

# Anaphylactic Reaction due to Cyclopentolate in a 4-Year-Old Child

C Tayman,<sup>1</sup> E Mete,<sup>2</sup> F Çatal,<sup>2</sup> H Akca<sup>1</sup>

<sup>1</sup>Fatih University, Faculty of Medicine, Department of Pediatrics, Ankara, Turkey

<sup>2</sup>Fatih University, Faculty of Medicine, Department of Pediatrics, Division of Allergology, Ankara, Turkey

## ■ Abstract

Ophthalmologists frequently use mydriatics both for diagnosis (retinal exploration, refraction tests) and for treatment. Cyclopentolate is used to induce quick and successful mydriasis for pediatric eye examination. Hypersensitivity reaction to cyclopentolate is very uncommon, especially in children. We report the case of a child who experienced a hypersensitivity reaction to cyclopentolate during preparation for an eye examination under cycloplegia

**Key words:** Cyclopentolate. Eye examination. Anaphylaxis. Children.

## ■ Resumen

Los oftalmólogos suelen utilizar agentes midriáticos tanto para el diagnóstico (exploración de la retina, pruebas de refracción) como para el tratamiento. El ciclopentolato se emplea para inducir una midriasis rápida y satisfactoria para la exploración ocular en niños. La reacción de hipersensibilidad al ciclopentolato es muy poco frecuente, especialmente en niños. Se describe el caso de un niño que experimentó una reacción de hipersensibilidad al ciclopentolato durante la preparación para una exploración ocular bajo cicloplejía.

**Palabras clave:** Ciclopentolato. Exploración ocular. Anafilaxia. Niños.

## Introduction

Ophthalmologists frequently use mydriatics for diagnosis (retinal exploration, refraction tests) and treatment [1]. Cyclopentolate, a synthetic antimuscarinic agent with an action similar to that of atropine, has been widely used in the form of eye drops to induce quick mydriasis in diagnostic procedures [2,3]. As the first-choice cycloplegic drug for most children over 1 year of age, cyclopentolate is used to induce quick and successful mydriasis. Although there have been reports of adverse effects of cycloplegic and mydriatic agents, little information is available on the side effects of cyclopentolate [3,4]. Hypersensitivity reactions to cyclopentolate are very uncommon in children [3]. We report the case of a child who experienced a hypersensitivity reaction to cyclopentolate while he was being prepared for a retinal examination and refraction tests under cycloplegia.

## Case Description

A 4-year-old boy was referred to our pediatric emergency department with swollen eyelids, widespread hyperemic rashes, itching, facial edema, and shortness of breath. Physical examination revealed angioedema of the face and eyelids, widespread urticaria, mild cyanosis around the lips, diffuse wheezing, and fine crackles. His vital signs were as follows: respiratory rate, 46 breaths/min; heart rate, 138 beats/min; and blood pressure, 60/30 mmHg. An acute anaphylactic reaction was suspected and treated immediately with intramuscular epinephrine (0.17 mg), intravenous diphenhydramine (17 mg), methylprednisolone (17 mg), fluid expansion, nebulized albuterol, and continuous oxygen therapy. After 2 hours, his vital signs were normal except for mild swelling around the eyes and lips. He was kept under observation in hospital for 3 days.

He had been admitted to the ophthalmology department

with blurred vision, and was about to be examined under cycloplegia. Three drops of Sikloplejin (Abdi İbrahim, İlaç San. Tic. AŞ, Istanbul, Turkey) (cycloplegic eyedrops containing 1.0% cyclopentolate hydrochloride, 0.01% benzalkonium chloride, and 0.05% disodium EDTA) were administered into each eye twice at consecutive 5-minute intervals. Ten minutes later, swelling developed around the eyes before extending across the face. An urticarial rash appeared throughout his body accompanied by respiratory distress. His mother said that he had never received any drug containing cyclopentolate hydrochloride. The patient had no personal or family history of atopic disease or of hypersensitivity to any drug. At the time of the reactions, he was not taking medication. Total immunoglobulin (Ig) E was 56 kU<sub>A</sub>/L and cyclopentolate-specific IgE was not determined, as no specific tests are available [4]. We believed that the reaction appeared after administration of the eye drops. An atropinic reaction would have shown the same clinical signs (tachycardia, tachypnea, unusual drowsiness, flushing, rash). Therefore, one month after the reaction, we performed a conjunctival challenge test with the same eye drop in serial dilutions in normal saline to distinguish between an atropinic and a hypersensitivity reaction. Informed consent was obtained from the parents before the test was applied. We initiated the test with 1/1000 of the original eye drop for conjunctival challenge tests and then increased ( $\times 10$ ) until the positive reaction was observed with conjunctival erythema pruritus, lacrimation, and eyelid edema at 1/10 dilution in 30 minutes. As a negative control, physiologic saline was instilled into the other eye. One month after the conjunctival challenge tests we performed a skin prick test with 1.0% cyclopentolate hydrochloride at dilution of 1/10 in normal saline to verify cyclopentolate hypersensitivity reaction; the result was positive (wheal  $11 \times 10$  mm with erythema). Skin prick tests with 0.01% benzalkonium chloride and 0.05% disodium EDTA at different dilutions in normal saline were negative, as were tests with common inhalant allergens and foods, which were performed to determine whether sensitization could have been by cross-reactivity with other allergens. The test results were considered to be positive if a wheal at least 3 mm greater than that of the saline control appeared and if this was associated with a flare. Consequently, we determined and confirmed hypersensitivity to cyclopentolate using two different tests. Ten healthy children were tested as controls using 1.0% cycloplegic eye drops. The results were negative.

## Discussion

Cycloplegic agents can enter the bloodstream by absorption through the cornea, conjunctiva, nasolacrimal mucosa, and gastrointestinal tract [5]. Once absorbed they can affect almost any system [3]. The 1.0% concentration is the most commonly used among young children [6], and each drop consists of approximately 50  $\mu$ L (0.5 mg). Lahdes et al [7] measured the degree of systemic absorption of 1.0% cyclopentolate using plasma level measurements [3] and found that one 35- $\mu$ L drop resulted in a detectable cyclopentolate concentration within 3 minutes [7].

Few side effects have been reported for cyclopentolate [3,4], and they are usually ocular and systemic [3]. There have been

reports of central nervous involvement in children [8,9]. The main hypersensitivity and allergic reactions to topically applied cycloplegics are unexpected eruptions on the skin and eyelids [3]. Hypersensitivity reactions to cyclopentolate are rarely reported in children [3], and, to our knowledge, only 1 pediatric case of contact urticaria and 1 case of generalized urticaria due to cyclopentolate have been reported [3]. The initial complaints and clinical features in the case we report indicate that the patient experienced an anaphylactic reaction to cyclopentolate. We therefore performed conjunctival challenge tests and skin prick tests with all the components in the eye drops, common inhalant allergens, and foods; all were negative, except cyclopentolate hydrochloride. Therefore, cyclopentolate hydrochloride was considered to be responsible for the anaphylactic reaction.

In conclusion, although rare, anaphylaxis due to cyclopentolate hydrochloride can occur in children. While preparing children for an eye examination under cycloplegia, ophthalmologists should be particularly aware of possible hypersensitivity reaction to this and other mydriatic agents. They should also be able to manage these reactions immediately.

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### ■ Cuneyt Tayman

Fatih Universitesi Tıp Fakultesi Hastanesi  
Hoşdere cad. no:145-147  
06540  
Y.Ayrancı  
Ankara/Turkey  
E-mail: ctayman22@hotmail.com