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CASE REPORTS

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Is a Life Without Water Possible? Aquagenic Urticaria: Report of a Case and Review of the Literature

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Background: Aquagenic urticaria (AU) is a rare form of physical urticaria, characterized by pruritic skin eruptions triggered by water exposure, irrespective of the water's temperature. Fewer than 100 cases have been documented. The wet towel provocation test is the diagnostic standard for AU.
Case Presentation: A 12-year-old female patient presented with urticarial eruptions induced by water exposure and was diagnosed with AU following the wet towel provocation test. Initially, she tolerated brief water exposure; however, over time, eruptions occurred even with exposure to her sweat. Partial symptom control was achieved through preventive measures and antihistamine therapy.
Conclusions: AU is a rare chronic condition that necessitates prompt diagnosis and tailored management strategies to improve the patient's quality of life.

Keywords: aquagenic urticaria, antihistamine therapy, omalizumab, physical urticaria, water provocation test

Introduction

Aquagenic urticaria (AU) is an uncommon form of physical urticaria triggered by water exposure. First described by Shelley and Rawnsley in 1964, fewer than 100 cases have been documented.[1,2] After water contact, regardless of temperature, patients develop pruritic, small, punctate (1–3 mm) wheals surrounded by erythema (1–3 cm) within 20–30 min. These lesions typically resolve within 30–60 min after cessation of contact.[1,3]AU most commonly affects the trunk and upper extremities, with palms and soles generally spared. The wet towel provocation test, involving the application of a compress soaked in 35°C–37°C water or physiological saline, is the diagnostic standard. A positive result is indicated by the development of urticarial lesions within 40 min of the application or 10 min after removal.[4] Here, we present the clinical and laboratory findings, along with management details, of a 12-year-old female diagnosed with AU, supported by relevant literature.

Case Presentation

A 12-year-old female patient presented with a 3-month history of pruritic erythema and wheals on skin areas exposed to water, appearing 5–10 min after swimming in the sea or showering. Symptoms lasted 30–60 min and resolved spontaneously. Photographic evidence of previous episodes revealed small urticarial lesions. The lesions were confined to the neck, back, and chest, sparing the palms, face, and legs. No additional triggers, such as specific foods, medications, stress, or exercise, were identified, and the rash was not associated with systemic symptoms such as cough, wheezing, abdominal pain, vomiting, or hypotension.

The patient's medical history was unremarkable for chronic diseases, regular medications, or supplements. No additional allergic symptoms were reported, and her family history was negative.

Physical examination, including skin and systemic evaluations, showed no significant findings, with no dermatographism observed.

Laboratory tests revealed a normal complete blood count, a peripheral eosinophil count of 100/mm^3, an erythrocyte sedimentation rate of 2 mm/h, and a serum total IgE level of 12.4 IU/mL. Specific IgE tests for aeroallergens, including grass mix, dust mix, olive tree, *Aspergillus fumigatus*, and cat dander, were negative. Thyroid hormone levels, C-reactive protein, and routine biochemical

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tests were within normal limits. An anti-thyroperoxidase antibody, anti-thyroglobulin antibody, and antinuclear antibody tests were negative. Urinalysis results were unremarkable, and viral screening tests (hepatitis B, hepatitis C, and HIV) were negative. The patient's urticaria control test (UCT) score was 6, indicating poor control.

The patient, who specifically reported rashes following exposure to seawater or showering but did not experience symptoms when washing her hands or face, underwent an ice cube test to rule out cold urticaria. The test yielded negative results. Subsequently, a water provocation test was performed using a towel soaked in 35°C tap water, which was applied to the patient's back, given the preliminary diagnosis of AU. This test was conducted during the summer. To ensure reliable results, the towel was replaced with a freshly soaked one at the 10th min. Within 20 min, the patient reported itching, and urticarial lesions appeared at the test site. Consequently, AU was confirmed through the wet towel provocation test (Fig. 1A, B, C).

The patient was prescribed 20 mg of the second-generation antihistamine bilastine, to be taken once daily with additional doses as needed. She was also advised to apply liquid petroleum jelly as a topical barrier cream before water exposure. Bath durations were restricted to minimize symptoms.

Although systemic symptoms have not been reported to date, the patient was prescribed an epinephrine auto-injector and received training on its proper use to manage potential systemic reactions.

After 1 month of antihistamine therapy and preventive measures, the patient's symptoms improved. Her follow-up UCT score was recorded as 11. However, her lesions worsened with excessive sweating or prolonged water exposure. The family was informed that the antihistamine dose could be increased by two- to fourfold if necessary and that omalizumab could be considered as an alternative treatment despite the patient's low IgE levels. At present, the patient is on twice-daily antihistamine therapy at the family's request.

Discussion

AU is a rare type of physical urticaria triggered by water exposure. It is slightly more common in females than males, with most cases presenting during or after puberty.[5] In our female patient, the symptoms also began during puberty, aligning with the existing literature.

Although most AU cases are sporadic, familial occurrences have been documented.[2,6] For instance, AU observed across three generations of a family has been associated with lactose intolerance due to lactase enzyme deficiency encoded on chromosome 2. However, this genetic link remains inconclusive and may be coincidental.[6] No similar complaints were reported in our patient's family.

In AU, lesions typically develop independently of water temperature and pH, as observed in our patient.[7] Reactions to saltwater are variable. Tkach[8] reported a case of urticaria triggered by tap water, snow, and sweat but not seawater, hypothesizing that sudden osmotic pressure changes around hair follicles may contribute to lesion development. Other studies suggest that increased salt concentration and water osmolarity may enhance the solubility and penetration of triggering epidermal antigens.[9–11] Body fluids such as sweat and tears have also been reported to trigger urticaria.[2] Our patient initially tolerated brief water exposure and reported lesions only after contact with seawater and tap water. However, over time, she began experiencing reactions to sweat as well. Notably, the severity of the rash was greater with seawater exposure than with tap water.

The pathogenesis of AU remains poorly understood. Early literature suggested that a toxic substance formed by the interaction of water and sebum could cause mast cell

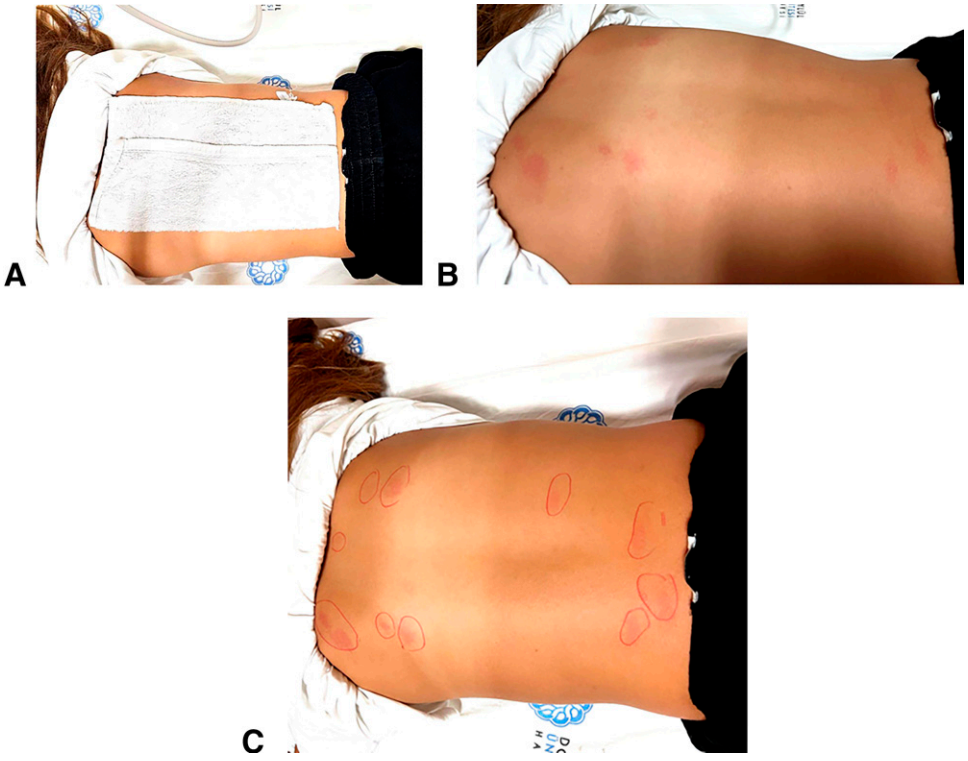


FIG. 1. Figure 1 demonstrates the wet towel provocation test and patient results. Image **(A)** shows the application site of the wet towel soaked with 35°C water to the child's back; **(B)** shows the urticarial lesions that developed at the test site 20 min following the application of the wet towel; **(C)** highlights these lesions.

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degranulation.[1] Czarnetzki et al.[12] hypothesized that a water-soluble antigen located in the epidermis diffuses into the dermis upon contact with water, triggering histamine release from mast cells. While cholinergic pathway activation has been implicated in AU, evidence remains inconsistent. For example, scopolamine, an acetylcholine antagonist, has been reported to prevent lesions in some cases, whereas atropine, a similar agent, has shown no such effect.[12,13]

For patients with a typical clinical history, the wet towel test offers a simple, cost-effective diagnostic method and can minimize the need for advanced investigations. In the differential diagnosis of AU, conditions such as aquagenic pruritus, cholinergic urticaria, cold urticaria, and other chronic urticarias should be excluded. Complementary physical urticaria tests may be necessary.[3,4] In our case, AU was diagnosed using the wet towel test, while cold urticaria was ruled out through the ice cube test.

Although our patient did not exhibit systemic symptoms, systemic manifestations of AU have been reported in the literature.[2,5] AU may also present as a manifestation of systemic diseases or in association with malignancies.[14–16] In our patient, who had experienced dermatological symptoms for 3 months without evidence of an underlying systemic condition, we opted for regular follow-up, symptom monitoring, and repeat laboratory evaluations as clinically indicated.

The UCT is a validated tool for assessing disease control in chronic urticaria, including chronic spontaneous and chronic inducible forms.[17] We utilized the UCT in our patient's clinical follow-up.

First-line treatment for AU includes antihistamines, followed by topical barrier creams, phototherapy, and omalizumab.[2,3,18,19] Stanozolol, a synthetic anabolic-androgenic steroid, has also shown efficacy in AU patients with comorbid conditions such as HIV and hepatitis C.[15] In our patient, partial symptom control was achieved by doubling the antihistamine dose. Although her total IgE level was below 30 IU/mL, omalizumab is planned for initiation during follow-up upon obtaining family consent, as certain urticaria cases benefit from omalizumab despite low IgE levels.

Because avoiding water as a trigger is nearly impossible, AU significantly affects patients' quality of life. Conservative approaches, such as applying barrier creams before water exposure and limiting bath durations, are essential. Symptomatic treatments similar to those used for other chronic urticarias are also recommended. In addition, patients should receive detailed guidance on the use of adrenaline auto-injectors to manage potential systemic reactions, such as anaphylaxis. Close monitoring throughout the disease course is crucial for effective management and safety. Further research is needed to clarify the pathogenesis, comorbidities, and specific treatment strategies for AU.

Ethical Approval and Trial Registration

The case description was performed in accordance with the ethical standards outlined in the Declaration of Helsinki and its latest amendments.

Consent for Publication

Written informed consent was obtained from the parents for the publication of the case report and photographic images.

Author Disclosure Statement

No competing financial interests exist.

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References

1. Shelley WB, Rawnsley HM. Aquagenic urticaria: Contact sensitivity reaction to water. JAMA 1964;189(12):895–898; doi: 10.1001/jama.1964.03070120017003
2. Rujitharanawong C, Kulthanan K, Tuchinda P, et al. A systematic review of aquagenic urticaria-subgroups and treatment options. J Allergy Clin Immunol Pract 2022;10(8): 2154–2162; doi: 10.1016/j.jaip.2022.04.033
3. Rothbaum R, McGee JS. Aquagenic urticaria: Diagnostic and management challenges. J Asthma Allergy 2016;9: 209–213; doi: 10.2147/JAA.S91505
4. Magerl M, Altrichter S, Borzova E, et al. The definition, diagnostic testing, and management of chronic inducible urticarias—The EAACI/GA(2) LEN/EDF/UNEV consensus recommendations 2016 update and revision. Allergy 2016; 71(6):780–802; doi: 10.1111/all.12884
5. Luong KV, Nguyen LT. Aquagenic urticaria: Report of a case and review of the literature. Ann Allergy Asthma Immunol 1998;80(6):483–485; doi: 10.1016/S1081-1206(10) 63071-2
6. Treudler R, Tebbe B, Steinhoff M, et al. Familial aquagenic urticaria associated with familial lactose intolerance. J Am Acad Dermatol 2002;47(4):611–613; doi: 10.1067/mjd .2002.124599
7. Chalamidas SL, Charles CR. Aquagenic urticaria. Arch Dermatol 1971;104(5):541–546; doi: 10.1001/archderm.1971 .04000230083015
8. Tkach JR. Aquagenic urticaria. Cutis 1981;28(4):454, 463.
9. Hide M, Yamamura Y, Sanada S, et al. Aquagenic urticaria: A case report. Acta Derm Venereol 2000;80(2):148–149; doi: 10.2340/0001555580150
10. Gallo R, Gonçalo M, Cinotti E, et al. Localized salt-dependent aquagenic urticaria: A subtype of aquagenic urticaria? Clin Exp Dermatol 2013;38(7):754–757; doi: 10.1111/ ced.12147
11. Vieira M, Rosmaninho I, Lopes I, et al. Localized salt-dependent aquagenic urticaria, a rare subtype of urticaria: A case report. Eur Ann Allergy Clin Immunol 2018;50(3):141–144; doi: 10.23822/EurAnnACI.1764-1489.56
12. Czarnetzki BM, Breetholt KH, Traupe H. Evidence that water acts as a carrier for an epidermal antigen in aquagenic urticaria. J Am Acad Dermatol 1986;15(4 Pt 1):623–627; doi: 10.1016/s0190-9622(86)70215-6
13. Sibbald RG, Black AK, Eady RA, et al. Aquagenic urticaria: Evidence of cholinergic and histaminergic basis. Br J Dermatol 1981;105(3):297–302; doi: 10.1111/j.1365-2133 .1981.tb01289.x
14. Ozkaya E, Elinç-Aslan MS, Yazici S. Aquagenic urticaria and syncope associated with occult papillary thyroid carcinoma and improvement after total thyroidectomy. Arch Dermatol 2011;147(12):1461–1462; doi: 10.1001/archderm .147.12.1461
15. Fearfield LA, Gazzard B, Bunker CB. Aquagenic urticaria and human immunodeficiency virus infection: Treatment

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with stanozolol. Br J Dermatol 1997;137(4):620–622; doi: 10.1111/j.1365-2133.1997.tb03798.x
16. Baptist AP, Baldwin JL. Aquagenic urticaria with extracutaneous manifestations. Allergy Asthma Proc 2005;26(3): 217–220.
17. Zuberbier T, Abdul Latiff AH, Abuzakouk M, et al. The international EAACI/GA^{2}LEN/EuroGuiDerm/APAAACI guideline for the definition, classification, diagnosis, and management of urticaria. Allergy 2022;77(3):734–766; doi: 10.1111/all.15090
18. Rorie A, Gierer S. A case of aquagenic urticaria successfully treated with omalizumab. J Allergy Clin Immunol Pract 2016;4(3):547–548; doi: 10.1016/j.jaip.2015.12.017
19. Kaur S, Jabbal IS, Bhasin AK. Omalizumab as a treatment option for antihistamine-refractory aquagenic urticaria. BMJ Case Rep 2022;15(7):e251057; doi: 10.1136/bcr-2022-251057

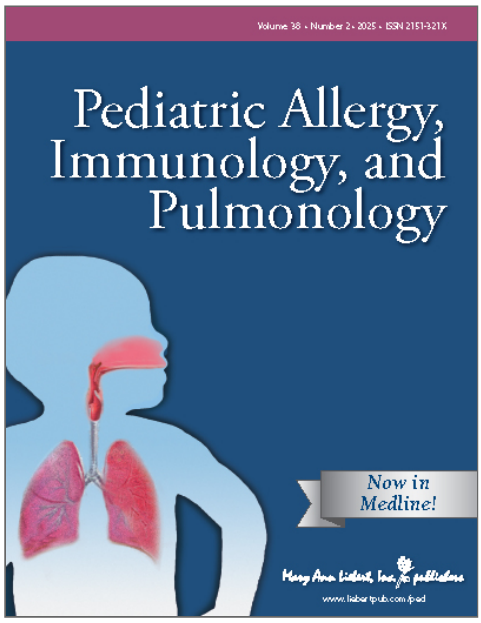
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