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CASE REPORT

Atrovent anisocoria: a case report

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Abstract

The pupil, the central opening of the iris, regulates the passage of light to the retina by changing its size in response to light intensity. Anisocoria, characterized by a difference in the size of the pupils, can be congenital or a sign of underlying medical conditions. Ipratropium bromide (Atrovent®) is widely used in the management of bronchospasm, although its use can lead to side effects such as visual disturbances and increased intraocular pressure, including anisocoria. In this article, we report the case of a 5-year-old female patient with a history of asthma who sought care at Hospital São Luiz Gonzaga, presenting with dyspnea and fever for 3 days. During treatment with antibiotic therapy, intravenous corticosteroids, beta-agonists, and inhalation of ipratropium bromide, the patient developed left-sided anisocoria, without any associated complaints. The physical and neurological examinations were normal, as were the laboratory tests and the brain CT scan. After discontinuation of the ipratropium bromide, the anisocoria resolved within 8 hours. We conclude that anisocoria requires careful evaluation to rule out life-threatening conditions and neurological complications. A detailed history and thorough clinical examination are essential to identify the etiology of anisocoria, enabling early interventions and minimizing complications. This study was approved by the Ethics Committee of the Irmandade da Santa Casa De Misericórdia de São Paulo, under the approval number CAAE 79053624.3.0000.5479.

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INTRODUCTION

The pupil is the central opening of the iris through which light passes into the eyeball and reaches the retina. It changes size depending on light exposure, and this change is always equal in both eyes, occurring proportionally. When one pupil remains larger than the other for a prolonged period, the patient may be diagnosed with anisocoria.[1,2]

Anisocoria is a condition that can be natural—meaning the patient is born with pupils of different sizes—or it can be a symptom or even a consequence of other medical conditions. Diseases such as Horner's syndrome, uveitis, glaucoma, stroke, brain hematomas, and brain tumors tend to evolve with this ocular alteration. Furthermore, it may also appear as a side effect of certain medications, such as clonidine, different types of eye drops, scopolamine patches, and ipratropium aerosol if it comes into contact with the eye.[1,3]

Ipratropium bromide is widely used in medical practice to reduce bronchospasm. Its side effects are few; however, there are reports of palpitations, visual disturbances, xerophthalmia, changes in gastrointestinal motility, urinary retention, dry mouth, nausea, vomiting, and increased intraocular pressure (IOP), glaucoma, and other ocular changes.[4]

Although ocular alterations are rarely described, they can be a serious complication of ipratropium bromide use, especially when administered by nebulization, due to either a systemic effect or direct exposure of the inhaled material to the eye.[5]

The first report of ipratropium bromide–induced anisocoria was published in 1986; however, it remains a rare condition in the general medical literature. Most reported cases have occurred in pediatric patients, due to the difficulty of maintaining proper facial mask adjustment during respiratory treatments.[1,6]

CASE REPORT

H.G.O., a 5-year-old girl, was admitted to Hospital São Luiz Gonzaga with complaints of dyspnea and fever for three days. She had a history of asthma, treated with salbutamol during crises. She had no other diseases or health conditions and was not taking any other medications.

Upon admission, the patient's vital signs were as follows: blood pressure of 110×70 mmHg, heart rate of 103 beats per minute, respiratory rate of 30 breaths per minute, SpO_2 of 90% on room air, and body temperature of 37.3°C. On physical examination, all systemic findings were normal, except for wheezing and the presence of bilateral rhonchi on auscultation, as well as some signs of respiratory distress—subcostal and intercostal retractions, mild suprasternal retraction, and prolonged expiratory time.

Treatment was initiated with a third-generation cephalosporin, intravenous corticosteroid, and pulmonary beta-agonist. The patient also required magnesium sulfate at a dose of 75 mg/kg.

During hospitalization, the patient began nebulization with ipratropium bromide due to hypersecretion and subsequently developed left-sided anisocoria, without any other associated complaints (Figure 1).

A visual examination was performed, and ocular and extraocular movements were found to be normal. Examinations of the eyelids, conjunctiva, and cornea revealed no abnormalities; fundoscopic evaluation was normal, and the neurological examination—including cranial nerves—showed no alterations. The patient presented no neurological symptoms: no headache, blurred vision, or vision loss. Laboratory tests were normal, and a non-contrast cranial computed tomography (CT) scan showed no abnormalities.

Ipratropium bromide was discontinued following the clinical finding, and resolution of the left anisocoria occurred eight hours after the suspension of the drug. No clinical or surgical treatment was required during the anisocoria episode (Figure 2).



Figure 1. Left-sided anisocoria, non–photo-reactive. Examination under white light.

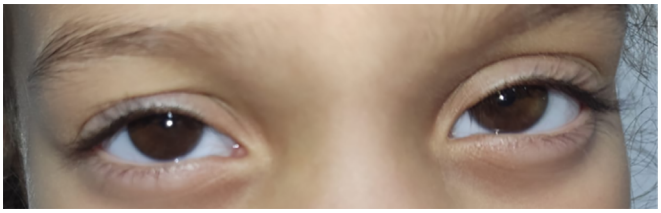


Figure 2. Resolution of anisocoria, bilaterally photo-reactive pupils.

DISCUSSION

Ipratropium bromide is an anticholinergic agent derived from atropine, with broncho-selective anticholinergic properties. When administered via inhalation, it is as effective as atropine but provides a longer duration of action and fewer side effects. Its administration—particularly by nebulization—ensures a localized effect on bronchial structures with minimal systemic absorption; however, systemic anticholinergic effects can still occur, requiring careful use.[1,7]

Its main side effects include mydriasis, blurred vision, dry mucous membranes, dry eyes, tachycardia, delayed gastric emptying, and urinary retention when administered by inhalation. The use of a poorly fitted or misaligned aerosol mask may allow direct exposure of the medication to the eyes, leading to unilateral or bilateral mydriasis.[2,3]

Reports in the literature indicate that the consequences seem to be more significant when ipratropium is combined with a β_2-adrenergic agonist, a common practice in clinical settings—especially in pediatrics. One case described a patient who developed acute-onset anisocoria shortly after using a poorly fitted nebulizer mask to administer ipratropium bromide and salbutamol, which resolved spontaneously after discontinuing the mask.[1,4]

It is unlikely that salbutamol—a β_2-adrenergic agonist—caused the mydriatic effect leading to anisocoria, as the pupillary dilator muscle is innervated by α_1-adrenergic receptors. In contrast, ipratropium bromide can bind directly to muscarinic receptors due to its anticholinergic properties, resulting in paralysis of the terminal parasympathetic nerves and, consequently, mydriasis.[4,8]

The most common cause of anisocoria is physiological anisocoria, which occurs in nearly 20% of the general population. To establish this diagnosis, the condition must have been present for a long time (old photographs may help confirm this). The difference in pupil size should be ≤1 mm, and the degree of anisocoria should remain unchanged under light and dark conditions.[2,4]

Although anisocoria is not a dangerous adverse effect of ipratropium bromide, it can be misinterpreted as a severe neurological emergency in patients with altered levels of consciousness. Therefore, ipratropium bromide use should be considered among the differential diagnoses of anisocoria when no structural abnormalities are observed on cranial CT scans.[4,5]

A review of the medical literature on the topic, conducted in PubMed between 1986 and 2015, identified publications addressing the duration of mydriasis in relation to the discontinuation of ipratropium bromide. Fourteen articles describing twenty case reports of mydriasis in the adult population were found.[1]

In these reports, the duration of mydriasis after discontinuation of the medication ranged from a few hours to 48 hours, with most cases resolving within 24 hours. Only three cases took at least 36 hours for full resolution. Most incidents were attributed to improperly fitted facial masks or defective mask seals, which we believe was the situation in our reported case. A faulty nebulizer circuit and mechanical contamination of the nebulizer with the eye were also cited as potential causes of anisocoria.[6,7]

CONCLUSION

Patients with anisocoria require careful and systematic evaluation to rule out potentially life-threatening conditions and neurological complications. A detailed history and thorough clinical examination can provide the necessary information to determine the etiology of this condition.

The use of nebulizers remains common in clinical practice, particularly in pediatrics, as demonstrated in the present case report. It is essential to ensure the rational use of masks associated with this medication, confirming that they are properly positioned and securely fitted, thus preventing the medication from coming into direct contact with the patient's eyes.

In the case presented here, the patient developed anisocoria following nebulization with ipratropium bromide, which was found to be caused by an improperly fitted mask. After discontinuation of the medication, the anisocoria resolved completely, with no further complications observed.

REFERENCES

1. Bisquerra RA, Botz GH, Nates JL. Ipratropium-bromide-induced acute anisocoria in the intensive care setting due to ill-fitting face masks. Respir Care. 2005;50(12):1662-4.
2. Openshaw H. Unilateral mydriasis from ipratropium in transplant patients. Neurology. 2006;67(5):914.
3. Valente RG, Neves DD. Alterações oculares após nebulização com brometo de ipratrópio. Pulmão RJ. 2007;16(2-4):65-9.
4. Sharma NS, Pennefather PS, Kerrigan JF, Casaulta C, Jeffery AR. Pharmacological mydriasis secondary to ipratropium bromide: a cause of unilateral dilated pupil. J Clin Neurosci. 2008;15(3):320-1.
5. Kokulu K, Kaya A, Baykan H, Mutlu HH. Pharmacologic anisocoria due to nebulized ipratropium bromide: A diagnostic challenge. Am J Emerg Med. 2019;37(6):1217.e3-4.
6. Pennington KM, Louis EK St. "Don't Believe Your Eyes" Ipratropium Induced Mydriasis: A Case Report and Review of the Literature. Gen Med (Los Angeles). 2016;4(3).
7. Chaudhry P, Friedman DI, Yu W. Unilateral pupillary mydriasis from nebulized ipratropium bromide: A false sign of brain herniation in the intensive care unit. Indian J Crit Care Med. 2014;18(3):176.
8. Oliveira JMF. Abordagem do padrão de normalidade da pupila [tese]. São Paulo: Universidade de São Paulo; 2016.