull with marked contrast enhancement (Fig 1). Magnetic resonance imaging showed an extradural lesion and a displaced but patent superior sagittal



**Fig 1. Computed tomography scan of the head shows a lytic skull lesion (left) that enhanced with contrast (right)**

sinus. Digital subtraction angiography demonstrated that the tumour was predominantly fed by the middle meningeal and occipital arteries.

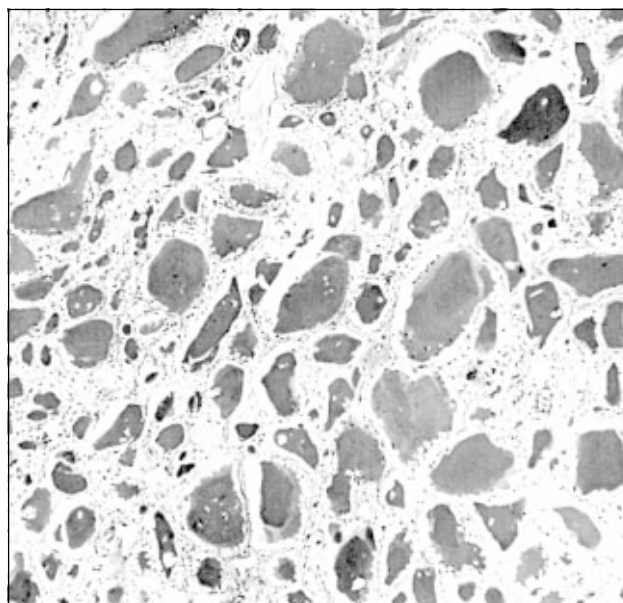
The lesion was embolised using Ivalon particle (150–250  $\mu$ m) embolisation to the major feeders. Gross total removal of the tumour was subsequently performed. Histological examination of the tumour revealed a metastatic thyroid carcinoma with a predominantly follicular pattern (Fig 2). Microscopic section showed sheets of tumour cells with distinct acinar formation filled with colloid. Tumour cells were round to irregular and occasional grooved nuclei were seen. The tumour cells stained strongly positive for colloid.

The patient underwent a completion left hemithyroidectomy 1 month later. Histological findings were normal. She had a whole body radioactive iodine scan that showed two possible foci of pelvic metastases. Chest X-ray was normal but CT scanning of the thorax showed multiple well-defined nodules in both lungs, predominantly distributed in the periphery of both lung bases. One of these lesions showed calcification. Features were compatible with lung metastases from thyroid carcinoma. The patient was given whole body iodine-131 (I-131) internal radiation, followed by thyroid-stimulating hormone (TSH)–suppressive maintenance dosing with L-thyroxine. No radiotherapy was given to the skull as there was no evidence of recurrence/residual disease at the cranial operative site.

## Discussion

Thyroid carcinoma accounts for 1% of all thyroid tumours.<sup>1</sup> Bone metastasis occurs in 10% to 40%, with skull

metastasis accounting for 2.5% to 5.8% of bone metastases. The mean age of presentation in a case series of 12 patients reported was 60 years and a female preponderance was seen.<sup>1</sup> Only one paediatric case has been reported in the literature.<sup>2</sup> Presenting features usually include a palpable scalp tumour, though unusual presentation with exophthalmos, disturbance of consciousness, hemiparesis, and headache have all been reported.<sup>1</sup> Patients usually have a long clinical course before the diagnosis of skull lesion (mean of 23 years after the initial thyroid surgery)<sup>1</sup> and a relatively short survival after diagnosis of the lesion. Anatomically,



**Fig 2. Microscopic examination of the tumour shows a thyroid carcinoma with a predominant follicular pattern. Sheets of tumour cells with distinct acinar formation can be seen filled with colloid (H&E, x200)**

skull metastatic lesions are most frequently located over the occipital region, with only four cases reported on the skull base to date.<sup>3</sup> Skull metastatic lesions were found to be osteolytic on skull X-ray and CT scan, and highly vascular on angiographic assessment, with feeders mainly from branches of the external carotid arteries.<sup>1</sup> Histological examination commonly reveals follicular carcinoma, usually well-to-moderately differentiated, but occasionally a mixed follicular-papillary pattern has been noted. Galectin-3 has been shown to be a reliable immunocytochemical marker for malignant thyroid cells and thyroglobulin a well-established marker for differentiated thyroid carcinoma.<sup>4</sup>

The differential diagnosis of metastasis should always be considered when a lytic skull lesion is identified, even in the young patient.<sup>2</sup> Multiplicity, irregular edges, and absence of peripheral sclerosis should arouse suspicion of malignancy and a biopsy is warranted in these cases. Lung, breast, prostate, and thyroid are all possible sources of the metastasis.

A whole body I-131 scan is the standard scan to identify metastatic disease. The main problem with such scans, however, is potential hypothyroidism caused by thyroxine withdrawal, but scans now may be performed during recombinant TSH-stimulation without discontinuing thyroxine.<sup>5</sup> Other alternative scanning techniques include 99mTc-tetroformin, 99mTc-methoxyisobutyl isonitrile, and positron emission tomography. Lung metastases have been noted in between 10% to 28% of patients with lytic skull metastasis on presentation, and while most of the lung metastases concentrated I-131, more than half of these lesions were not seen on X-ray.<sup>6</sup>

The treatment of children and adolescents with differentiated thyroid carcinoma is more controversial than the treatment of adults because there is no well-defined protocol for this patient group. On initial patient presentation with differentiated thyroid carcinoma, surgery is the treatment of choice,<sup>7</sup> but there is no consensus concerning the optimal procedure. Some surgeons perform a total or near-total thyroidectomy with cervical lymph node dissection if metastasis is present, whereas other surgeons favour sub-total thyroidectomy. Children are more likely to experience complications as a result of surgery than adults. Thus, there are reservations about performing extensive surgery, especially considering that mortality rates associated with thyroid carcinoma in children and adolescents are very low.<sup>8</sup> Total thyroidectomy has the advantage of complete clearance of any tumour foci in the thyroid and facilitates the use of thyroglobulin as a marker and the use of

radioactive iodine scanning for any recurrence/metastasis. Indications for postoperative I-131 therapy in children and adolescents are also debated, but many clinicians would recommend whole-body I-131 scanning and ablation of the thyroid remnant with 30 mCi of I-131. Thyroxine should be given in sufficient dosage to maintain serum TSH concentrations in the low-normal range.<sup>9</sup> Failure to provide such treatment in this case may explain the development of metastases.

The best treatment for the subsequent skull metastasis seen remains to be determined but current literature favours excision of the skull lesion, thyroid tissue ablation, and TSH-suppressive maintenance dosing with L-thyroxine. Biopsy followed by radiotherapy and I-131 internal radiation are other treatment options recommended for highly vascularised metastatic skull tumours.<sup>10</sup> The outcome for these patients is poor. A median survival of 4.5 years was noted in a case series of 12 patients in the 1950s to 1970s.<sup>1</sup> A more recent case series has reported a 40% 5-year survival in patients with follicular thyroid carcinoma metastasis.<sup>3</sup>

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