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## Esthesioneuroblastoma metastatic to the neck and lung: a case report and review of the literature

Sepúlveda Ison · Max Schorwer · Michael Frelinghuysen · Enrique Platin · Carolina Delgado · Francisco Mucientes

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**Abstract** Esthesioneuroblastoma (ENB) is a rare tumor of the olfactory epithelium that has been shown to metastasize mostly to the lymph nodes of the neck but more rarely to other locations. We report on a rare case characterized by distant metastasis to the neck and lung.

**Keywords** Esthesioneuroblastoma · Metastasis · Cervical · Lung · CT · MRI

### Introduction

Esthesioneuroblastoma (ENB) is a rare neoplasm of neuroectodermal origin that arises from olfactory epithelium in the upper nasal cavity at the level of the cribriform plate. These tumors have the potential to spread regionally but metastasize to the neck lymph nodes in approximately 10% of the patients. Hematogenous metastases are rare but may occur in bone, bone marrow, lung, or skin at the time of relapse.

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### Case report

We report on a 63-years-old male patient with medical history of sinonasal esthesioneuroblastoma. The patient was treated in 2013 with combined endoscopic/transcranial surgery and 4 weeks later received 70 Gy of radiation in 35 fractions (Fig. 1, 2).

On a follow-up study 3 months after treatment, a 5 cm nodal mass was discovered in the left cervical region. A computed tomography (CT) exam with contrast showed an expansive mass in the left IB and IIA ganglionic levels. Moderate enhancement was seen following intravenous contrast administration (Fig. 3).

The head and neck tumor board (HNTB) reviewed the findings and was categorized as esthesioneuroblastoma Kadish C staging system. Surgical resection of the tumor and a left selective supraomohyoid neck dissection treatment was decided and performed 15 days later; postoperative biopsy findings of the surgical specimen revealed esthesioneuroblastoma grade III (Hyams grading system) in the mass and in levels IB, IIA. Reirradiation was not performed because of limiting doses of the spinal cord (Fig. 4).

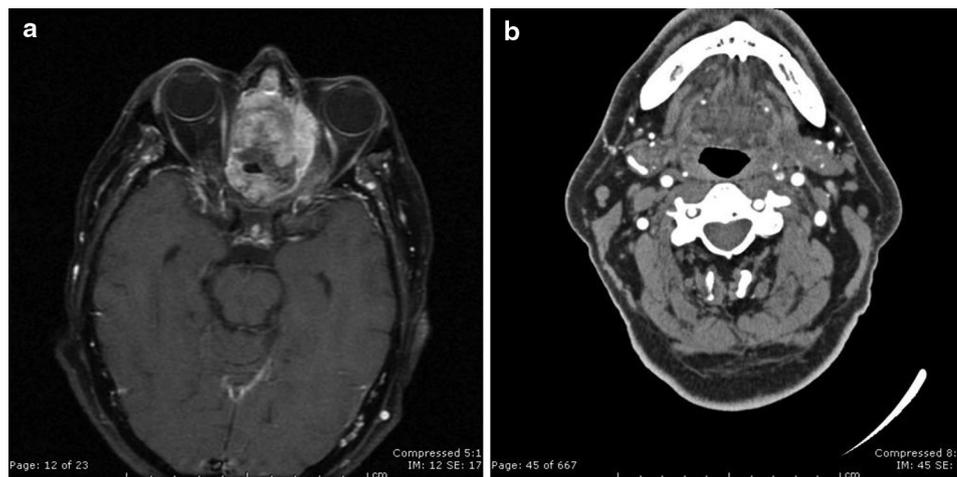
Following treatment, swelling of the right neck region was observed. Neck and chest CT examinations were performed showing an expansive mass in the right side of the neck and the presence of nodules in the left lung suggestive of metastasis. Following additional reviewed by the HNTB, surgical treatment of the neck was recommended followed by supportive care (Fig. 5, 6).

### Discussion

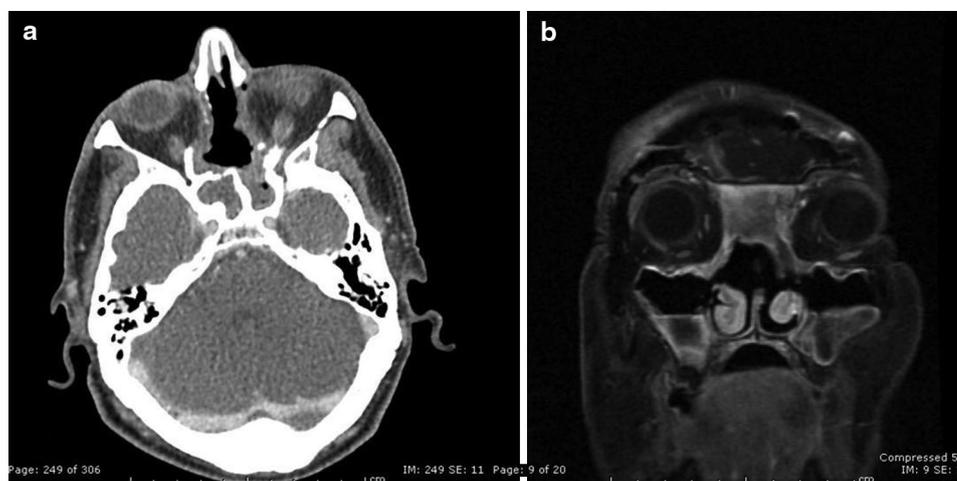
Berger et al. first described ENB in 1924 as esthesioneuroepithelioma olfactive. The tumor later received various names due to the lack of knowledge of its histological ori-

## case report

**Fig. 1** **a** Magnetic resonance imaging T1 fat sat and gadolinium showing a primary sino-nasal esthesioneuroblastoma. **b** Computed tomography after intravenous contrast injection showing absence of masses in the neck



**Fig. 2** **a, b** Computed tomography and magnetic resonance imaging control imaging study after treatment of the primary tumor



gin. However, only two terms have been used in recent publications, ENB and olfactory neuroblastoma [1–4].

This is a rare neoplasm of neuroectodermal origin that arises from olfactory epithelium in the upper nasal cavity at the level of the cribriform plate. It accounts for 3–6% of all intranasal tumors. The incidence peaks between the ages of 11 and 20 years of age and again between the 5th and 6th decade of life [2–9]. The symptoms and signs are characterized by nasal obstruction, epistaxis, headache, hyposmia, exophthalmos, and diplopia [6, 7, 9].

The development of ENB beyond the region where the olfactory epithelium exists is extremely rare. Only nine cases have been reported as esthesioneuroblastoma outside the cribriform plate. They include five cases in the sellar region, three cases in the sphenoid sinus, and one additional case in which the clinical details were unable to be confirmed. The etiology and pathogenesis of ENB is not fully understood. Herrold (1964) [10] and Vollrath et al. (1986) [11] induced ENB in the nasal cavity of hamsters by injecting nitrous derivatives. Other authors have proposed polyomavirus as responsible for its development [3]. Many genetic markers of neuroblastomas such as ploidy status, oncogene amplification, or allelic loss; have been correlated to its clinical outcome. A subset of patients with neuroblas-

toma has shown a predisposition for its development and this predisposition follows an autosomal dominant pattern of inheritance [12].

These tumors have the potential to spread regionally. Neck metastasis can occur either early in the disease or many years later. Metastasis of cervical lymph nodes occurs in approximately 10% of cases. Hematogenous metastases are rare but may occur in bone, bone marrow, lung, or skin at the time of relapse. Therefore, the possibility of a second primary tumor must be considered in the differential diagnosis of patients with new or recurring symptoms especially after having been radiated for pituitary adenoma [1, 7, 13–15].

One of the most reliable histologic features is their lobular architecture. The circumscribed lobules or nests are made up of “primitive” neuroblastoma cells and are usually located below an intact mucosa and in a vascularized fibrous stroma. Tumor cells are small, round, and blue [4, 9].

This tumor is staged using the Kadish staging system; worldwide it is the most widely staging system used et al., (1976) [16]. Stage A is limited to the nasal cavity, stage B involves the paranasal sinuses, and in stage C the tumor extends beyond the nose and paranasal sinuses as seen in our patient. Three types of direct intracranial extensions



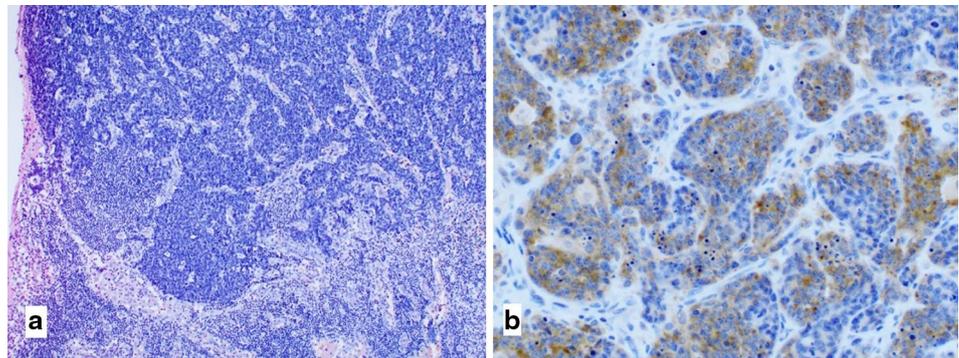
**Fig. 3** Computed tomography soft tissues window following intravenous contrast injection shows a cervical mass at the IB and IIA left ganglionic levels. The mass is compressing and displacing the sternocleidomastoid muscle, submandibular gland, and great vessels of the neck

by ENB can be found on CT and MRI, cranio-orbital-nasal communicating ENB, cranio-nasal communicating ENB; and orbital-nasal communicating ENB. ENB exhibits no specific appearance on MRI and CT imaging. The combined use of CT and MRI techniques is excellent in providing necessary information for treatment planning [1-4, 14, 17].

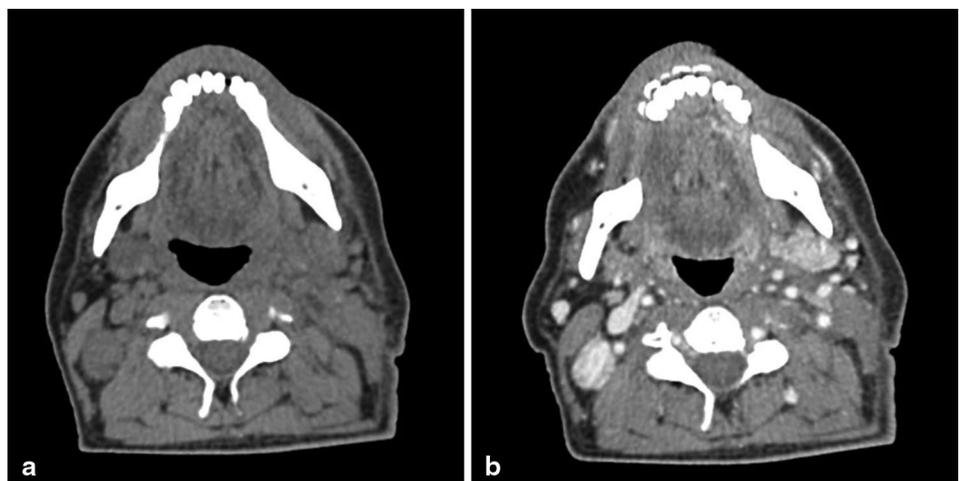
Using a CT bone window, the tumor displays bone remodeling such as dilation of the nasal cavity causing bone destruction and is observed especially in the cribriform plate. A CT with intravenous contrast shows a homogenous enhanced mass. T1-weighted magnetic resonance imaging with gadolinium contrast shows marked enhancement. Cysts in the intracranial tumor margin are highly suggestive of ENB [3-5, 9, 18].

The overall survival rate in patients with esthesioneuroblastoma has changed dramatically since Berger and Luc first described the disease in 1924 [19]. Today, the standard treatment is external craniofacial resection followed by postoperative radiotherapy. Surgery along with adjuvant radiation therapy alone or in combination with chemotherapy (for recurrent or advanced disease) has improved the long-term survival rate for tumors previously considered inoperable. However, local recurrence rates are high and are reported to be between 58 and 62% [1, 6-8, 14, 15, 17].

**Fig. 4** Esthesioneuroblastoma. **a** Hematoxylin and eosin stain. **b** Positive synaptophysin stain

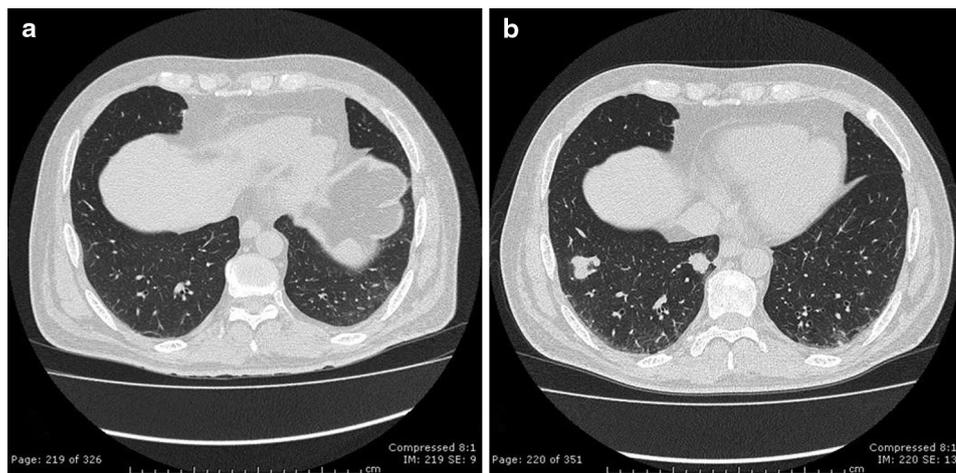


**Fig. 5** **a** Nodule isodense in IIB right ganglionic level. **b** Hyper enhancement following intravenous contrast administration



## case report

**Fig. 6** Showing comparative CTs **a** August 2014 showing no evidence of pulmonary nodules. **b** February 2014 showing multiple metastatic nodules in the left lung



## Conclusion

ENB is a rare neoplasm originating from the olfactory membrane of the sinonasal tract with a high incidence of local recurrence. Cervical metastasis of ENB, can occur either early in the disease process or many years later. Systemic metastasis is uncommon. The present case report highlights the unusual site of a metastasis from ENB to the lung. Imaging studies are helpful for making the diagnosis, and surgery is the treatment of choice for obtaining diagnostic tissue and debulking the tumor. Radiotherapy is also a mainstay of postoperative treatment.

## Conflict of interest

S. Ilson, M. Schorwer, M. Frelinghuysen, E. Platin, C. Delgado, and F. Mucientes declare that there are no actual or potential conflicts of interest in relation to this article.

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