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Anisocoria due to the Datura Plant

Datura Bitkisine bağlı Anizokori

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Abstract

Unilateral unresponsive dilatation of the pupil is an alarming finding and may be secondary to a wide range of ocular and neurological disorders. Ocular side effects, particularly pupillary dilation with blurring of vision may be alarming because they can indicate potentially lethal conditions related to some kinds of plants with local and systemic effects. It may also be only a topical side effect without any systemic disorder. We herein report a case of mydriasis related to the datura plant. The right pupil of the patient was dilated and unresponsive to both the pupillary light reflex (direct, consensual) and the accommodation reflex. There was no accompanying headache, diplopia, or other neurological symptom. Topical pilocarpine 2% induced normal constriction of the left pupil but had no effect on the right, confirming the pharmacological basis of the right mydriasis. Pupil size and accommodation gradually returned to normal after three days without any treatment. In some conditions as in this case the pupil dilation with blurring of vision is only a topical side effect of some kinds of plants without any systemic disorder. A detailed history and this simple topical pilocarpin test provided us vaulable information and eliminated the need for unnecessary expensive neuro-imaging and the use of unnecessary medication.It also prevented us from squandering the time of the emergency services.. *(Marmara Medical Journal 2012;25:93-5)*

Key Words: Mydriasis, Unilateral, Anisocoria, Datura, Gardener's pupil

Özet

Tek taraflı pupil dilatasyonu çok geniş bir dağılımdaki oküler ve nörolojik bozukluklara ikincil gözlenebilir. Oküler yan etkiler, özelikle görme bulanıklığı ve pupil dilatasyonu, bazı bitki ürünlerinin neden olabileceği lokal ve sistemik etkiler ile gelişen ve ölümcül olma potansiyeli bulunan durumların uyarıcısı olabilir. Fakat sistemik bozukluğun gözlenmediği sadece topikal yan etkiler de oluşabilir. Burada datura bitkisine bağlı oluşan bir midriyazis vakası sunuldu. Sağ pupil dilate haldeydi. Sağ pupil hem ışık refleksine (direk ve indirek) ve hem de akomodasyon refleksine cevapsızdı. Hastada eşlik eden bir başağrısı, diplopi veya diğer bir nörolojik semptom yoktu. Topikal %2 lik pilokarpin ile sol pupillada konstriksiyon ortaya çıkarken sağda hiçbir etki gözlenmemesi midriyazisin farmakolojik temelini doğrulamaktaydı. Bunun gibi bazı olgularda görme bulanıklığı ile birlikte olan pupil dilatasyonu birkaç tür bitkinin neden olduğu, sistemik herhangi bir bozukluk olmadan sadece topikal olarak gözlenen bir yan etki olabilir. Detaylı anamnez ve basit topikal pilokarpin testi bize önemli bilgiler verir ve gereksiz ve pahalı radyolojik görüntüleme yöntemlerinden, gereksiz medikal tedavilerden korunmuş olunur ve acil durumlarda zaman kaybı önlenmiş olunur. *(Marmara Üniversitesi Tıp Fakültesi Dergisi 2012;25:93-5)*

Anahtar Kelimeler: Midriyazis, Tek taraflı, Anizokori, Datura, Bahçıvan Pupillası

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Introduction

Unilateral unresponsive pupil dilation may be secondary to a wide range of ocular and neurological disorders. Ocular disorders which cause unilateral mydriasis include third nerve palsy, Adie's pupil, traumatic mydriasis, and pharmacologic mydriasis. We report a case of mydriasis related to datura plant products. This condition is called "Gardener's pupil" in the literature and is a pharmacological mydriasis caused by exposure to plants containing alkaloids such as scopolamine, hyoscyamine, or atropine[1,2]. This report emphasises the importance of accurate history taking when evaluating a fixed and dilated pupil.

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Case Report

A healthy 27 year old white male presented with a unilateral fixed dilated pupil, associated with blurred vision, noted 2 hours earlier. There was no accompanying headache, diplopia, or other neurological symptom. The past medical history was unremarkable. Inadvertent self medication was denied.

Figure 1. Before instillation of topical pilocarpin

Figure 2. After instillation of topical pilocarpin

Figure 3. Second day examination

General and neurological examination was normal. Visual acuity measured 10/10 for distant vision in both eyes. Examination of the anterior segments and fundus were unremarkable. Ocular movements were full, and the eyes were orthophoric. However, the right pupil was dilated and unresponsive to both the pupillary light reflex (direct, consensual) and the accommodation reflex (Figure 1).

Instillation of topical pilocarpine 2% induced normal constriction of the left pupil but had no effect on the right, confirming the pharmacological basis of the right mydriasis[3] (Figure 2). The patient was a gardener and during the history taking, he recalled that 4 hours ago a leaf of a datura plant had accidentally gotten into his eye while working in the garden.

On the second day's examination, the right pupil was mid-dilated (Figure 3). And the patient brought some types of plants that have the potential to be the source. One of them was the datura plant which is the most popular of the ornamental plants that contain anticholinergic substances (Figure 4). Pupil size and accommodation gradually returned to normal on the third day without any treatment. Written permission was obtained from the patient to publish his photographs and other information.

Discussion

"Gardener's pupil" is a pharmacological mydriasis that occurs after inadvertent exposure to plants containing tropane alkaloids[1,2].The "trumpet plant," also known as moonflower, Datura or Brugmansia arborea, is one of the most popular of the ornamental plants that contain anticholinergic substances. Some of these species are common ornamental garden plants as well as indoor plants because of their beautiful trumpet-shaped blossoms[4]. Most of these plants are members of the same genus and grow in the wild. Datura is, however, poisonous, containing these tropane alkaloids.

Tropane alkaloids are commonly described as anti-cholinergic compounds, due to their ability to bind to muscarinic acetylcholine receptors and hence act as competitive antagonists at these receptors[5]. The tropane alkaloids that are present in Datura spp are

Figure 4. Datura plant

hyoscyamine, atropine and scopolamine. The mechanism of action of tropane alkaloids relates to their competitive antagonism at muscarinic acetylcholine receptors, preventing the binding of acetylcholine. According to the specificity and selectivity of muscarinergic acetylcholine receptors in different organs, the functions of smooth muscles and exocrine gland cells, as well as the heart rate, respiration and functions in the central nervous system are modulated. According to the organ, different subtypes of muscarinic receptors have been described, denoted M1 to M5, all belonging to the class of G- protein coupled receptors[4]. Approximately 60% to 75% of the muscarinic receptors in the human iris sphincter and ciliary body are the M3 subtype. Lower levels (5% to 10%) of the m2 and m4 receptors are present in these tissues. The m1 receptor (7%) has been detected in the ciliary processes and iris sphincter and the m5 receptor (5%), which is usually found only in the central nervous system, was present in the iris sphincter. The m3 subtype is the predominant muscarinic receptor in the anterior segment of the human eye and these alkoloids directly affect these receptors[6].

These tropane alkoloids are readily absorbed by the aqueos humuor through the cornea and conjunctiva. The iris has both circular and radial muscles that work in a complementary manner to control the pupil diameter. In tropane alkaloid-induced mydriasis, the mechanism of action involves blocking the contraction of the circular pupillary sphincter muscle, which is normally stimulated by acetylcholine release, thereby allowing the radial pupillary dilator muscle to contract and dilate the pupil These alkoloids also induce cycloplegia by paralyzing the ciliary muscles and abolish the accomodation reflex. Tropane alkaloids degrade slowly, typically wearing off in 2 to 3 days.

Ocular toxicity occurs through inadvertent topical exposure, while systemic side effects (primarily tachycardia due to a vagolytic effect) occur through absorption of the alkaloids from the lachrymal passages. Systemic effects are more pronounced upon oral ingestion. Sometimes ocular side effects may also be only a topical side effect without any systemic disorder such as in our case. The onset of symptoms occurs 1-4 hours after contact or ingestion of plant material or seeds[7]. The duration of symptoms is often 24-48 hours Ocular disorders which cause unilateral mydriasis include third nerve palsy, Adie's pupil, traumatic mydriasis, and pharmacologic mydriasis. The simple measure of instillation of topical pilocarpine 2% establishes the pharmacological nature of the condition and eliminates the need for expensive neuro-imaging. Although accidental mydriasis is commonly due to parasympatholysis, it may also occur secondary to increased adrenergic stimulation. Care should therefore be exercised while interpreting a pilocarpine test[8].

Differentiation between paralytic mydriasis and pharmacologic mydriasis can be made by using a pilocarpine 2% eye drop test. A dilated pupil from paralytic mydriasis will constrict with 2% pilocarpine, whereas a dilated pupil from pharmacologic mydriasis will not constrict. Pilocarpine is competitively inhibited by alkaloids (atropine, etc.), paralyzing the iris sphincter. Although a traumatic pupil would stay dilated in response to pilocarpine 2%, making it difficult to differentiate this condition from pharmacologic mydriasis, the anisocoria would not have improved over the day in a traumatic pupil as it did in our patient. If the degree of toxicity is low, mydriasis may be overcome with pilocarpine drops. However, if the pupil does not constrict after pilocarpine 2% instillation, one can avoid costly investigations and reassure the patient that the pupillary dilation was due to a chemical exposure.

In this case, third nerve palsy was ruled out because the patient did not present with any neurologic symptoms. In addition, there was no ptosis or motility deficit. The improvement of the anisocoria over time also suggested that the etiology was exposure to some type of chemical. If further work up of a third nerve palsy was to be considered, an MRI would have been the next step to rule out a compressive cause due to a third nerve palsy.

Adie's pupil is the result of an injury to the ciliary ganglion, which can occur after viral infection, trauma, or cancer. Adie's pupil will often have segmental constriction and light-near dissociation. Adie's pupil can be demonstrated by a drop of topical pilocarpine 0.1%. This very small concentration of pilocarpine will cause constriction of the pupil due to denervation sensitivity.

Ocular side effects, particularly pupillary dilation with blurring of vision may be alarming for the potentially lethal conditions related to some kind of plants with local and systemic effects[8]. It may also be only a topical side effect without any evidence of a significant systemic disorder. This report emphasises the importance of accurate history taking when evaluating a fixed and dilated pupil. Retailers of such poisonous plants should detail the local and systemic effects of accidental exposure, rather than merely labelling a plant (non-specifically) as poisonous. The history taking and this simple topical pilocarpin test eliminates the need for unnecessary expensive neuro-imaging and the use of unnecessary medication, and also prevents us from squandering the time of emergency room staff.

References

1. Voltz R, Hohlfeld R, Hertel H. Gardener's mydriasis. Lancet 1992;339:752. doi 10.1016/ 0140-6736(92)90660-U
2. Reader AL. Mydriasis from Datura wrightii. Am J Ophthalmol 1977;84:263-4.
3. Thompson HS, Newsome DA, Lowenfeld IE. The fixed dilated pupil. Sudden iridoplegia or mydriatic drops? A simple diagnostic test. Arch Ophthalmol 1971;86:21-7.
4. Scientific Opinion of the Panel on Contaminants in the Food Chain on a request from the European Commission on Tropane alkaloids (from Datura spp.) as undesirable substances in animal feed. The EFSA Journal 2008; 691:1-55.
5. Brown JH, Taylor P. Muscarinic receptor agonists and antagonists. In: Brunton LL, Lazo JS, Parker KL, editors. Goodman & Gilman's The Pharmacological Basis of Therapeutics, 11th ed. New-York: McGraw-Hill Companies, Inc 2006:183-200.
6. Gil DW, Krauss HA, Bogardus AM, WoldeMussi E. Muscarinic receptor subtypes in human iris-ciliary body measured by immunoprecipitation. Invest Ophthalmol Vis Sci 1997;38:1434-42.
7. Goldfrank LR. Toxicologic Emergencies, 5th ed., Norwalk, CT: Appleton and Lange, 1994:7-8.
8. Raman S V, Jacob J. Mydriasis due to Datura inoxia. Emerg Med J 2005;22:310-1 doi: 10.1136/emj.2003.013060