

## Skull Metastasis from Papillary Thyroid Carcinoma: Case Report and Literature Review

Kerouach A<sup>1\*</sup>, Hali F<sup>1</sup>, Bertal A<sup>2</sup>, Chadli A<sup>3</sup>, Guebessi NB<sup>4</sup>, Regragui M<sup>4</sup>, Guensi A<sup>5</sup> and Chiheb S<sup>1</sup>

<sup>1</sup>Department of Dermatology and Venereology, IBN Rochd University Hospital, Casablanca, morocco

<sup>2</sup>Department of Neurosurgery, IBN Rochd University Hospital, Casablanca, morocco

<sup>3</sup>Department of Endocrinology, IBN Rochd University Hospital, Casablanca, morocco

<sup>4</sup>Department of Pathology, IBN Rochd University Hospital, Casablanca, morocco

<sup>5</sup>Department of Nuclear Medicine, IBN Rochd University Hospital, Casablanca, morocco

### \*Corresponding author:

Kerouach Amal,  
Department of Dermatology and Venereology,  
Morocco, E-mail: am.kerouach@gmail.com

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## 1. Abstract

**1.1. Introduction:** Although papillary thyroid carcinoma is a relatively common form of malignancy, metastatic spread to the skull is exceptional. Here, we report a case of papillary thyroid carcinoma revealed by frontal skull metastasis.

**1.2. Case Presentation:** A 74-year-old woman presented with a 8-month history of a growing mass in the frontal bone, initially thought to be a meningioma. A biopsy of the mass showed a tumor of thyroid origin. One month later, the patient underwent a total thyroidectomy. Pathological examination confirmed the diagnosis of papillary thyroid carcinoma with frontal skull metastasis.

**1.3. Clinical Discussion:** Papillary thyroid carcinomas are slow-growing subtypes of thyroid cancer and are typically associated with a favorable prognosis, unless they have distant metastasis. Lung and bone are the two most favored sites of metastasis. Bone metastasis from papillary thyroid carcinoma tend to be multiple and is most frequently located at the ribs, vertebrae and sternum. The skull is an unusual site for metastasis, which, when occurring, is most often situated in the occipital area and appears as a soft, non-painful lump

**1.4. Conclusion:** Skull metastasis must be considered at an early stage of the clinical course of papillary thyroid cancer. To facilitate this, patients need to be carefully examined by a multidisciplinary team to enhance their quality of life.

## 2. Introduction

Papillary Thyroid Carcinoma (PTC) is the most predominate thyroid cancer, comprising approximately 80-90% of all thyroid cancers newly diagnosed [1]. PTC is generally marked by an indolent clinical course compared to other differentiated and undifferentiated malignancies of the thyroid [2, 3]. Women are more affected than men. It can arise at any age, but most patients are in the 30-50 age range.

PTC frequently metastasizes to lymph nodes, particularly to cervical and mediastinal nodes (in 40% of cases) [1], whereas distant metastasis may rarely occur and accounts for 9-10% during follow-up [2], reflecting a poor prognosis with a decreased survival rate of 37% and 24% at 5 and 10 years respectively [4].

The most frequent sites of distant metastases are lung (49%), bone (25%), and central nervous system (12%) . Bone metastases are most likely to occur in the scapula, sternum, and ilium. However, metastasis to the skull is exceptional, occurring in only 2.5-5.8% of thyroid carcinoma cases [5].

To date, only few cases of skull metastasis from PTC have been described. In this article, we report a case of a patient who presented initially with frontal Skull metastasis from an undiagnosed primary PTC and review the reported cases of PTC with skull metastasis.

### 3. Case Presentation

A 74-year-old woman was admitted in our Hospital with a eight month history of a growing well circumscribed mass on the left frontal region of the scalp. A personal medical history of previous malignancy, radiotherapy exposure, surgery, and diabetes were denied .

Physical examination showed a 6 cm × 6 cm, firm and immobile mass of the frontal area (figure 1a), There was no evidence of any other swellings in the body and no lymphadenopathy or enlarged thyroid gland. Neurological function and visual acuity were both normal. Systemic examination was unremarkable. Laboratory studies, including tumor markers, showed no abnormalities except for increased serum thyroglobulin (515 ng/mL) and anti-thyroglobulin antibody levels (19 IU/mL). All vital signs were normal.

Head Computed Tomography (CT)-scan showed an aggressive and osteolytic mass of the left frontal vault, heterogeneous with necrotic and haemorrhagic changes (Figure2a), a complementary brain MRI showed an exophytic mass with bone and meningeal invasion. The mass biopsy revealed an infiltration of papillary carcinoma to the bone .

Neck ultrasonography showed a multiheteronodular goiter with a

4 cm hypoechogenic nodule with irregular contours and calcifications in the right lobe (figure 2b), and multiple spongiform nodules, the biggest one measuring 3.5 cm in the left lobe. Fine-Needle Aspiration (FNA) biopsy was performed , showing clusters of oval neoplastic cells with purple squamoid cytoplasm and oval nuclei. Total thyroidectomy was then performed and showed branching papillae having a dense fibrovascular core covered with cuboidal epithelial cells that have nuclei with a clear ground glass appearance, compatible with a PTC.

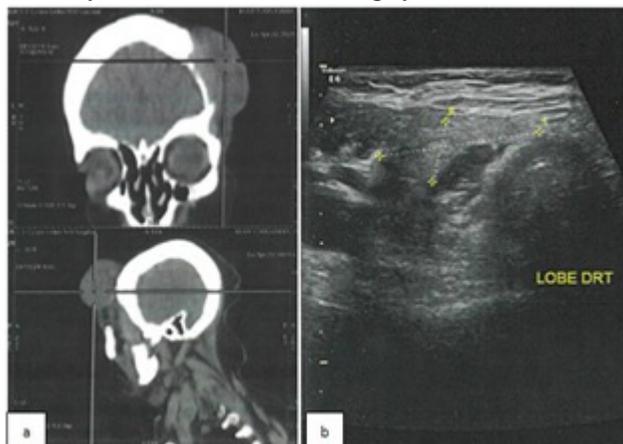
Exeresis of the left frontal tumor was then performed, peroperative aspect of a highly vascularised soft lesion, infiltrating the bone at the base, parenchyma and meninges were intact .Histopathology examination showed the similar histology of the thyroidectomy specimen, in accordance with a cranial localization of papillary thyroid carcinoma, then a TEPscan was performed showing no other suspect lesions.

The patient received suppressive doses of L-thyroxin postoperatively. Adjuvant radioiodine treatment using 100 mCi of <sup>131</sup>I, given orally to treat the skull base metastasis, caused no discomfort or clinical symptoms. At present, the patient is alive 2 years after surgery, without evidence of recurrence or metastasis during (figure 1b).



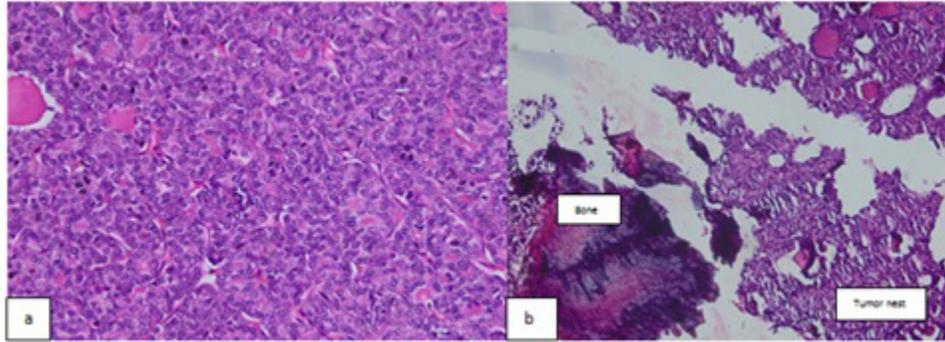
**Figure 1a:** Clinical presentation at diagnosis; Left frontal tumefaction

**Figure 1b:** 1 year after the frontal mass surgery



**Figure 2a:** head Computed Tomography (CT) scan exhibiting a large immobile tumor (60\*30\*55 mm) with hypervascular and osteolytic destructive features, invading the left frontal skull

**Figure 2b:** Neck ultrasonography revealed revealed hypoechoic lesion of 4,06 cm lesion in the right thyroid lobe, with irregular borders and calcifications



**Figure 3a:** Histopathological report of biopsy from the thyroid lesion revealing branching papillae having a dense fibrovascular core covered with cuboidal epithelial cells that have nuclei with a clear ground glass appearance.

**Figure 3b:** infiltrating papillary tumor cells in the frontal skull bone

#### 4. Discussion

Bone metastases from thyroid carcinoma is the second most usual site after lung [6, 7]. The common primary sites of skull metastatic tumors are lung, breast, and prostate [6]. Skull metastasis from thyroid carcinoma are uncommon, and there are only few reports in the literature. The largest series by Nagamine et al. reported 12 cases (2.5%) of skull metastases in a series of 473 patients with thyroid carcinoma [7]. They are most commonly situated in the

occipital region and appear as a soft, painless mass [6, 7]. Due to their rare occurrence, PTC metastasis in the skull can easily be mistaken for other skull tumors, including meningioma, schwannoma, chondrosarcoma, and paraganglioma, as was the case in our patient [8].

The vast majority of skull metastasis from thyroid carcinoma is of the follicular subtype [7]. Only few cases of skull metastasis from papillary thyroid carcinoma have been published, four of which were located in the frontal region (Table 1).

**Table 1:** Summary of reported cases with skull metastasis from papillary thyroid carcinoma

| Author                   | Age/Sex | Metastatic site       | Treatment                           |
|--------------------------|---------|-----------------------|-------------------------------------|
| Nagamine et al. (1985)   | 71/M    | Parietal and temporal | Surgery, 131 I                      |
| Lin et al. (1997)        | 75/F    | Occipital             | NS                                  |
| Coconu et al. (1998)     | 67/M    | Parietal              | Surgery                             |
| Kusunoki et al. (2003)   | 70/F    | Parietal              | Surgery                             |
| Miyawaki et al. (2003)   | 55/F    | Parietal              | Surgery, 131 I                      |
| Tetsuo et al. (2006)     | 74/F    | Frontal               | Surgery, 131 I                      |
| Feng et al. (2009)       | 60/F    | Frontal               | Surgery                             |
| Mostarchid et al. (2010) | 50/F    | Temporooccipital      | NS                                  |
| Nigam A et al. (2012)    | 48/F    | Occipitoparietal      | Surgery, chemotherapy, radiotherapy |
| Hugh SC et al. (2011)    | 64/F    | Temporal              | Surgery, radiotherapy               |
| Houra K et al. (2011)    | 76/F    | Frontal               | Surgery                             |
| Li et al. (2013)         | 61/F    | Frontal               | Surgery, 131 I                      |
| Dukhabandhu Naik (2018)  | 38/F    | Frontoparietal        | Surgery, 131 I                      |

The mean period from the initial diagnosis of thyroid papillary carcinoma until the detection of skull metastasis is 23.3 years [11], whereas in our case both were diagnosed simultaneously. The identification of skull metastasis should therefore be envisaged in all cases of papillary thyroid carcinoma as early as possible

Prognosis in the case of metastasis is usually poor and the 10-year survival with bone metastasis from differentiated thyroid cancers is reported to be 27% [9]. Tickoo et al. related that the overall 5- and 10-year survival probabilities after the bone metastases of thyroid carcinoma were 29% and 13%, respectively [10]. For skull metastasis, the average survival time is 4.5 years, ranging from 5 months to 17 years in a series of 12 patients including papillary and follicular thyroid carcinomas [7].

PTC has been observed to be associated with a rearranged form of the ret proto-oncogen on chromosome 10 [12] and PTC has been described in identical twins [13] and HLA identical siblings [14]. The first-line management for the metastatic thyroid carcinoma is

complete excision of the thyroid gland and as many of the metastatic lesions as possible [7]. Secondary radiation with 131I is indicated when a scintigram demonstrates uptake. The last option is administration of thyroid hormone to inhibit tumor growth by suppression of endogenous TSH

The main key to successful management of the skull metastasis of thyroid carcinoma is early diagnosis and adequate treatment. Skull metastasis should be explored early in the clinical course of papillary thyroid cancer. To facilitate this, patients should be carefully examined by a multidisciplinary team in order to improve their quality of life.

#### 5. Conclusion

Although reported as a very rare event, distant metastasis to the frontal skull can become the first presentation of a silent papillary thyroid cancer and need to be considered whenever a new hyper-vascular skull osteolytic lesion in the head region is found.

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