Influence of genetic and environmental factors on the manifestation of atopic dermatitis in twins: A case report

Influência dos fatores genéticos e ambientais na manifestação da dermatite atópica em gemelares: Um relato de caso

Influencia de factores genéticos y ambientales en la manifestación de dermatitis atópica en gemelos: Aporte de un caso

RESUMO

Objetivo: ressaltar a influência da interação dos fatores genéticos e ambientais na manifestação da dermatite atópica, através da observação de diferentes desfechos em gemelares. Método: As informações contidas nesta descrição de caso clínico foram obtidas por meio de anamnese, exame físico, exames complementares e revisão nas literaturas referenciadas neste trabalho. Resultados: Relatou-se o caso de gemelares de 21 anos com história de exposição muito similar a antígenos externos e que foram diagnosticadas com DA na infância, tendo evoluções diferentes na adolescência e idade adulta. Conclusão: supõe-se que os gêmeos compartilham fatores de risco ambientais e, portanto, ao compará-los, é possível estimar o impacto relativo de fatores genéticos e ambientais em uma determinada doença.

DESCRITORES: Dermatite Atópica. Gêmeos. Genética. Exposição Ambiental.

ABSTRACT

Objective: to highlight the influence of the interaction of genetic and environmental factors in the manifestation of atopic dermatitis, through the observation of different outcomes in twins. Method: The information contained in this clinical case description was obtained through anamnesis, physical examination, complementary exams and review of the literature referenced in this work. Results: We report the case of 21-year-old twins with a history of very similar exposure to external antigens and who were diagnosed with AD in childhood, with different evolutions in adolescence and adulthood. Conclusion: twins are assumed to share environmental risk factors and, therefore, by comparing them, it is possible to estimate the relative impact of genetic and environmental factors on a given disease.

DESCRIPTORS: Atopic Dermatitis. Twins. genetics. Environmental Exposure.

RESUMEN

Objetivo: resaltar la influencia de la interacción de factores genéticos y ambientales en la manifestación de la dermatitis atópica, a través de la observación de diferentes desenlaces en gemelos. Método: La información contenida en esta descripción de caso clínico se obtuvo a través de anamnesis, examen físico, exámenes complementarios y revisión de la literatura referenciada en este trabajo. Resultados: Presentamos el caso de unas gemelas de 21 años con antecedentes de exposición a antígenos externos muy similares y que fueron diagnosticadas de EA en la infancia, con distintas evoluciones en la adolescencia y la edad adulta. Conclusión: se supone que los gemelos comparten factores de riesgo ambientales y, por lo tanto, al compararlos, es posible estimar el impacto relativo de los factores genéticos y ambientales en una determinada enfermedad.

DESCRIPTORES: Dermatitis Atópica. Mellizos. genética. Exposición Ambiental.

RECEBIDO EM: 28/05/2022 **APROVADO EM:** 01/08/2022

Giovana Elisa Rosa Galiassi
Student of the Medicine course at the University of Cuiabá (UNIC)
ORCID: 0000-0002-4951-1800

Gabriela Regina Rosa Galiassi
Master's student in Technological and Environmental Chemistry at the Federal Institute of Mato Grosso; Chemical Engineer at the Federal University of Mato Grosso
ORCID: 0000-0003-1850-2570

DOI: https://doi.org/10.36489/saudecoletiva.2022v12i78p11360-11367

Thayanne Rysia Gomes Bezerra
Physician at the University of Cuiabá (UNIC)
ORCID: 0000-0002-4110-6499

Daniella Alana Andrade Souto Rodrigues
Resident in Internal Medicine at the General Hospital (Cuiabá-MT); Physician at the University Center of Várzea Grande (UNIVAG)
ORCID: 0000-0002-4548-9407

Christiane Yule de Barros Figueiredo
Physician at the University Center of Várzea Grande - UNIVAG
ORCID: 0000-0002-1519-654X

INTRODUCTION

Atopic dermatitis (AD - or eczema) is a chronic inflammatory skin disease characterized by pruritic eczematous lesions that affect the face, trunk and extremities. [1] Usually, the onset is in early childhood, with the disease progressing in a recurrent course before disappearing some time before puberty. [2]

However, although uncommon, it can persist into adulthood or recur during this period [1], with a prevalence of 1-3% in adults. [2]

Eczema is characterized by ill-defined erythema, edema and vesicles in the acute stage and, in the chronic stage, by a well-defined, scaly erythematous plaque with a variable degree of lichenification. [3]

As it is a multifactorial disorder, the development of the disease is influenced by several genes that interact [4] with each other and with environmental factors.

Twins have very similar exposure to foreign antigens [5] and twin studies have been used to examine the relative importance of genetic and environmental factors for AD and also for the relationship between AD and related atopic diseases. [6]

The objective of the present report is to highlight the influence of the interaction of genetic and environmental factors in the manifestation of atopic dermatitis, through the observation of different outcomes in twins.

METHODS

The information contained in this clinical case description was obtained through anamnesis, physical examination, complementary exams and review of the literature referenced in this work.

RESULTS

Twin 1, female, 21 years old, twin, white, born in Tangará da Serra – MT and resident of Cuiabá – MT, diagnosed with atopic dermatitis (AD) since she was 2 years old.

The history of labor and birth data shows prematurity (37 gestational weeks), low weight (2340g), Apgar scores of 91 and 105 and twins (diamniotic dichorionic pregnancy). Breastfeeding was performed until two months of age. She was the first twin to be born (1st twin).

The patient's twin sister's history (2nd twin) shows prematurity (37 gestational weeks), low weight (2480g), Apgar scores of 91 and 105 and breastfeeding for up to two months of life.

The twins started with symptoms of pruritus, cutaneous xerosis and reddened and exuding lesions at 2 years of age, located in the retroauricular region, wrists, flexure regions, posterior thigh and buttocks. The triggering factors for symptoms used to be irritants (cleaners, certain types of fabrics, certain cosmetics and soaps), high bath water temperature, skin dehydration, and skin that was damp for long periods. For the prevention of crises, measures were adopted such as keeping the skin well dried after bathing, moisturizing the skin with neutral products, avoiding the use of irritating products and exposure to chemicals. In case of appearance of lesions, topical corticosteroids, antihistamines and often oral corticosteroids were used, with partial improvement and return of the lesions after drug withdrawal, when re-exposed to the triggering factors.

At 5 years of age, both were diagnosed with allergic rhinitis, referred to episodes of allergic bronchitis also at this stage. Respiratory and skin conditions used to occur concomitantly and recurrently. For the treatment of respiratory symptoms, nasal hygiene, inhaled corticosteroids, oral antihistamines and even systemic corticosteroids (orally) were used.

At 10 years of age, the 2nd twin had a significant spontaneous improvement in her skin symptoms, with persistence of respiratory symptoms. The 1st twin persisted with cutaneous and respiratory symptoms.

At 15 years of age, the 1st twin, presented gastrointestinal symptoms compatible with food allergy. She did the Prick Test, showing positive for beta lactoglobulin, dust, D. farinae and Blomia tropicalis. Lanolin, neomycin, paraphenylenediamine and nickel sulfate reacted positively to the patch test, and contact dermatitis was diagnosed with these components. Treatment with allergen-specific immunotherapy is reported for approximately 1.5 years, starting

DOI: https://doi.org/10.36489/saudecoletiva.2022v12i78p11360-11367

when she was 15 years old, with significant improvement in food allergy and partial improvement in skin and respiratory conditions.

At age of 18, she was diagnosed with anxiety disorder, and drug therapy and psychotherapy were introduced. When reaching 19 years of age, she had a significant recurrence of atopic dermatitis, with the appearance of hyperemic and exudative lesions in the eyelid region, wrists, flexure regions, inner thigh and vulvar. Inner thigh lesions progressed to the urticarial form. Emotional stress is usually related to the recurrence of injuries and worsening of the condition. In addition, sleep deprivation and environmental pollution, as well as dry weather, were also reported as triggering factors.

The patient sought medical help, where instructions were given on how to avoid triggering factors, use liquid and neutral soaps, take quick baths (maximum 5 minutes) in warm to cold water and use environmental control measures to reduce the mite population (also considering the control of respiratory manifestations).

For lesion prophylaxis, the patient made frequent use of moisturizers, upon waking up, right after bathing and before going to bed, and avoided exposure to triggering factors.

To control the itching crises and eczematous lesions, he used topical corticosteroids, oral antihistamines and even systemic corticosteroids, but he only partially improved.

At the age of 21, after a new episode of recurrence of the lesions, the use of probiotics and replacement of the use of corticosteroids with tacrolimus were added to the medications already used by the patient. From then on, the patient continued the treatment with intense hydration, probiotics and tacrolimus (used when in crisis), showing stabilization of the condition.

The use of probiotics (L. acidophilus, L. rhamnosus, L. paracasei, B. lactis) and intense hydration was maintained, and tacrolimus was removed after the crisis had stopped.

At the moment, the condition is stable, without further exacerbations.

Twins have very similar exposure to foreign antigens 5 and twin studies have been used to examine the relative importance of genetic and environmental factors for AD and also for the relationship between AD and related atopic diseases.

DISCUSSIONS

AD is a chronic pruritic inflammatory skin disease whose disease course is relapsing and is often associated with elevated serum immunoglobulin E (IgE) levels, individual or family history of type I allergy, allergic rhinitis, and asthma. [7]

The pathophysiology of atopic dermatitis is related to the interaction between genetic factors predisposing to AD and environmental and/or exacerbating factors, such as maternal exposures during pregnancy, skin contact irritants, climate, pollutants, tobacco smoke, hard water, urban and rural life, and diet. [8,9,10]

As for the persistence of AD in adulthood, this is related to the early age of onset of symptoms, severe forms of presentation, family history of AD and early allergic sensitization. [8,9]

Loss-of-function mutations in filaggrin have been implicated in severe atopic dermatitis due to a potential increase in transepidermal water loss, pH changes, and dehydration. The imbalance of Th2 to Th1 cytokines seen in atopic dermatitis can create changes in cell-mediated immune responses and can promote IgE-mediated hypersensitivity, both of which appear to play a role in the development of atopic dermatitis. [11]

The exact role of allergen exposure in atopic dermatitis is controversial, however allergens present in food and the environment have been shown to be associated with the pathogenesis of atopic dermatitis. [12]

Clinically, individuals with atopic dermatitis are more susceptible to viral, bacterial, and fungal infections. Coagulase-positive S. aureus intensely colonizes 75 to 90% of patients with atopic dermatitis and acts as a superantigen by directly activating T cells. [13]

DOI: https://doi.org/10.36489/saudecoletiva.2022v12i78p11360-11367

Twin studies have been used to examine the relative importance of genetic and environmental factors for AD and also for the relationship between AD and related atopic diseases. The AD concordance rate is consistently higher for monozygotic (MZ) twins than for dizygotic (DZ) twins 1, indicating that genetic factors play an important role in the development of AD.

CONCLUSION

The evaluation of atopic dermatitis in twins is important to estimate the relative genetic and environmental contribution to various diseases. It is assumed that MZ twins are perfectly matched genetically, while DZ twins, like common siblings, share half of their segregating genes. In addition, twins are assumed to share environmental risk factors and therefore, by comparing them, it is possible to estimate the relative impact of genetic and environmental factors on a given disease. Furthermore, it is possible to estimate the degree of overlap between genetic and environmental factors for related diseases. [6]

REFERENCES

1.Thomsen SF, Ulrik CS, Kyvik KO, Hjelmborg JVB, Skadhauge LR, Steffensen I, Backer V. Importance of genetic factors in the etiology of atopic dermatitis: A twin study. Allergy and Asthma Proceedings 2007; 28(5), 535–539.

2.Silvestre SJ, Romero-Pérez D, Encabo-Durán B. Atopic Dermatitis in Adults: A Diagnostic Challenge. Journal of Investigational Allergology and Clinical Immunology 2017; 27(2), 78–88.

3.Gonzalez ME et al. Cutaneous microbiome effects of fluticasone propionate cream and adjunctive bleach baths in childhood atopic dermatitis. J Am Acad Dermatol. 2016; 75(3):481-93.

4.Kluken H, Wienker T, Bieber T. Atopic eczema/dermatitis syndrome - A genetically complex disease. New advances in discovering the genetic contribution. Allergy 2003; 58:5–12.

5.Thestrup-Oederseb K. Contact allergy in monozygous twins. Contact Dermatitis 1997; 36(1), 52–53.

6.Elmose C, Thomsen SF. Twin Studies of Atopic Dermatitis: Interpretations and Applications in the Filaggrin Era. Journal of Allergy 2015; 1–7.

7.Eichenfield LF et al. Guidelines of care for the management of atopic dermatitis: Section 1. Diagnosis and assessment of atopic dermatitis. J Am Acad Dermatol. 2014; 70:338-51.

8.Weidinger S, Gupta AK. Atopic dermatitis. Lancet. 2016; 387(10023):1109-22

9.Wandalsen GF, Camelo-Nunes ICC, Naspitz CK, Solé D. Fatores de risco para eczema atópico em escolares. Rev Inst Matern Infant Pernamb. 2005; 5:19-25

10.Kantor R, Silverberg JI. Environmental risk factors and their role in the management of atopic dermatitis. Exp Rev Clin Immunol. 2017; 13(1):15-20.

11.David BW, Tarbox JA, Tarbox MB. Atopic Dermatitis: Pathophysiology. Management of Atopic Dermatitis 2017; 21–37.

12.Addor FAZ, Aoki V. Barreira cutânea na dermatite atópica. An. Bras. Dermatol. 2010 abr; (85)2: 184-194

13.Sampaio SAP, Rivitti EA. Dermatologia. 3. ed. São Paulo: Artes Médicas, 2008; 209-221.

DOI: https://doi.org/10.36489/saudecoletiva.2022v12i78p11360-11367