

An Overview of Airborne Contact Dermatitis

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Abstract

Airborne-contact dermatitis (ABCD) is a form of contact dermatitis which originates from air borne allergens like dust, sprays, pollens etc. ABCD is most commonly seen secondary to plant antigens especially to compositae family. However, recently cases of ABCD due to non-plant allergens have also been reported. This review focuses on common air borne allergens/irritants, clinical manifestations, diagnosis and management of air borne contact dermatitis.

Keywords: Allergen; Dermatitis; Airborne; Non-plant

Introduction

Airborne contact dermatitis is a dermatoses affecting mainly exposed parts of the body and is caused by allergens/irritants present in the atmosphere. Allergens can be present in various forms like dust, sprays and pollens, which settle on the exposed parts of our body [1]. Most commonly affected sites are face, neck, 'V' area of chest, eyelids, axillae and forearms. Sometimes non exposed sites like major body folds can also be involved [2-4]. Allergens can be of plant as well as non-plant origin. Most common airborne dermatitis is due to *Parthenium hysterophorus*. However cases due to non-plant allergens and industrial origin are on increasing trend especially in developing countries [2,5]. The diagnosis of airborne dermatitis is usually made on the basis of history of the patient, the distribution and morphology of the lesions and patch test, prick test or Radio allergosorbent test [6]. The incidence of the airborne contact dermatitis is increasing now a day [7]. In this article, an overview of the nature of airborne contactants, clinical manifestations of airborne dermatitis, diagnosis, differential diagnosis and various preventive and treatment modalities will be provided.

Nature of Airborne Contactants

The air borne allergens and irritant agents can enter the environment in many different ways like vapors etc. The most common allergens and irritants causing airborne dermatitis has been listed in Table 1 [6-30]. In India, *Parthenium hysterophorus* is the most common Compositae weed responsible for causing airborne dermatitis. This plant is also known as Congress grass or feverfew. Parthenium is originally a species of Mexico, brought to India along with wheat shipments from USA. The weed grows wildy on wastelands and along canals, railway tracks and roads. Sesquiterpene lactones (SQL) are the most important allergens in the plant. Among the SQLs, Parthenin is the major allergen [31-33]. Other than parthenin, coronopilin, hymenin, tetraeurin A has been found in parthenium. Liverwort, tulip tree and sweet bay also contain SQL so they may show cross sensitivity with parthenium [32].

Clinical Manifestations

According to a classification by Dooms- Goossens, airborne contact dermatitis can be divided into different types [8]:

1. Airborne allergic or irritant contact dermatitis
2. Airborne phototoxic reactions
3. Airborne photoallergic reactions
4. Airborne contact urticaria

Other rare airborne skin reactions include exfoliative dermatitis, lichenoid papules, hyper- and depigmentation and targetoid lesions. One particular product can cause more than one type of reaction for example, *P. hysterophorus* can produce allergic contact dermatitis, photocontact dermatitis and lichenoid eruption. Sometimes one dermatitis may mask another one, for example, in case of rosacea and air-borne dermatitis in a farmer [34].

Classical air borne dermatitis presents as involvement of face, nasolabial folds 'V' of neck, extensors of upper limb and dorsum of hands. The skin symptoms can also occur on those parts of the body which are not exposed to the air [35]. Occasionally, though rarely there can be generalized involvement with the picture of an erythroderma, for example, erythroderma due to compositae dermatitis, mercury exanthema (generalization of the dermatitis caused by volatile substances such as mercury vapors). In addition to airborne factor, penetration through clothing and inhalation may play role in generalization. To assess the severity of Air borne contact dermatitis, there is a Clinical Severity Score (CSS) put forward by Verma et al. [36]. ABCD can also be subclassified as plant or non-plant origin [37]. Non plant allergens include potassium dichromate, epoxy resins, colophony, formaldehyde, perfumes/deodorants, volatile paints etc. Ghosh et al. studied 64 patients and found potassium dichromate as most common allergen followed by fragrance mix and epoxy resins [5]. In urban and semiurban areas, cement, perfumes, volatile paints and synthetic glues are the commonest allergens [38].

Diagnosis and Differential Diagnosis

Involvement of upper eyelid is a useful sign to differentiate these patients from pure photosensitivity. Also involvement of covered parts of the body such as major body folds, the genital region, lower legs, "Wilkinson's triangle" and area under the chin suggest airborne contact dermatitis. The allergen in the environment can be found with the help

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Allergic airborne contact dermatitis						
Plants, natural resins, vegetable and wood allergens	Plastic, rubber and glues	Metals	Industrial and pharmaceutical chemicals	Insecticides, pesticides, animal feed additives	Solvents	Miscellaneous
Ambrosia deltoidea Acacia melanoxylon Cedar pollen [9] Citrus fruits Compositae Cinnamon [10] Chrysanthemum Eucalyptus Pulverulenta [11] Essential oils Frullanta Garlic Helianthus annus Latex [12] Pinus roxburghii [13] Parthenium hysterophorus Soybean Tropical and domestic woods	Acrylates [14] Benzoyl peroxide Epoxy acrylates Epoxy resin Formaldehyde and formaldehyde resins Isocyanates [15] Rubber additives	Arsenic salts Chromate Cobalt [16] Gold Mercury Platinum [17] Nickel Silver	Azathioprine Azithromycin Albendazole Budesonide Cefazolin Famotidine Formaldehyde and releasers Glutraldehyde Isoflurane Lansoprazole Meropenam Methotrexate Methyl chloroform Methyl chloroisoithiazolium [18,19] Pantoprazole Paraphenylenediamine Paracetamol PABA Potassium metabisulphite [20] Rhodium solutions [21]	Carbamates(fungicides) Cobalt (animal feed additive) Dyrene Ethoxuquin (antioxidant in animal feed) Oxytetracycline hydrochloride (animal feed antibiotic) Organophosphorus pesticides [22] Pig's feed [23] Penicillin (animal feed antibiotic) Pyrethrum Spiramycin(animal feed antibiotic)	Acetone	Agricultural dusts [24] Cigarettes [25] Cladosporium Disperse dyes Penicillium
Non-allergic airborne contact dermatitis						
Irritant contact dermatitis	Photoallergic reactions	Contact urticaria	Contact urticaria syndrome	Protein contact dermatitis	Erythema multiforme like eruption	
Phosphates [26] Synthetic fibers Chlorothalonil Mustard gas Metal dust Carbon fiber Ethylene oxide	Carprofen [27] Chlorpromazine Olaquinox Pesticides-manes, fenitrothion	Amoxicillin Epoxy resin Hyacinth Weeping fig Isothiazolinone	Anisakis simplex Compositae Fern Goat dander Protease Lupine flour	Flour Sapele wood [28]	Japanese liquor tree [29] Weeds [30]	

Table 1: Various airborne contactants (modified from Santos et al. [6], Huygens et al. [7] and Handa et al. [8]).

of chemical analysis or direct microscopic studies of the air materials in the air [39]. Patch test is useful for air borne allergic cases [40]. Light tests and photopatch tests can help in excluding photosensitive disorders. Air borne dermatitis can also be confused with dermatitis caused by directly applied agents, dermatitis caused by occasional contacts with an allergen, connubial or consort dermatitis, an id reaction and photoinduced reactions [8]. Irritant and allergic contact dermatitis of the face can occur due to the transfer of allergenic particles by nail polish. This is the classic example of an “ectopic dermatitis” [41]. Another example of ectopic dermatitis in males is genital lesions caused by ‘hand transportation’ of the allergens. Finally, other eczematous skin diseases, for example, atopic dermatitis having predominant flexural and skin crease involvement is also an important differential diagnosis.

Management

To control air borne dermatitis, degree of contact hypersensitivity and quantity of antigen should be decreased. In cases of parthenium dermatitis, causative plant should be removed from the immediate environment. Patient should cover as much of the skin as possible by clothing. Uncovered areas should be washed with soap and water so as to remove the antigen before it penetrates the skin. Barrier creams can also be used after every wash. Change of job and residence if possible can help in decreased exposure [8].

Treatment

Corticosteroids are the mainstay of therapy. Mild to moderate disease can be controlled with topical corticosteroids only. Corticosteroids decrease the number of inflammatory cytokines as well as decrease the antigen presenting cells. For severe involvement that is more than 25% body surface area, systemic steroids may be

required. Systemic steroids are usually prescribed at a starting dose of 0.5-1 mg/kg/ day of prednisolone. Within 3 months, patient can achieve complete remission. To decrease the side effects, corticosteroid dose should be tapered as soon as remission occurs [32]. Amongst other immunosuppressants, azathioprine is most commonly used [42]. It takes 4-6 weeks to exert its action, so is more useful for the treatment of chronic cases. It should be used with corticosteroids in the management of acute stage. Weekly azathioprine therapy 300 mg / week can also be used instead of daily dose, this has benefit of increased compliance and lesser side effects [43,44]. Main side effects with azathioprine are gastrointestinal intolerance, hepatotoxicity and bone marrow suppression. Methotrexate and cyclosporine can also be used as effective steroid sparing agents [45]. Cyclosporine can be used in the acute phase because of quicker response. Side effects of cyclosporine include hypertension and nephrotoxicity. Oral hyposensitization i.e. introduction of an antigen into the body by a route different from natural one to induce such a change in the immune system so that when antigen is introduced into the body through normal route, the body does not develop clinical features. It is thought to act by causing depletion of memory T-cells. It is tolerated well by the patients except for mild abdominal pain, ‘heartburn,’ and cheilitis [46]. Immunotherapy with recombinant protein is emerging as a new treatment option for ABCD patients [47,48].

Conclusion

ABCD patients tend to have active symptoms even many years after diagnosis. Avoidance of further antigen exposure should be emphasized. Biological measures like exotic arthropods and opportunistic pathogens, use of various antagonistic plants and bioherbicides and chemical herbicides can help in decreasing parthenium hysterothorus.

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