

## ABDUCENS NERVE PALSY AS THE FIRST MANIFESTATION OF NASOPHARYNGEAL MALIGNANCY

### *(ABDUCENS NERVE PALSY SEBAGAI MANIFESTASI PERTAMA KEGANASAN NASOFARING)*

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### ABSTRACT

Abducens Nerve Palsy is the most common ocular motor nerve palsy because the abducens nerve runs a long course from the brainstem to the lateral rectus muscle. Abducens Nerves palsy can result from several etiology; common etiologies of abducens palsy in adults include vascular disease, inflammation, tumours, and trauma. Therefore, early diagnosis is essential for some conditions that cause sixth nerve palsy. The purpose of this paper is to describe an isolated sixth nerve palsy as a first manifestation of Nasopharyngeal Malignancy. A 46-year-old female came to Cicendo Eye Hospital complaining of double vision from one month earlier, which would disappear if one eye was closed. The patient was diagnosed with Right Eye Abducens Nerve Palsy, which was suspected to be caused by ischemic then was asked to do an ischemic blood test and referred to an Internal Medicine Specialist. Three months after symptoms appeared, the patient returned to the clinic without any improvement and underwent a CT scan of the head with

contrast and found an intracranial mass, suspected Nasopharyngeal Malignancy. Abducens nerve paralysis can be the first manifestation of a dangerous disease such as nasopharyngeal malignancy, so it takes awareness from every clinician when finding such cases.

**Keywords:** abducens nerve palsy; nasopharyngeal carcinoma

### **ABSTRAK**

*Kelumpuhan saraf abducens adalah kelumpuhan saraf motorik okular yang paling umum karena saraf abducens berjalan jauh dari batang otak ke otot rektus lateral. Kelumpuhan saraf abducens dapat diakibatkan beberapa etiologi, etiologi umum kelumpuhan saraf abducens pada orang dewasa termasuk penyakit pembuluh darah, peradangan, tumor, dan trauma. Oleh karena itu, diagnosis dini sangat penting untuk beberapa kondisi yang menyebabkan kelumpuhan saraf keenam. Tujuan dari makalah ini adalah untuk menggambarkan kelumpuhan saraf keenam yang terisolasi sebagai manifestasi pertama dari Keganasan Nasofaring. Seorang wanita berusia 46 tahun datang ke Rumah Sakit Mata Cicendo mengeluh penglihatan ganda dari satu bulan sebelumnya dan akan hilang jika satu mata tertutup. Pasien didiagnosis sebagai Kelumpuhan saraf abducens mata kanan yang diduga disebabkan oleh iskemik kemudian diminta untuk melakukan tes darah iskemik dan dirujuk ke Dokter Spesialis Penyakit Dalam. Tiga bulan setelah gejala muncul, pasien kembali ke klinik tanpa perbaikan dan menjalani CT scan kepala dengan kontras dan menemukan massa intrakranial, diduga Keganasan Nasofaring. Kelumpuhan saraf abducens dapat menjadi manifestasi pertama dari penyakit berbahaya seperti keganasan nasofaring, sehingga dibutuhkan kesadaran dari setiap klinisi ketika menemukan kasus tersebut.*

**Kata kunci:** karsinoma nasofaring; kelumpuhan saraf abducens

## **INTRODUCTION**

The Abducens Nerve, or sixth cranial nerve, is a nerve that innervates the

lateral rectus muscle of the eye and is responsible for the abduction movement of the eye. Abducens nerve palsy presents as horizontal diplopia that worsens with a horizontal gaze toward the affected lateral rectus muscle. The abducens nerve runs a long course from the brainstem to the lateral rectus muscle, makes it extremely vulnerable to any interrupting process and can result from numerous etiologies.<sup>1</sup> Common etiologies of abducens palsy in adults include vascular disease, inflammation, tumours, and trauma.<sup>2,3</sup>

Sixth, nerve paralysis is often caused by mild lesions that can recover completely over time, but caution is needed because this can also indicate a serious disorder. Based on the location of the lesion of the abducens nerve, other neurological structures may be involved with this nerve-related pathology. A systematic approach in history taking and physical examination, prompt and correct diagnosis, and also neuroimaging examination is very helpful in localizing the lesion and determining the cause.<sup>4,5</sup> This case report describes an isolated sixth nerve palsy as the first manifestation of Nasopharyngeal Malignancy.

## **CASE REPORT**

A 46-year-old woman came to the Neuro-ophthalmology unit at Cicendo Eye

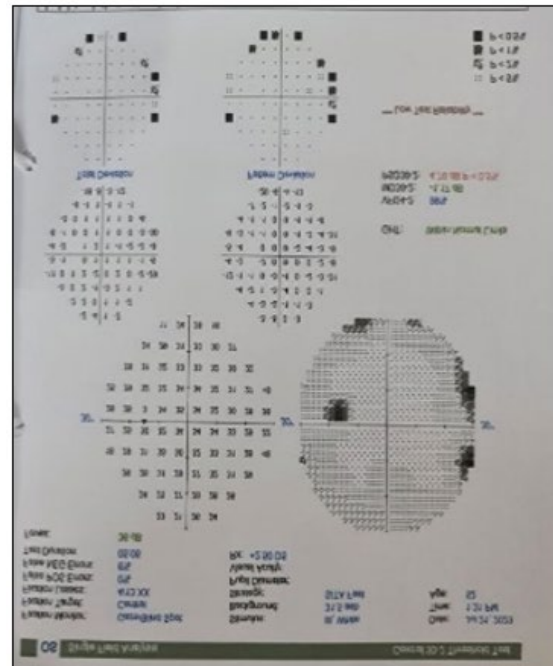
Hospital with the main complaint of double vision for one month before being admitted to the hospital. Double vision will disappear if one eye is closed. This complaint is not accompanied by recurrent red eyes, blurred vision, pain, headaches, nausea and vomiting. The patient had no history of wearing glasses, eye surgery, diabetes, hypertension, hypercholesterolemia or trauma. The patient has used injectable hormonal contraceptives for the last 5 years. The patient's level of consciousness was good, blood pressure was 121/83, and other vital examinations showed visual acuity of 0.63 in the right eye and 1.0 in the left eye. There were seven degrees of esotropia in the right eye based on the cover and uncover test red glass examination revealed horizontal diplopia. Examination of nine gaze positions showed esotropia of 7 degrees, and the right eye was unable to abduct with a value of -4 (Figure 1), while the other EOM was normal. The results of the accommodative and convergent eye movement examination were within normal limits. Intraocular pressure based on Non-Contact Tonometry (NCT) examination in both eyes was 18 mmHg. The results of colour vision examination using Ishihara, Contrast Sensitivity, and Amsler grid were within normal limits. The patient had no neurological deficits on cranial and motor nerve examination.



**Figure 1.** Results of eye examination in nine gaze positions: Right eye 7° esotropia and unable to abduct (-4).

Source: perpustakaanrsmcicendo

Examination of the anterior and posterior segments of both eyes was within normal limits, except that the lens in the right eye was slightly cloudy. Pupil reflex examination was within normal limits and no relative afferent pupillary abnormalities (RAPD) were found in both eyes. No other abnormalities were found on neurological and ophthalmological examination. The results of the visual field examination with Humphrey 30:2 showed the presence of peripheral scotoma in both eyes (Figure 2.)

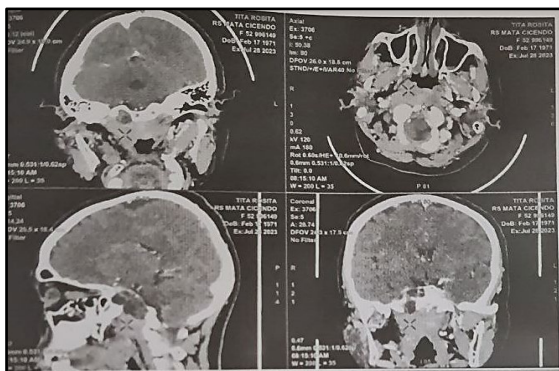


**Figure 2.** Result of visual field examination with Humphrey 30:2 (A) Left eye (B) Right eye: There was a peripheral scotoma in both eyes.

The patient was diagnosed with right eye abducens nerve paralysis caused by suspicious ischemia and immature senile cataract in the right eye. Patients were given neuroprotectors, asked for blood tests to determine ischemic factors, and monitored for one week with the results of the blood tests. The patient had no control for two months and during the follow-up, the patient felt there had been no improvement in her complaints. The physical examination at the second visit was almost the same as the first visit. At this second visit, the patient underwent a CT scan with a contrast examination of the brain and eye. Laboratory examination to determine the patient's ischemic factors was found to be

within normal limits.

A CT-Scan examination showed a suspicious solid mass accompanied by intra-tumoral necrosis, which obliterated the tuberosus torus and recesses in the bilateral pharynx, especially the right medial pterygoid, the bilateral eustachian tube was narrowed, extended to the bilateral posterolateral nasal cavity, damaged the right sphenoid bone and entered the nasal cavity, bilateral sphenoidal sinus, right temporal fossa, right cavernous sinus, optic chiasma and enters intracranially in the subcortical cortical area of the right temporal base which can be caused by Nasopharyngeal Malignancy, DD/ Sino Nasal Tumor (Figure 3.).



**Figure 3.** The result of the CT Scan Brain and Orbit examination showed a solid mass suspected of nasopharyngeal malignancy.

The patient was diagnosed with Isolated Abducens Nerve Palsy of the right eye caused by Space space-occupying lesion (suspected Nasopharyngeal Malignancy) and an Immature Senile

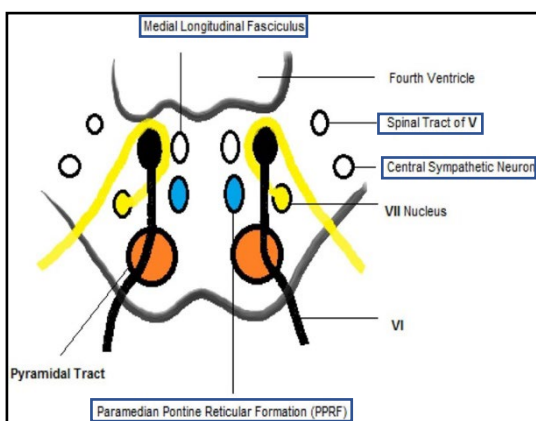
Cataract of the right eye. The patient was referred to an ENT surgeon for treatment of Nasopharyngeal Malignancy.

## DISCUSSION

The Abducens nuclei are located in the dorsal lower portion of the pons just below the fourth ventricle, and Facial nerve axons encircle the posterior aspect of the Abducens nucleus. It has clinical significance later. Abducens Nerve's main function is to innervate the lateral rectus, which functions to abduct the eye on the ipsilateral side. The sixth nerve is also secondarily involved in the innervation of the contralateral medial rectus muscle via the medial longitudinal fasciculus so that both eyes move laterally in a coordinated manner for horizontal gaze.<sup>2</sup> After exiting the nucleus, the fibres of the abducens nerve pass superiorly and anteriorly and then leave the brainstem at the Pontomedullary groove, pass through the Petrous apex of the Temporal bone, and then enter the cavernous sinus through Dorello's canal. The Cavernous Sinus cavity, just below the Internal Carotid Artery, enters the orbit through the Superior Orbital Fissure and ultimately innervates the Lateral Rectus Muscle. The long course of the Abducens nerve fibres makes it very susceptible to any disturbance process; damage to the nerve fibres can be identified through the

involvement of nearby structures.<sup>5,6</sup>

Sixth nerve nuclear lesions cause a horizontal gaze palsy rather than an isolated abduction deficit. An ipsilateral facial palsy may occur because of the proximity of the facial and abducens nerve in the pons. Nuclear lesions are usually associated with other brainstem signs (e.g., hemiparesis, hemisensory loss, a central Horner's syndrome). Likewise, lesions of the sixth nerve fascicle involve adjacent structures (e.g., cranial nerves V, VII, and VIII; cerebellar ataxia; a central Horner's syndrome; or contralateral hemiplegia) (figure 3.1). Patients with a presumed nuclear or fascicular SNP should undergo neuroimaging (usually magnetic resonance imaging [MRI]) directed to the pons.<sup>6</sup>



**Figure 4.** The lower pons include four internal structures<sup>1</sup>.

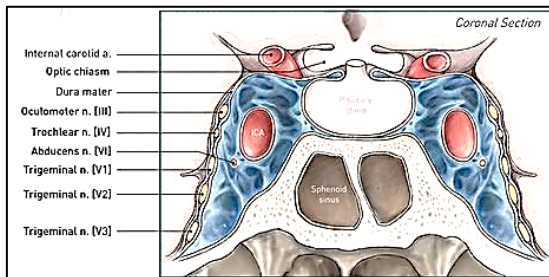
The second portion of the sixth nerve lesion corresponds to the vertical course of the nerve as it ascends to the clivus and turns 90 degrees anteriorly to enter Dorello's canal. Lesions of the

subarachnoid space may result in unilateral or bilateral SNP. This Abducens nerve palsy is a nonlocalizing finding because any cause of increased intracranial pressure may result in this palsy. Changes in intraocular pressure can cause downward herniation of the brain stem, resulting in stretching or compression of the sixth nerve. The abducens nerve is located near the pons and Dorello's canal, making it susceptible to these effects. Patients with a subarachnoid space lesion should undergo neuroimaging directed to this location, followed by a lumbar puncture (LP) as needed.<sup>6</sup> Pathologies associated with increased cranial pressure are subarachnoid hemorrhage, meningeal infections, inflammatory conditions, or infiltrative causes such as lymphoma, leukaemia, and carcinoma.<sup>1,9</sup>

The lesion in the cavernous sinus, the sixth nerve in the cavernous sinus adjacent to the third nerve, fourth and fifth cranial nerves (ophthalmic and maxillary divisions), the internal carotid artery and carotid sympathetic plexus, the pituitary gland, the optic nerve and the optic chiasm. Disorders of the cavernous sinus can cause deficits in two or more structures in the cavernous sinus (figure 3.2). Disorders of the sixth nerve in the cavernous sinus through various processes, including Nasopharyngeal carcinoma, Carotid-



cavernous fistula (CCF), Meningiomas, metastatic lesions, neurofibromatosis, craniopharyngioma, and lymphoma.<sup>1,6,10</sup>



**Figure 5.** The Cavernous Sinus with all structures.

The Orbital lesion with sixth nerve palsy exhibits various symptoms, including proptosis, conjunctival chemosis, optic atrophy, and papilledema. Tumours that can present with similar symptoms are orbital tumours, pseudotumors, thyroid eye disease, orbital cellulitis, and myositis. Other conditions may mimic isolated lateral rectus weakness, such as Thyroid eye disease, Myasthenia gravis, or long-standing orbital fractures. This diagnosis, as well as thyroid eye disease, can be confirmed by performing a forced duction test on the affected eye. Several examinations must be carried out if the above disease is suspected, such as an ice test, sleep test or tension, to confirm the diagnosis of Myasthenia gravis or Thyroid laboratory examination, ultrasound or neuroimaging for thyroid eye disease.<sup>1,6,9,10</sup>

An abduction deficit, which may

be complete (palsy) or incomplete (paresis), results in esotropia, ipsilateral abduction deficiency, and double vision. Patients will report diplopia that is worse at a distance and when looking toward the affected muscle. A lesion anywhere along the abducens nerve course, from the pons to the orbit, can cause paresis or palsy.<sup>9,10</sup> The Abducens motor nerve palsy is the most common cranial neuropathy in adults, mostly seen in 60–70 ages. The most common underlying pathology is microvascular causes, especially in advanced age. Trauma, demyelinating or inflammatory diseases, infections, tumours, aneurysms, and increased intracranial pressure are the other major causes of abducens nerve palsy.<sup>11,12</sup>

Nasopharyngeal carcinoma (NPC) is an intrusive tumour but endemic in certain regions of the world, especially in Southeast Asia, and has a poor prognosis. In Indonesia, the recorded mean prevalence is 6.2/100 000, with 13.000 yearly new NPC cases; NPC is ranked as the fourth most sufferer after breast, cervical, and lung cancer.<sup>14,15</sup> Nasopharyngeal carcinoma is the most feared etiology of sixth nerve palsy and occurs most frequently between the ages of 40 and 70 years. NPC is a relatively rare disease in which the tumour may remain asymptomatic for several months. The presentations of NPC can

appear with various symptoms, including nasal obstruction, rhinorrhea, epistaxis, and serous otitis media due to obstruction of the Eustachian tube; the sphenoid sinus is also often affected by tumour extension superiorly.<sup>16</sup>

At the time of diagnosis of NPC, cranial nerve involvement may be present in up to 20% of patients. The location of the nasopharynx, which lies beneath the base of the skull, allows for intracranial tumour invasion in patients with NPC. Cranial nerve involvement at the time of diagnosis indicates intracranial extension of NPC, which has a poor prognosis. The most commonly affected nerves are cranial nerves V, VI, and IX. Isolated sixth nerve palsy at the time of diagnosis of NPC is uncommon. The sixth nerve may be affected by various lesions at any level, from the brain stem to the cavernous sinus and orbit.<sup>16,17</sup>

Early diagnosis of nasopharyngeal malignancies is difficult. Despite the presence of signs, most patients are diagnosed in the advanced stage, resulting in poor prognosis. It is attributed to the anatomical peculiarities of these malignancies, their insidious manner of growth, and the lack of specificity of their clinical manifestations. Neuroimaging is important to assess the location and extension of these lesions.<sup>16,18</sup> The common

imaging findings in patients with nasopharyngeal carcinoma are destruction of the skull pedestal and intracranial growth into the middle cranial fossa. In cases with cranial nerve palsy indicating the intracranial extension of the tumour, destruction of the skull base is the most typical finding.<sup>16</sup> Early detection of isolated sixth nerve palsy and recognition that NPC could cause it is important for ophthalmologists.<sup>17</sup>

Radiation therapy is commonly employed as the primary procedure or in combination with other procedures like surgical interventions or chemotherapy. Hoppe et al. reported that patients with cranial nerve dysfunctions had a poor prognosis but that there were a few long-term survivors after radiation therapy among them. In the early stage, some nasopharyngeal malignancies may be radio-curable. Early diagnosis ensures an improved prognosis.<sup>10,18</sup>

An adult patient who demonstrates only lateral rectus weakness and no historical data to implicate a specific etiology is categorized as having “isolated sixth nerve palsy”. Isolated sixth nerve palsy usually will be resolved within 2-3 months and can arise from various factors, including diabetes, hypertension, and recent viral infections.<sup>12,13</sup> Our patient was diagnosed with isolated 6<sup>th</sup> nerve palsy



before a neuroimaging examination. Patients are advised to carry out laboratory tests to determine ischemic factors, but all the results are within normal limits.

This patient's history and physical examination showed the inability of the right eye to abduct, and no symptoms of seventh nerve disorders such as ipsilateral facial muscle paralysis or ipsilateral hearing loss were found. The patient did not show symptoms related to abnormalities in the pons, such as hemiparesis, abnormalities in the fifth and eighth nerves, as well as pyramidal lesions or sympathetic disorders, so the sixth nerve lesion in this patient was more likely caused by disorders outside the pons.

The results of the patient's history showed the main complaint was binocular double vision, not accompanied by recurrent red eyes, blurred vision, pain, headache, nausea and vomiting, meaning there were no symptoms of high intracranial pressure. Evaluation of extraocular movements (EOM) showed esotropia in the right eye and limitation in viewing to the right side, whereas the other EOM was normal. On neurological and other ophthalmological examinations, no other abnormalities were found, and there was no decrease in pupillary reflexes and no papilledema, which are signs of increased intracranial pressure. The results of the

visual field examination with Humphrey 30:2 showed that there were peripheral scotomas in both eyes, not widening of the blind spot, and that was not very specific, indicating the approximate location of the lesion.

The history and clinical examination carried out on this patient could not determine the location and cause of the sixth nerve paresis in this patient. The location of the abducens nerve lesion in this patient was only discovered after a CT-scan neuroimaging examination of the orbital head with contrast. The results of a CT scan revealed a mass suspected of being a nasopharyngeal malignancy that had infiltrated intracranially, one of which was in the right cavernous sinus. The patient's age was 46 years, in accordance with the incidence of nasopharyngeal malignancy, which is between 40-70 years. In this patient, neuroimaging revealed the location of tumour invasion, including the right temporal fossa and right cavernous sinus, thus explaining the sixth nerve palsy.

Based on the medical history, eye examination, and CT scan results, the patient was diagnosed as suffering from acquired unilateral abducens nerve paralysis in the right eye, which was caused by suspected Nasopharyngeal Malignancy and Immature Senile Cataract in the right eye. The patient was referred to an ENT

surgeon for treatment of Nasopharyngeal Malignancy. The patient is currently in the ENT Department of RSHS, being treated with radiotherapy, and then surgery is planned. The patient's prognosis is expected to be better because even though she suffers from abducens nerve palsy, she has received appropriate treatment.

## CONCLUSION

The most common cause of isolated sixth nerve palsy in people over 50 years of age is microvascular infarction; however, atypical presentations should be explored. New onset of diplopia or other symptoms of cranial nerve palsy should be evaluated further to rule out any life-threatening conditions, one of which is NPC. A thorough clinical examinations and neuroimaging examination are necessary. Any isolated nerve palsy requires neuroimaging with the use of contrast in adult patients with or without systemic disease and older patients without systemic disease.

## CONFLICT OF INTEREST

The authors declare that they have no conflicts of interest.

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