When a Cataract is More than it Seems

Quando uma Catarata é Mais do que Aparenta

Gonçalo Passos Croca [1], Catarina Mendonça [1], Joana Pereira [1], Pedro Gil [2], Eduardo Silva [2], Madalena Sassetti [1]

[1] Serviço de Pediatria, Unidade Local de Saúde do Oeste, Unidade das Caldas da Rainha, Caldas da Rainha, Portugal
[2] Serviço de Oftalmologia Pediátrica, Hospital Dona Estefânia, Unidade Local de Saúde de São José, Lisboa, Portugal

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ABSTRACT

Type 1 diabetes is a chronic condition associated with many ocular complications. Although cataracts are rare in children, they can occur early in the course of the disease.

A 9-year-old girl was admitted to the emergency department with dyspnea, altered consciousness, polyuria and polydipsia for 5 days. Laboratory findings include severe metabolic acidosis (pH 6.83, HCO3 1.8 mmol/L), blood glucose 675 mg/dL, ketonemia 7 mmol/L and hemoglobin A1c 15.9%. Further investigation revealed vision loss complaints for seven months, which led to an ophthalmology consultation and a diagnosis of bilateral cataracts. After metabolic stabilization, she underwent surgery with marked improvement in vision.

This case illustrates an unusual presentation of diabetes in children. This severe complication highlights the importance of appropriate screening and early eye examination to detect and manage visual complications, to preserve visual function and improve clinical outcomes.

KEYWORDS: Cataract; Child; Diabetes Complications; Diabetic Ketoacidosis.

RESUMO

A diabetes tipo 1 é uma doença crónica associada a várias complicações oculares. Embora a catarata seja rara em crianças, pode ocorrer como apresentação inicial da doença.

Criança de 9 anos recorreu ao serviço de urgência por dispneia, alteração da consciência, poliúria e polidipsia desde há 5 dias. Analiticamente, acidose metabólica grave (pH 6,83, HCO3 1,8 mmol/L), glicemia de 675 mg/dL, cetonemia de 7 mmol/L e hemoglobina A1c de 15,9%. Referia hipovisão com sete meses de evolução, tendo já sido observada em consulta de Oftalmologia e diagnosticada com cataratas bilaterais, estando a aguardar cirurgia. Após estabilização metabólica, realizou intervenção cirúrgica bilateralmente, com melhoria da acuidade visual.

Este caso ilustra uma apresentação atípica de diabetes em crianças. Esta complicação destaca a necessidade de avaliação oftalmológica precoce de forma a detetar e tratar complicações visuais, a fim de preservar a função visual e melhorar o prognóstico do doente.

PALAVRAS-CHAVE: Catarata; Cetoacidose Diabética; Complicações da Diabetes; Criança.

INTRODUCTION

Diabetes *mellitus* is a chronic condition characterized by hyperglycemia resulting from either insulin resistance or insufficient secretion. As a chronic disease, it requires constant medical surveillance and a multidisciplinary approach.[1,2]

Diabetes is associated with several ocular complications. Retinopathy caused by persistent hyperglycemia is the main ocular disease associated with diabetes. Although rare, diabetes can also be a risk factor for the development of cataracts and glaucoma.[1,3,4]

In type 1 diabetes the prevalence of cataract ranges from 0.7%-3.4% with a predominance in female and adolescents. The youngest case reported involved a 5-year-old child.[3,6–11] Contrarily to what happens with age-related cataracts, diabetic cataracts are rapidly progressive.[3,5,8–10,12]

The main causes are various and include local factors, poor metabolic control, genetic and nutritional factors.[1,3,5–8] High HbA1c levels and ketoacidosis represent important risk factors.[8,9] The pathophysiological mechanism is not yet fully understood. However, the main theory involves the polyol pathway and aldolase in which osmotic damage and oxidative stress caused by persistent hyperglycemia leads to cataract.[5,6,8,10] In these patients the development of cataracts is due to poor metabolic control with constant fluctuation of glycemia leading to an imbalance of osmotic pressure near the lens. Therefore, this condition is not present in the early stages of the disease for the majority of patients. Anterior, posterior or "snow-flake" opacities are the main forms of cataract observed.[3,6,9,11] The main treatment of diabetic cataracts is the surgical removal of the lens, with some recovery of visual acuity in the majority of cases.[5,7,10]

Current guidelines recommend initial retinopathy screening for children 11 years or older (or at the onset of puberty if early), if T1D diagnosis was made 2-5 years before.[7,12] It is also advised that other ocular conditions should be detected, like cataracts or major refractive errors in case of visual complaints.[12]

Even though cataracts seem to develop years after the diagnosis of diabetes, several cases have been reported with decreased visual acuity being the first symptom of an underlying disease.[1,3,4,7–9,13]

CASE REPORT

A 9-year-old girl presented to the pediatric emergency department with dyspnea and altered consciousness for the last few hours, as well as polyuria and polydipsia for the past 5 days. Physical exam revealed altered mental status (Glasgow Coma Scale of 13), polypnea and perineal candidiasis. Capillary glycemia was rapidly obtained and revealed a glucose value of 556 mg/dL (30.9 mmol/L) and ketonemia (7 mmol/L). Furthermore, blood gas analysis showed severe metabolic acidosis (pH 6.83, HCO3 1.8 mmol/L). Random blood glucose level was 675 mg/dL (37.4 mmol/L) and glycosylated hemoglobin 15.9%. The patient was promptly initiated on diabetic ketoacidosis protocol with progressive improvement of the overall condition.



Figure 1. Cataract in the left eye at the time of hospital admission.

After correction of ketoacidosis and achieving clinical stability, bilateral lens opacities were observed (Fig. 1). Further history revealed a history of bilateral loss of vision for the past seven months.

She had no family history of diabetes or any other significant diseases.

The patient was discharged under intensive insulin therapy regimen with multiple day injection regimen (using glargine and lispro insulins) and intermittently scanned continuous glucose monitoring (isCGM). All autoimmune antibodies were negative except glutamic acid decarboxylase (GAD).

During follow up, the patient progressively improved metabolic control. Three months after the diagnosis the time in range (TIR) was 65% with a variation coefficient of 29.1% and a median glucose value of 170 mg/dL

After metabolic control, she was referred to a Pediatric Ophthalmology evaluation at a level III hospital. On first observation, the patient had a best-corrected visual acuity (BCVA) of 5/10 (with +1.00 of correction) in the right eye and under 1/10 in the left eye. Optical coherence tomography of the right eye revealed the preservation of the macular architecture. Slit-lamp observation revealed a sutural cataract in the right eye and total white cataract in the left eye, without signs of intraocular inflammation. Fundoscopy was difficult in the right eye and impossible in the left eye, due to media opacity. Intraocular pressure was normal and left

eye ocular ultrasound (B-scan) was unremarkable. Optical biometry in the right eye and ultrasound biometry in the left eye were successfully performed for intraocular lens power calculations. She was referred for cataract surgery with primary monofocal IOL (Alcon AU00T0 +22.0) in the bag implantation. Left eye BCVA improved to 8/10 while the right eye worsened to 2/10. Six months later and after further optimization of glycemic control after the topical and systemic postoperative steroids, she underwent right eye cataract surgery with primary monofocal IOL (Alcon AU00T0 +22.0) in the bag implantation. Postoperatively, right eye BCVA improved to 8/10.

One-year post-surgery of the left eye, BCVA worsened to 5/10 and slit lamp examination revealed a posterior capsule opacification. After Nd:YAG laser capsulotomy, BCVA improved to 8/10 OU at the last follow-up, with media transparency and no signs of diabetic retinopathy.

DISCUSSION

Cataracts are rare but serious complications of type 1 diabetes with significant impairment of patients' quality of life.

Usually, cataracts present years after the diagnosis of diabetes, but rarely they can develop prior to the diagnosis as observed in this case and reported in a few other cases (Wilson *et al*[3], Wu *et al*[9], Uspal *et al*[8] and Datta *et al*[6]).

When cataracts occur, they typically present in female adolescents, exhibiting a rapid and bilateral progression, as observed in this particular case.

Poor metabolic control with constant fluctuation of glycemia, high HbA1c levels and ketoacidosis represent important risk factors for the development of cataract. This patient's diminished visual complaints started seven months before the diagnosis and, in fact, she had a HbA1c of 15.9% at diagnosis, reflecting the chronic hyperglycemia state in the previous months.

If left untreated, cataracts may be devastating for children and adolescents. On the other hand, if type 1 diabetes is suspected, fast screening should be made in order to prevent acute complications such as ketoacidosis. This highlights the importance of the accessibility to health services and a multidisciplinary approach of these cases.

According to international guidelines, ophthalmology screening for children with diabetes starts 2-5 years after the diagnosis, in order to screen for retinopathy (Bjornstad P *et al*[12]). Nevertheless, in case of visual complaints, referral should be made earlier to rule out cataracts or other eye disturbances. In fact, the diabetic population has a higher risk of developing cataract and the risk is even higher in female and adolescent patients with high HbA1c at the diagnosis, with cataract occurring in the early course of the disease (Wu *et al*[9] and Uspal *et al*[8]). The health team should be aware of these risk factors and consider forwarding these patients to an early ophthalmology evaluation.

This case illustrates an unusual presentation of diabetes in children where a metabolic disease manifested early through visual impairment, contrary to cataract being a long-term complication and a standing metabolic disorder like diabetes. Cataracts in children should trigger an alarm for potential underlying diabetes and lead to appropriate screening to prevent episodes of ketoacidosis and further complications. Patient education, health services accessibility and a multidisciplinary approach are the key to optimized management.

CONTRIBUTORSHIP STATEMENT / DECLARAÇÃO DE CONTRIBUIÇÃO

All authors contributed to this work, approved the final version of the manuscript for publication, and agree to be accountable for all aspects of the work, ensuring the accuracy and integrity of the data presented.

Todos os autores contribuíram para este trabalho, aprovaram a versão final do manuscrito para publicação e concordam em assumir a responsabilidade por todos os aspetos do trabalho, garantindo a exatidão e a integridade dos dados apresentados.

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Corresponding Author/
Autor Correspondente:

Gonçalo Passos Croca
Rua Diário de Notícias,
2500-176 Caldas da Rainha, Portugal
E-mail: passoscroca@gmail.com

ORCID: 0000-0002-8320-4740