

METASTASIS TO THE UNILATERAL OCULOMOTOR NUCLEUS COMPLEX

Case report

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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.

Metástase para o complexo nuclear oculomotor unilateral: relato de caso

RESUMO - O presente relato descreve um homem de 76 anos que, após cirurgia de câncer de pulmão apresentou paralisia oculomotora extrínseca à esquerda e paralisia contralateral do músculo reto superior, além de ptose palpebral bilateral. O exame de ressonância magnética evidenciou uma rara situação caracterizada por metástase isolada na região do núcleo do terceiro nervo craniano esquerdo provavelmente comprometendo o sub-núcleo do reto superior e o núcleo central caudal, justificando assim o envolvimento óculo motor bilateral.

PALAVRAS-CHAVE: Núcleo do III nervo cranial, metástase, oftalmoplegia.

Different kinds of lesions can compromise the third nerve nucleus^{1,2}. 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 bronchoscopy revealed an epidermoid cell

carcinoma in the right lung. A right inferior lobectomy with mediastinal lymphadenectomy was done without interurrences. 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 irremarcable, and the remainder of the examination was unrevealing. He had no headaches, fever, or signs of intracranial hypertension. Electroneuromyography 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.

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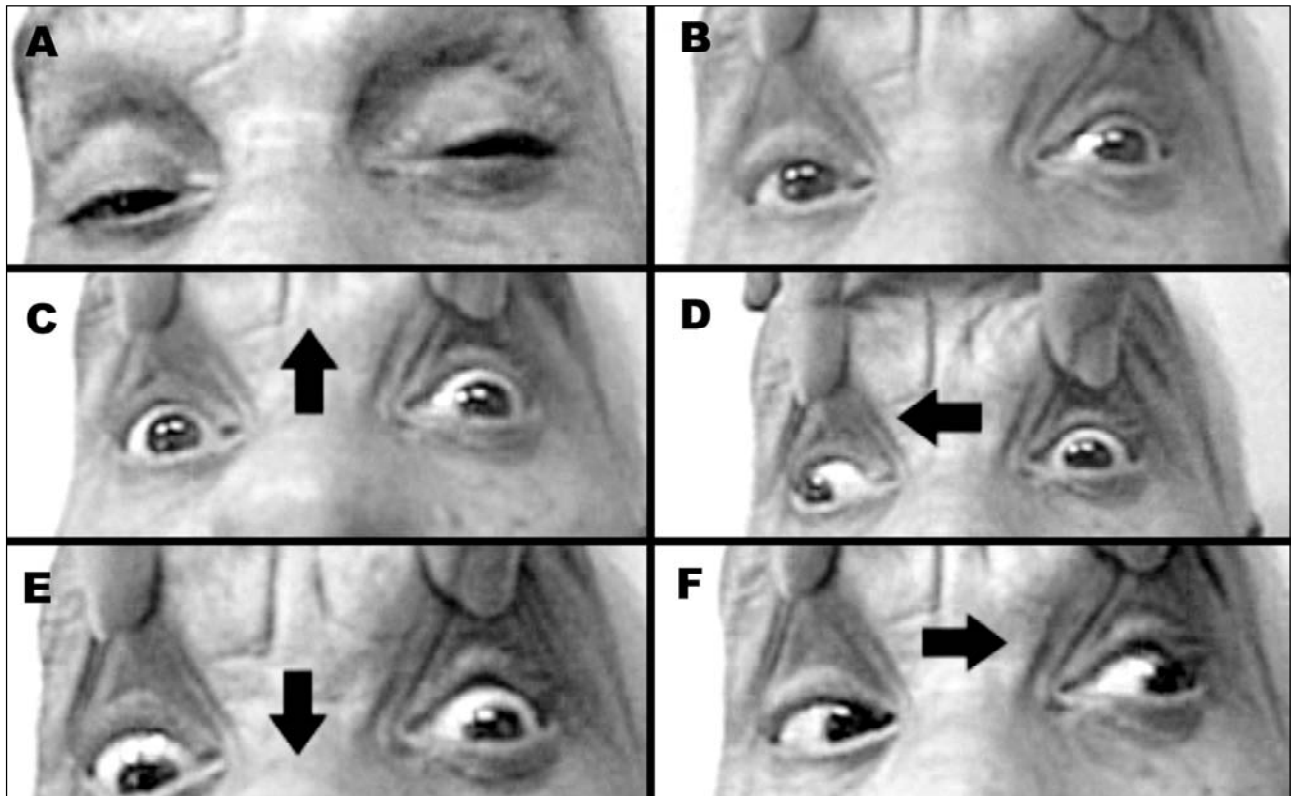


Fig 1. Bilateral ptosis with compensatory contraction of the frontal muscle (A), slightly left exotropia in the inert looking (B), reduced bilateral supraduction (C), and findings consistent with a left third cranial nerve palsy (D,E,F).

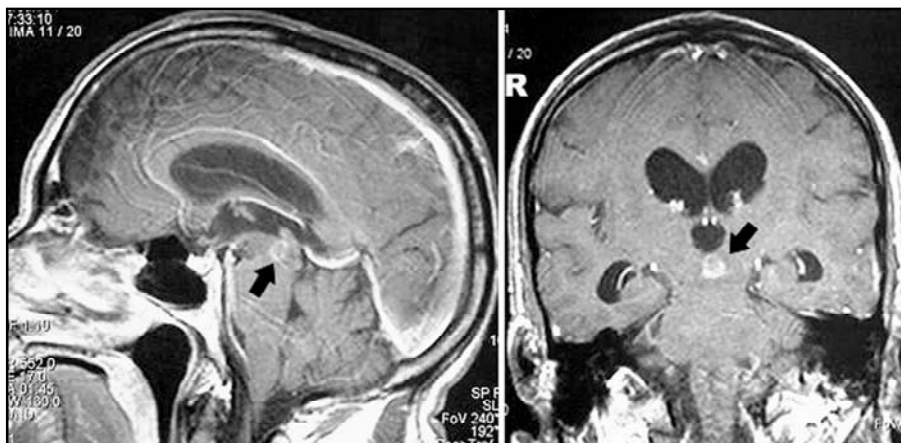


Fig 2. MRI with gadolinium. Sagittal slice T1-weighted image shows a ring enhancing lesion in the mid-brain adjacent to the cerebral aqueduct (arrow) (left). Coronal slice T1-weighted image shows the same lesion below the third ventricle (arrow) (right).

DISCUSSION

Probably because of the fact that the brainstem comprises only about 2% of the weight of the total cerebral blood flow⁴, solitary metastasis to the brainstem are rare^{4,5}, 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 time⁴. Even though Stevenson and Hoyt⁶ reported a bilateral ptosis and

ophthalmoplegia caused by a metastasis to the mid-brain in a case of breast carcinoma, and Chou et al.⁷ 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 nerve¹ and, when there are such publications, they usually involve adjacent structures⁵.

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 brainstem^{4,5} 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 side^{1,8,10,11}. 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 complex^{1,8,10}.

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 be helpful for locating almost all the oculomotor dysfunctions³.

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