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Case Study

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Ophthalmic manifestation of skull base metastasis from breast cancer

Authors' Contribution:
A Study Design
B Data Collection
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Summary

Background: There is a vast discrepancy between the incidence of skull base metastases reported *in vivo* and at autopsy. Asymptomatic character or unspecific symptoms make the diagnosis difficult, particularly in patients with no history of cancer. Our case illustrates a skull base metastasis from breast cancer, detected in a diagnostic process initiated by ophthalmologic examination.

Case Report: We report the case of a 53-year-old woman complaining of ptosis and diplopia, with concomitant loss of skin sensation within the right half of the forehead, and without any other worrisome symptoms or signs. Ophthalmic examination revealed impairment in eye movements, slight proptosis and corneal hypoesthesia on the right side, with normal pupillary light reflexes. The anterior and posterior segments of the eye were normal. Based on CT and MRI, an extensive tumor was detected, infiltrating the right orbit and the frontotemporal region of the skull base, and producing edema of the adjacent aspects of the brain. Aside from partial palsy of the oculomotor nerve and the ophthalmic division of the trigeminal nerve, no abnormalities were found on neurological examination. Explorative craniotomy and histopathological findings revealed a skull base metastasis from breast cancer.

Conclusions: Diplopia, ptosis, proptosis, and ophthalmic nerve sensory loss may be the only manifestation of a skull base metastasis. Careful ophthalmologic examination is crucial in early detection of this life-threatening condition.

key words: **skull base metastasis • metastatic breast cancer • ophthalmic manifestation • oculomotor nerve palsy • trigeminal nerve palsy**

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Background

In patients with systemic cancer, there is a vast discrepancy between the frequency of skull base metastases reported *in vivo* (4%) [1] and at autopsy (22%) [2]. This difference seems to be related to the fact that most of these metastases are either asymptomatic or their symptoms are unspecific, making the diagnosis difficult, particularly in patients without known history of cancer [1]. The most common primary sites of cancer are breast (21%), followed by lung, and prostate [2].

The size, location, and rate of growth, and not the character of the lesion itself, determine the clinical presentation of the skull base tumor. The signs and symptoms arise from the stretching of the dura, compression of cranial nerves, irritation (with resulting edema) of the adjacent brain tissue, and, rarely, occlusion of the dural venous sinuses. Greenberg et al. [3] described 5 clinical syndromes caused by skull base lesions. The orbital and parasellar syndromes are characterized by diplopia, supraorbital frontal headache, and sensory loss in the region of the ophthalmic nerve. Proptosis and decreased vision occur in the orbital syndrome. The clinical and radiological appearance of skull base metastasis sometimes mimic a primary lesion such as meningioma.

Early detection of skull base metastases is vital, as timely surgery may influence patient quality of life and rate of survival. Careful ophthalmologic examination may provide such an opportunity in a situation when the infiltration reaches the cranial nerves serving the visual system. In this account, we report the case of a patient with skull base metastasis, in whom ophthalmic examination helped in establishing the diagnosis.

Case Report

A 53-year-old woman presented to the ophthalmology emergency room with a 10-day history of ptosis and a 1-week history of diplopia. Additionally, she complained of skin numbness in the right half of the forehead up to the hairline, and dry eye on the right side. Aside from systemic hypertension and obesity, the medical history was unremarkable. Neither the patient nor the family noticed any other worrisome symptoms or signs, including psychological or psychiatric complaints.

On ophthalmic examination, eye movement assessment revealed elevation and slight adduction deficit, with proper depression and abduction (Figure 1). Proptosis (17 mm *vs.* 15 mm) and corneal hypoesthesia on the right side were noted. The patient had visual acuity of 20/20 and intraocular pressure of 17 mmHg on both sides, with normal pupillary reflexes, pupil diameter, and color vision. The anterior and posterior segments of the eye were normal; no signs of papilledema or venous stasis were observed.

Head CT and MRI (Figure 2) revealed an extensive abnormal mass within the right frontal sinus, penetrating to the

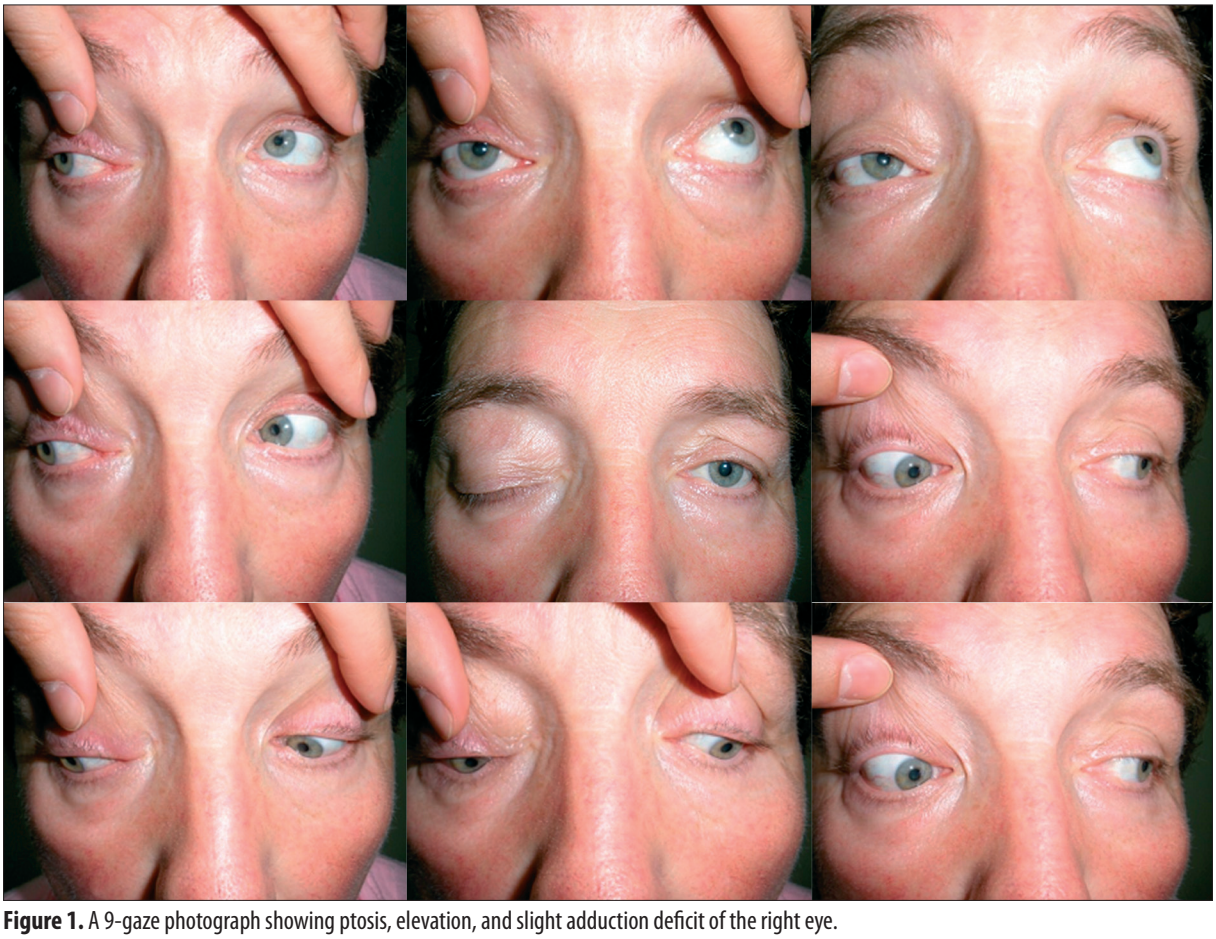

Figure 1. A 9-gaze photograph showing ptosis, elevation, and slight adduction deficit of the right eye.

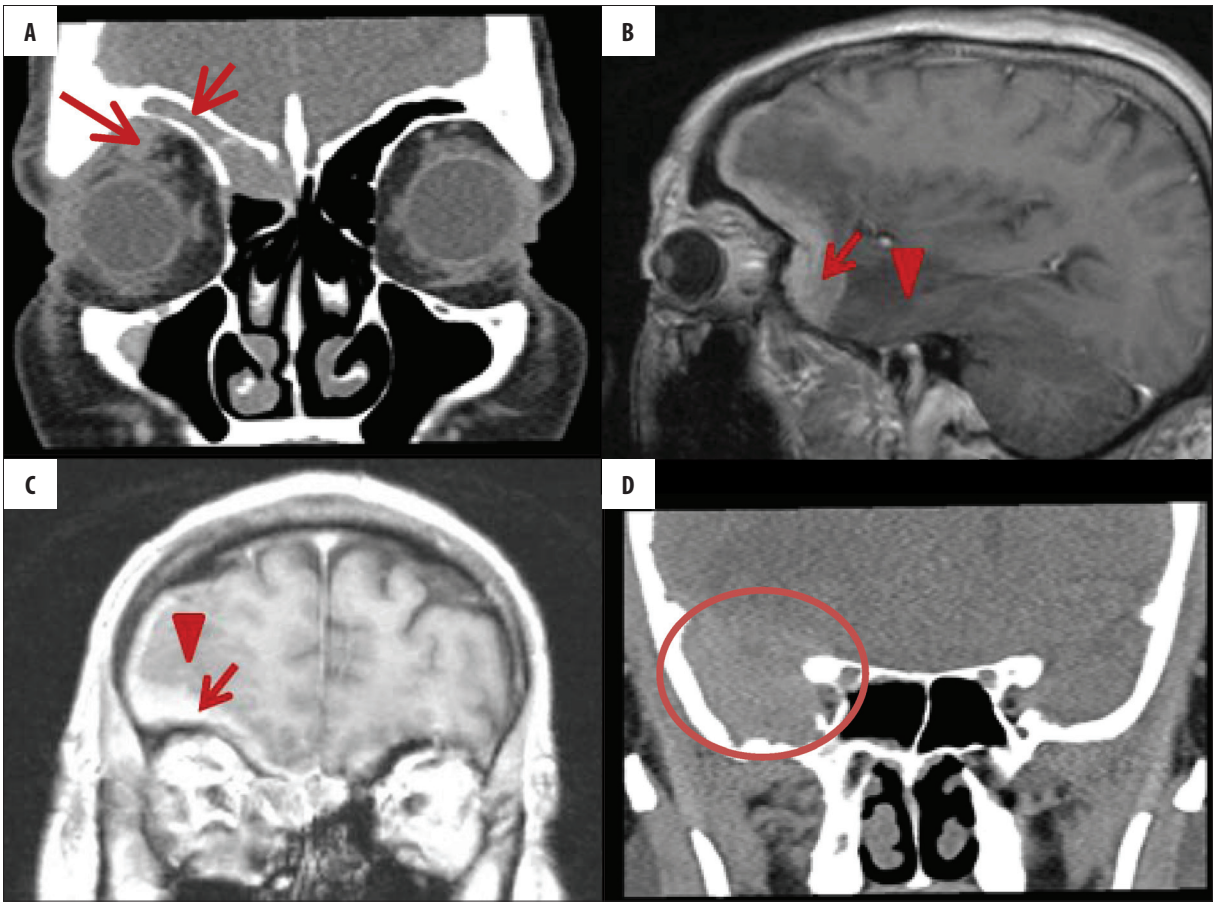

Figure 2. Head and orbit CT (**A, D**) and MRI (**B, C**) scans. (**A**), extensive abnormal mass within the right frontal sinus, penetrating to the orbit, adhering to the superior and medial recti muscles (arrows). (**B, C**), tumor stretching along the frontotemporal region of the skull base (arrows), causing massive edema of the adjacent aspects of the brain (arrowhead). (**D**), globular mass within the anterior aspect of the middle cranial fossa.

orbit, adhering to the superior and medial recti muscles, with no compression of the optic nerve. The mass infiltrated the medial-upper wall of the orbit, stretching along the orbital roof and causing its hyperostosis, thus appearing as a meningioma "en plaque". The lesion crossed the lesser sphenoid wing and formed a globular mass within the anterior aspect of the middle cranial fossa. The upper orbital fissure seemed not to be occupied by the tumor. The tumor caused massive edema of the adjacent aspects of the frontal and temporal lobes of the brain.

A comprehensive neurological examination was performed. Apart from partial oculomotor nerve palsy and palsy of the ophthalmic division of the trigeminal nerve, no abnormalities were detected. The level of CA 15-3, a tumor marker indicative of breast cancer, was elevated. Mammography and breast ultrasonography revealed a structure suggestive of cancer, but biopsy proved negative. Otherwise, the systemic screening was negative.

Explorative craniotomy was undertaken because meningioma "en plaque" was suspected and the symptomatic character of the lesion prompted a final diagnosis. Partial resection confined to the globular part of the lesion was achieved. Histopathological examination revealed breast cancer metastasis. The patient received palliative radiation therapy.

Discussion

In this case report, we would like to emphasize the role of the ophthalmologist as the professional responsible for initiating the diagnostic process. In spite of the extensive cranial base infiltration and concomitant brain edema, the patient presented signs and symptoms limited solely to partial involvement of the oculomotor and ophthalmic nerves. This was the only manifestation of an undetected skull base tumor.

The presence of ptosis and elevation deficit pointed to the palsy of the superior division of the oculomotor nerve. Furthermore, the region of hypoesthesia, involving the skin and cornea, as well as the dry eye, suggested a palsy of all 3 branches (frontal, nasociliary, and lacrimal) of the ophthalmic division of the trigeminal nerve. The elevation and adduction deficit, accompanied by proptosis, could be attributed to the mass effect within the upper and medial part of the orbit. Consequently, the signs and symptoms were consistent with orbital and parasellar syndromes.

Early and proper diagnosis of skull base tumors is of utmost importance in achieving effective treatment and survival. Despite the availability of advanced imaging techniques, there remains a vast discrepancy between the frequency of skull base metastases reported *in vivo* and at autopsy [2].

This discrepancy exists because clinical signs and symptoms of the anterior skull base infiltration are vague and highly unspecific. Some of these symptoms (such as diplopia, ptosis, proptosis, supraorbital frontal headache, and sensory loss in the region of the ophthalmic nerve) have been clustered into the orbital and parasellar syndrome. It should be noted, however, that familiarity with this symptomatology, especially of its potential etiological background, is not part of the common competence of the ophthalmologist. For that reason, awareness is fundamental. The possibility of a skull base tumor must be kept in mind among other, more frequent, causes of palsy of the nerves supplying the eye and the adnexa.

Conclusions

Orbital and parasellar syndromes consisting of diplopia, ptosis, proptosis, and sensory loss in the region of the ophthalmic nerve may be the only manifestation of a skull base metastasis. Careful ophthalmologic examination is crucial in early detection of this life-threatening condition.

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