METASTASIS TO THE UNILATERAL OCULOMOTOR NUCLEUS COMPLEX

Case report

Péricles Maranhão-Filho¹, Maria Elisa Paiva Pires²

ABSTRACT - This article describes a 76 years old man that, after lung cancer surgery, showed left extrinsic oculomotor paralysis and contralateral paralysis of the superior rectus muscle associated with bilateral ptosis. Magnetic resonance imaging confirmed a rare situation characterized by an isolated metastasis in the region of the left third cranial nerve nucleus, probably compromising the superior rectus subnucleus and the central caudal nucleus, therefore justifying the bilateral oculomotor involvement.

KEY WORDS: Cranial third nerve nucleus, metastasis, ophthalmoplegia.

Different kinds of lesions can compromise the third nerve nucleus¹,². Solitary metastasis to the brainstem is uncommon; isolated metastasis concerning the nucleus of the third cranial nerve is even rarer. Vertical eye movements are organized in the midbrain, with ipsilateral oculomotor paralysis and contralateral paralysis of the superior rectus muscle, when the third nerve nucleus is unilaterally damaged, associated with bilateral ptosis, when the lesion also affects the central caudal nucleus³.

The aim of this article is to report a rare case of bilateral oculomotor signs and magnetic resonance imaging (MRI) compatible with unilateral oculomotor nuclear metastasis.

CASE

A 76-year-old, right-handed man was admitted to the hospital because of coughing with hemoptysis, dyspnea, and chest pain. A broncoscopy revealed an epidermoid cell carcinoma in the right lung. A right inferior lobectomy with mediastinal linfadenectomy was done without intercurrences. Based on the TNM international staging system, his lung cancer was classified as T III N 0 M 0. Ten days later, he had a rapidly progressive bilateral ptosis. Examination revealed a lucid, oriented, and concerned patient, with cranial nerve III extrinsic palsy in the left eye and right ptosis associated with up gaze palsy (Fig 1). His pupils were of medium caliber, symmetric, and responded to light. He could forcefully close his eyes. The fundus oculis was irremarckable, and the remainder of the examination was unrevealing. He had no headaches, fever, or signs of intracranial hypertension. Electroencephalography examination was normal and the brain MRI demonstrated a lesion in the midbrain adjacent to the cerebral aqueduct, in the region of the left oculomotor nucleus (Fig 2). Radiotherapy was done, and after that, the patient physically deteriorated without changes in the oculomotor aspects, until his death one month later. Post Mortem, the patient’s daughter has formally given authorization for the publication of this case report.
DISCUSSION

Probably because of the fact that the brainstem comprises only about 2% of the weight of the total cerebral blood flow, solitary metastasis to the brainstem are rare, corresponding to only about 0.87% of central nervous system metastases. Otherwise, brainstem involvement as part of multiple central nervous system metastases was considerably more frequent, occurring 8% of the time. Even though Stevenson and Hoyt reported a bilateral ptosis and ophthalmoplegia caused by a metastasis to the midbrain in a case of breast carcinoma, and Chou et al. registered an isolated right rectus inferior muscle palsy by a metastasis to the homolateral oculomotor nucleus, there are few publications on tumor lesions to the nucleus of the third nerve and, when there are such publications, they usually involve adjacent structures.

Usually, brainstem metastases can be diagnosed on clinical grounds. The combination of progressive
cranial nerve palsies with “crossed” long-tract findings clearly identifies a disease in the brainstem⁴,⁵ and can produce severe conditions including coma, respiratory distress, dysarthria, dysphagia, motor weakness, and cranial nerve abnormalities⁷.

The clinical diagnostic problem is when small lesions affect the midbrain where the nuclei and fascicles of the oculomotor nerve lie in close proximity, and it is practically impossible to recognize, in this small area, what structure was affected. Currently, MRI findings may not provide sufficient resolution to differentiate between nuclear and fascicular lesions¹.

The initial understanding of the organization of the oculomotor nerve is credited to R. Warwick⁸, who, in 1953, microscopically observed retrograde degeneration in the oculomotor nucleus after extirpation of individual extraocular muscles in monkeys. He found that the third nerve nuclei are arranged in clusters that are specific for individual extraocular muscles. These groups of neurons have both a columnar and a dorsoventral arrangement. Subsequent studies based on radioactive retrograde tracer techniques⁹ have shown the same columnar arrangement, but with different nuclear motor pools.

Based on current knowledge of the anatomic organization of the oculomotor nucleus, it is possible to set certain criteria for diagnosis of nuclear third nerve palsy. When nuclear lesions affect the superior rectus subnucleus, elevation of both eyes is impaired. This is because axons from one superior rectus subnucleus cross and pass through the fellow subnucleus on the opposite side¹,⁸,¹⁰,¹¹. Thus, a lesion of one superior rectus subnucleus is effectively a bilateral lesion. Similarly, when lesions affect the central caudal nucleus, the result is bilateral ptosis. This is because the unpaired nature of the central caudal nucleus sits at the bottom of the oculomotor nuclear complex¹,⁸,¹⁰.

The organization of extraocular motoneurons shares many similarities among rats, monkeys, cats, and rabbits¹². Whether this precise arrangement is reproduced in humans is not yet known¹³. However, it is useful for the neurologist to know the clinical abnormalities of the eye movements that are visible at the bedside, since such signs can helpful for locating almost all the oculomotor disfuctions³.

**Acknowledgments** – The authors are in debt with Péricles Maranhão Neto for his technical assistance.

**REFERENCES**