CASE REPORT

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Unilateral Tonic Pupil in the Postpartum Period After General Anesthesia: Is It Related To Anesthesia?

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ABSTRACT A 33 years old woman underwent cesarean section under general anesthesia for premature rupture of membranes and fetal distress at 38 weeks of gestation. Mild blurred vision at close range, discomfort from light and dilated left occurred in the postpartum period. She presented with on neurologic examination, anisocoria became more prominent under bright light in favor of dilated pupil and narrowed strongly when focusing on a close target (light-near dissociation). Pharmacologic testing with 0.1% dilute pilocarpine for the differential diagnosis of mydriasis showed a constriction of the left pupil, but no change in the right pupil. This also resulted in improvement of her photophobia and blurred vision. The diagnosis of Adie's tonic pupil was made. In addition to that oculomotor nerve paralysis, pharmacologic mydriasis and iris trauma should be considered in the differential diagnosis. We describe a case of tonic pupil occurring in the postpartum period who develop anisocoria after surgery under general anesthesia.

Keywords: Tonic pupil; anisocoria; general anesthesia

The tonic (Adie) pupil is a strong, tonic response to near stimulation with a slow and sustained dilation due to abnormal regeneration of the iris sphincter and hypersensitivity to muscarinic receptor agonists (e.g. pilocarpine).[1] When a dysfunction due to loss of deep tendon reflexes, most commonly the patella and Achilles tendon, is added, it is called Adie syndrome.[2] Patients may complain of reading difficulties and photophobia. The prevalence is 2/1000, the average age of onset is the 3rd decade and it is usually unilateral. Unilateral presentation is seen in approximately 80% of cases.[2] Most of the time it is idiopathic and no further investigation is required after pharmacologic diagnosis.[3]

In this article, we describe a case of anisocoria occurring in the postpartum period after general anesthesia.

CASE REPORT

A 33 years old, 52 kg female patient underwent emergency cesarean section under general anesthesia due to premature rupture of membranes and fetal distress at 38 weeks of gestation. She had no known systemic disease and was not taking any medication. It was learned that she continued her routine pregnancy controls regularly and there was no problem. In anesthesia premedication, the patient was preoxygenated with 100% oxygen for 1-2 min, then anesthesia induction was performed with propofol at 2 mg/kg and rocuronium at 0,6 mg/kg and intubated with a 7,5 mm endotracheal tube. In maintenance of anesthesia: Prenatal: Sevoflurane in 0-50% N2O (nitrous oxide) to reach a total maximum of 1 MAK (minimal alveolar concentration), Postpartum: N2O was increased and

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sevoflurane was administered to reach a maximum of 0,5-0,75 MAK, opioid 0,05 µg/kg/min remifentanil was administered as IV infusion to provide analgesia, and the patient was extubated while fully awake and then taken to the obstetric ward. No complications developed and the patient was discharged with a healthy baby boy. In the postpartum period, she noticed mild blurred vision and discomfort from light when she focused on something at close range and during this period, she noticed that her left pupil was different from her right pupil, but she did not visit an ophthalmologist. Neurologic examination revealed diplopia, ptosis, afferent pupillary defect and normal extraocular eye movements. There was an anisocoria between both pupils at room temperature (dim) with approximately 1 mm in the right pupil and approximately 3 mm in the left pupil, the left pupil was larger and this difference was greater under bright light, which was an abnormal condition for the left eye (Figure 1).

Brain MRI to evaluate intracranial pathologies and other biochemical blood and syphilis tests were normal. The patient had no history of ocular infection or trauma. In the differential diagnosis, pharmacologic mydriasis and adie tonic pupil were considered. The left mydriatic pupil had a preserved near reflex and near light dissociation (+) (the left pupil did not react to light, but strongly constricted when looking toward a near target and slowly dilated again when looking away). Pharmacologic testing with 0.1% dilute pilocarpine, used in the diagnosis of Adie's tonic pupil, resulted in a constriction of the left pupil, but no significant change in the right pupil (Figure 2).

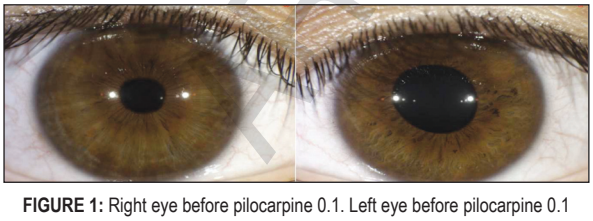

FIGURE 1: Right eye before pilocarpine 0.1. Left eye before pilocarpine 0.1

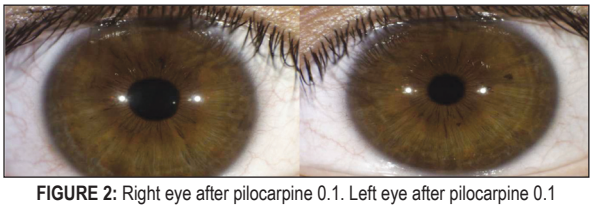

FIGURE 2: Right eye after pilocarpine 0.1. Left eye after pilocarpine 0.1

Adie's tonic pupil was diagnosed because a thorough examination of the systems and examination did not reveal any indication of symptoms of an underlying secondary cause. The patient's symptoms of photophobia and blurred vision improved immediately with pilocarpine 0.1%.

The author obtained written informed consents from the patients prior to publication.

DISCUSSION

Tonic pupil is caused by damage to the slier ganglion and postganglionic short ciliary nerves in the orbit and denervation of the iris sphincter and ciliary muscle. A dilated pupil unresponsive to light and near-light develops. Over time, cholinergic supersensitivity may develop, followed by aberrant reinnervation. In the oculomotor nerve, since the majority of parasympathetic pupilomotor fibers (30:1) are accommodative fibers, the accommodative fibers regenerate more with aberrant reinnervation.[4] Therefore, a strong and tonic near reflex develops while the light reflex is absent. This pupil unresponsive to light with delayed dilatation after constriction is called tonic pupil (Adie pupil). Pilocarpine 0.1% diluted solution is used for pharmacologic diagnosis. Pilocarpine causes myositis in the mydriatic pupil 30-40 minutes after administration due to cholinergic supersensitivity and is ineffective in normal pupils at low concentrations. It is usually unilateral. It may be bilateral in 20% patients.[4] Pupil size difference should first be evaluated under bright and dim light. If the pupil, which is larger as in our case, dilates further under bright light, this pupil is abnormal. In the differential diagnosis, 3rd cranial nerve palsy, tonic pupil, pharmacologic mydriasis, iris trauma and infections should be considered for dilated pupil.[5-7] Tonic pupil shrinks when pilocarpine 0.1% solution is instilled into the eyes. If there is no change in the pupil, pilocarpine 1-2% solution is used. Normal pupils or pupils with oculomotor nerve palsy become myotic, whereas there is no change in pharmacologic mydriasis. Pharmacologic mydriasis occurs after exposure to anticholinergic or sympathomimetic

agents.[8] The pilocarpine test appears to be useful to diagnose whether anisocoria is caused by a peripheral or central lesion. In addition, 0.1% diluted pilocarpine may be considered as pharmacologic treatment for photophobia and blurred vision in patients with tonic pupils. Although treatment is not usually necessary, 0.1% diluted pilocarpine can be considered as a treatment and used successfully, as in this case. 1-4% full-acting pilocarpine can have significant ocular side effects such as intraocular inflammation, periocular pain and peripheral retinal tears; therefore, a diluted formulation was preferred.[9]

In a study using diluted pilocarpine on 25 patients with tonic pupil, it was found that 0.2% pilocarpine concentrations produced too many false positive reactions and 0.05% pilocarpine was insufficient compared to the control group. Pilocarpine 0.1% concentration is considered suitable for ordinary clinical examinations and is recommended for pharmacological confirmation of the diagnosis of (Adie) tonic pupil.[10] Recent data have shown that a concentration of 0.125% or 0.0625% can be used during topical dilute pilocarpine testing and that 0.0625% dilute pilocarpine has a sensitivity of 100% and a specificity of 82.8% for detecting Adie's tonic pupil.[11] Pupillary constriction after dilute pilocarpine administration is observed in tonic pupil and is explained by cholinergic denervation supersensitivity.

Tonic pupil most often develops idiopathically and there is no etiologic cause. It may be associated with syphilis, chronic alcoholism, Human immunodeficiency virus (HIV), Lyme disease, influenza, Herpes zoster, Sjögren's syndrome, autoimmune disorders such as polyarteritis nodosa, sarcoidosis, systemic lupus erythematosus, amyloidosis, Guillain-Barre syndrome and Vogt-Koyanagi-Harada disease, local or general anesthesia, paraneoplastic syndromes, sinusitis, orbital tumors and surgeries, inferior dental blocks.[12] However, in this case, there was no history or findings to support other causes than general anesthesia.

The effect of anesthesia drugs on pupil dilatation (mydriasis) can take various forms. In one case reported in the literature, unilateral mydriasis was observed in a 74-year-old woman after induction of general anesthesia, and it was thought that the mydriasis was caused by phenylephrine/lidocaine spray used to provide topical anesthesia to the patient's airway.[13] Topical anesthesia, like all other types of regional anesthesia, can be effective at sites distant from the targeted site, but the literature is not clear about the use of inhaled or i.v. anesthetic agents in general anesthesia. In addition to their effects on synaptic transmission, the ganglionic effects of general anesthetic agents responsible for changes in autonomic functions have also attracted interest.

In conclusion, tonic pupil as in this case suggests that after general anesthesia may be caused by many reasons, including the effects of volatile gases such as halogenated ethers used in the maintenance of anesthesia and whose exact mechanisms of action are unknown. In addition, the possibility that rocuronium may have affected autonomic tone cannot be ruled out. In patients who develop anisocoria after operations performed under general anesthesia, tonic pupil should be considered in the differential diagnosis and unnecessary hospital investigations should be avoided.

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Conflict of Interest

No conflicts of interest between the authors and / or family members of the scientific and medical committee members or members of the potential conflicts of interest, counseling, expertise, working conditions, share holding and similar situations in any firm.

Authorship Contributions

Idea/Concept: *Ayfer Ertekin;* ***Design:*** *Ayfer Ertekin;* ***Control/Supervision:*** *Ayfer Ertekin;* ***Data Collection and/or Processing:*** *Ayfer Ertekin;* ***Analysis and/or Interpretation:*** *Ayfer Ertekin;* ***Literature Review:*** *Ayfer Ertekin;* ***Writing the Article:*** *Ayfer Ertekin;* ***Critical Review:*** *Ayfer Ertekin;* ***References and Fundings:*** *Ayfer Ertekin;* ***Materials:*** *Ayfer Ertekin, Mehmet Şirin Uludağ.*

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