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Central Anticholinergic Syndrome by Topical Cyclopentolate Eye Drops Instillation in a Pediatric Patient: A Case Report

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Abstract

Central anticholinergic syndrome (CAS) is a rare but serious complication of cyclopentolate, a commonly used anticholinergic drug in pediatric ophthalmology. CAS is characterized by flushing, increased heart rate, feeding difficulties, seizures, drowsiness, behavioral changes, and transient psychotic reactions. An11-year-old male patient, presented with reduced visual acuity following the instillation of cyclopentolate eye drops. The patient experienced central nervous system manifestations. A comprehensive history, physical examination, and symptomatic treatment were initiated immediately. The patient exhibited gradual resolution of distressing symptoms within 10-12 hours. After continuous monitoring, confirmatory investigations, and comprehensive evaluation, the patient was discharged after 24 hours of hospitalization.

Information Box

What specific question does this report address?

Topical cyclopentolate easily crosses the blood-brain barrier and produces CNS toxicity if not properly transcript (middle canthus closed due to short and straight nasolacrimal duct in pediatric patient) to the patient how to administer. (Medication error and transcription error)

What does this report add to our current knowledge?

Not only lower body mass patients but also normal BMI (Body Mass Index) Pediatric patients can also suffer from CNS toxicity due to topical cyclopentolate.

Abbreviations

CAS, Central anticholinergic syndrome; OPD, outpatient department; CNS, central nervous system; WBC, White Blood Cell; RBC, Red Blood Cell; MCV, Mean Corpuscular Volume; MCH, Mean Corpuscular Hemoglobin; MCHC, Mean Corpuscular Hemoglobin

Concentration; RDW, Red Blood Cell Distribution Width; BMI, Body Mass Index

Keywords: Cyclopentolate, Central Anticholinergic Syndrome, Pediatric Patient

Introduction

Cyclopentolate is an anticholinergic, antimuscarinic tertiary amine with atropine-like actions whose topical administration to eyes causes mydriasis and cycloplegia the advantages of this drug are rapid onset of action and recovery. Side effects are uncommon. It has gained widespread use as the cycloplegic drug of first choice for most children over the age of 1 year and allows many optometrists and ophthalmologists to carry out quick successful cycloplegic refractions with few complications.[1]

Although rare, systemic absorption of cyclopentolate can lead to the development of Central Anticholinergic Syndrome (CAS).Central anticholinergic syndrome (CAS) was first described by Longo in 1966. The estimated frequency of this syndrome varies between 1 and 11.2%.[2]

CAS includes tachycardia and central nervous system (CNS) effects like restlessness, hallucination, psychosis, hyperactivity, seizures, incoherent speech, and ataxia.[3,4]

Children, particularly infants, are more prone to systemic adverse effects of topical eye drops because of their lower body mass and blood volume, immature metabolism, and immaturity of excretory, nervous, and cardiovascular systems.[5]The toxicity is dose-related.[6]

Case History

An 11-year-old male presented to the outpatient department (OPD) of ophthalmology with the chief complaint being reduced vision in the eyes, particularly affecting his ability to see distant objects. Remarkably, the patient had no prior history of allergies, systemic illnesses, or prior medication usage. The body Weight of the Patient is 30 kg and the BMI (Body Mass Index) is 16.2 kg/m2.

To analyze fundus and refractive studies, 1% w/v Cyclopentolate eye drops were prescribed to be instilled once or twice till full dilatation of pupils but the relative of the patient had administered eye drops multiple times (approximately 10-15 drops = Appx 0.1 to 0.15 mg total dose) within one hour. Following this accidental overdose, the patient began experiencing a constellation of neurological symptoms within one hour. The patient and relatives reported that he had developed mental confusion, hallucinations, dizziness, incoherent speech, inability to recognize familiar faces including relatives (prosopagnosia), and a proclivity for uttering irrelevant and nonsensical statements that's suggestive of possible delirium state due to anticholinergic drug.

After a thorough history and clinical evaluation in the ophthalmology department. including the Intraocular pressure (IOP) checkup (IOP=24mmHg), a provisional diagnosis of cyclopentolate toxicity was made, for which the patient was referred and admitted to the pediatric ward.

In the Pediatric ward, a blood sample was sent for investigations following which swift and astute initiation of symptomatic management was ensured. The findings of the blood investigations were as follows:

Investigation Parameters	Investigation Report of Patient on Admission
Haemoglobin	11 g/dl
Pack cell volume	33%
Total WBC count	6500
Differential WBC count	51/45/2/2
Platelet count	2,83000/microliter
RBC	4.42 million/mm3

MCV	74.90 femtoliter (FL)
MCH	24.90 Picogram
MCHC	33.20 g/dl
Reticulocyte count	0.5%
RDW	13.30 fl
C reactive Protein	18 mg/L
Sickling test	Negative

[WBC: White Blood Cell, RBC: Red Blood Cell, MCV: Mean Corpuscular Volume, MCH: Mean Corpuscular Hemoglobin, MCHC: Mean Corpuscular Hemoglobin Concentration, RDW: Red Blood Cell Distribution Width.]

Subsequently, the patient was continuously monitored. There was gradual alleviation of the distressing symptoms within 10-12 hours and the patient was discharged after 24 hours

Discussion

Cyclopentolate is a synthetic antimuscarinic tertiary amine in nature, due to tertiary amine in chemical nature, cyclopentolate readily crosses the blood-brain barrier and can produce central nervous system effects. Central anticholinergic syndrome (CAS) arises due to excessive or abnormal response to anticholinergic medications, either through overdosing or at regular therapeutic doses. CAS results from the inhibition of muscarinic cholinergic neurotransmission and is manifested by central nervous system (CNS) effects peripheral nervous system effects, or both.[7]

An absolute or relative reduction in cholinergic activity in the central nervous system (CNS) due to anticholinergic drugs can result in anticholinergic syndrome, which can manifest with a variety of signs and symptoms. Dryness of the skin and mouth, dermal flushing, fever, irritability, abdominal distention, urinary retention, feeding intolerance, psychosis, ataxia, hallucinations, convulsion, coma, tachycardia with normal blood pressure, arrhythmia, and death can be observed after multiple installations of the eye drops or accidental ingestion by infants, children and patients with neurologic disorders.[8]

In this case, the 11-year-old child had acute CNS toxicity in the form of hallucinations, psychosis, hyperactivity, and incoherent speech, ataxia. CNS effects can be due to stimulation of the medulla and cerebral centers by the anticholinergic action of cyclopentolate.

The drug can be systemically absorbed after administering eye drops, either through the trans conjunctival or via the highly vascular nasal mucosa by the nasolacrimal duct in pediatricpatients.[9]

Steps that can be taken to reduce systemic absorption and toxicity include using the lowest available concentration of the drug, not exceeding recommended number of drops (instill one drop of 0.5% or 1% in eye followed by one drop of 0.5% or 1% after five minutes, if necessary), occluding the lacrimal passage after topical administration, blotting away excess drops after administration and using micro drops (drops with volume of 5.6 microliters as against volume of 35.4 microliters of a standard drop). In neonates and infants, cyclopentolate and phenylephrine combination is preferred due to lower cyclopentolate concentration and reduced risk for systemic reaction.[10]

Physostigmine is the antidote drug of choice as an antidote as it readily crosses the blood-brain barrier.

Causality, Preventability, and Severity Assessment Classifying the case concerning Adverse Drug Reaction		
Assessment	Criteria Used	Interpretation of CAS of the current case
Causality Assessment	WHO Causality Assessment [11]	"Probable" Drug Reaction Basis: There was reasonable time between drug intake and drug reaction. It was unlikely to be attributed to disease or other drugs. Response to withdrawal was clinically reasonable & rechallenge was not required.
	Naranjo's ADR Probability Score [11]	"Probable" (Score-6) Basis: A Score between 5 to 8 is classified as "probable".
Preventability Assessment	Modified Schumock & Thornton Preventability Criteria	"DefinitelyPreventable" Basis: There is a known treatment for this Adverse Drug Reaction(Physostigmine: Antidote)
Severity Assessment	Hartwing& Sieger Severity Assessment Scale	"Level 4(b)" Basis: Admission to the hospital due to the ADR

Conclusion

Clinicians need to give meticulous attention to dosage, ensuring accurate qualitative and quantitative transcription of the prescribed dose, adherence to the appropriate administration protocol, and diligent observation of patients for any potential signs and symptoms of drug reactions, thereby ensuring holistic patient care and safety.

Ethical approval and Informed consent: IEC (Institutional Ethics Committee) oral permission was taken. Written informed consent of the Patient with relatives was taken.

Disclosure

I declare no conflicts or financial interest in any product or service mentioned in the manuscript, including grants, equipment, medications, employment, gids, and honoraria. I had full access to all present information in this report and took responsibility for the integrity and accuracy of the report. All authors attest to meeting the four criteria recommended by the ICMJE for authorship of this manuscript.

References

1. Lim DL, Batilando M, Rajadurai VS. Transient paralytic ileus following the use of cyclopentolate–phenylephrine eye drops during screening for retinopathy of prematurity. J Paediatr Child Health. 2003;39(4):318-320. doi:10.1046/J.1440-1754.2003. 00144.X
2. Roland R Rizzi, John Ho. Post resuscitation central anticholinergic syndrome. Resuscitation. 2004;61(1):101-102.
3. Mirshahi A, Surgery TKJ of C& R, 2003 undefined. Acute psychotic reaction caused by topical cyclopentolate use for cycloplegic refraction before refractive surgery: case report and review of the literature. Elsevier AMirshahi, T KohnenJournal of Cataract & Refractive Surgery, 2003•Elsevier. https://www.sciencedirect.com/science/article/pii/S0886335002016516
4. Bhatia S, Vidyashankar C, RSI, 2000 undefined. Systemic toxicity with cyclopentolate eye drops. indianpediatrics.net.

5. Patel A, Simon J, for DHJ of AA, 2004 undefined. Cycloplegic and mydriatic agents for routine ophthalmologic examination: a survey of pediatric ophthalmologists. Elsevier.
6. Jones LWJ, Modes DT. Possible allergic reactions to cyclopentolate hydrochloride: case reports with literature review of uses and adverse reactions. Ophthalmic and Physiological Optics. 1991;11(1):16-21. doi:10.1111/J.1475-1313. 1991.TB00189.
7. Nagori N, Doshi H. A Case of Acute Psychosis Induced by Topical 1% Cyclopentolate Eye Drops In A Young Child. Indian J Appl Res. 2019 May;9(5):16–17.
8. Labetoulle M, Frau E, Medicale CLJLP, 2005 undefined. Systemic adverse effects of topical ocular treatments. Elsevier.
9. Ophthalmology EP, 1986 undefined. How safe are ocular drugs in pediatrics? Elsevier EA Palmer Ophthalmology, 1986 Elsevier.
10. Wheatcroft S, Sharma A, McAllister J. Reduction in mydriatic drop size in premature infants. British Journal of Ophthalmology. 1993;77(6):364-365. doi:10.1136/BJO.77.6.364
11. Naranjo CA, Busto U, Sellers EM, et al. A method for estimating the probability of adverse drug reactions. Clin Pharmacol Ther. 1981;30(2):239-245. doi:10.1038/CLPT.1981.154