Pigmented contact dermatitis

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Pigmented contact dermatitis (PCD) is a noneczematous variant of contact dermatitis, characterized clinically by hyperpigmentation with little or no signs of dermatitis. The term "pigmented contact dermatitis" was coined by Osmundsen, a Danish dermatologist who described an epidemic of melanosis in Copenhagen.[1] In a series of excellent observations and investigations, he proved that the melanosis was in fact due to contact dermatitis caused by an "optical whitener" present in a washing powder. The chemical responsible was shown to be a mixture of two "pyrazoline" derivatives that seem to have a marked tendency to induce pigmented contact dermatitis. Many chemicals with a similar tendency have been identified in the subsequent years. Consequently, a great deal of knowledge has been acquired in the field of pigmented contact dermatitis.

PIGMENTED COSMETIC DERMATITIS

In Japan, after World War II, a large number of patients, particularly females presented with a peculiar type of pigmentation on the face. Diffuse or patchy brown pigmentation was observed on the cheeks and/or forehead; the entire face was affected in severe cases. Occasionally, erythematous macules and papules were also noted suggesting the possibility of mild contact dermatitis. Nakayama *et al.* proposed the term "pigmented cosmetic dermatitis" to describe this condition.[2] Patch testing with various chemicals used in the cosmetic industry and cosmetics used by the patient "as is" revealed distinct positive reactions to many ingredients in the cosmetics. Following this, major cosmetic companies in Japan stopped the usage of these strong sensitizers in their products from 1977. In the years that followed, the incidence of pigmented cosmetic dermatitis has decreased remarkably. It is now clear that pigmented cosmetic dermatitis is a variant of PCD; the only differences being the causative allergen and the sites affected.

RIEHL'S MELANOSIS – A VARIANT OF PCD

In 1917, during the First World War, Riehl in Vienna observed several patients with striking dark brown to grayish-brown pigmentation on the forehead, temporal and zygomatic region of the face. The pigmentation was more pronounced laterally on the face than in the midline. Riehl could not explain the cause of this condition with certainty; he attributed it to food substitutes during the time of war. Subsequently, Pierini investigated 20 patients presenting with Riehl's melanosis by using patch testing. It revealed a strong reaction to aniline dye (orange II) in the face powder, indicating that Riehl's melanosis could be a variant of contact dermatitis. The inflammatory component was present in small amounts or absent in these patients and the only macroscopic sign of dermatitis was hyperpigmentation. At present, Riehl's melanosis is considered synonymous with PCD; the common allergen being fragrances and chemicals in cosmetics.[3]

PATHOMECHANISM OF PCD

Most of the reported cases of PCD occurred in patients with dark complexion, pointing strongly towards pigment-genetic interaction. Although, PCD is commonly acquired due to direct contact with the allergens, a few cases have been described in the literature where it occurred after air-borne spread.[4,5] The common allergens responsible for PCD are listed in Table 1. The exact mechanism by which these allergens

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Table 1: Common allergens causing pigmented contact dermatitis

Cosmetics	Fragrances, preservatives, hair cosmetics (hair dyes), lipsticks, and kumkum
Fragrances	Benzyl salicylate, ylang-ylang oil, cananga oil, jasmine absolute, hydroxycitronellal, methoxycitronellal, sandalwood oil, benzyl alcohol, cinnamic alcohol, lavender oil, geraniol oil, and musk-ambrette
Textiles	Azo dyes (e.g., disperse blue 106, disperse blue 124), optical whiteners, and coupling agents (Naphthol AS)
Toiletries	Chromium hydroxide, fragrances, nickel oxide
Others	Minoxidil, nickel sulfate, wood dust (*Plathymenia foliosa*), paratertiary butyl-phenol formaldehyde (PTBPF)

induce pigmentation is unknown. Osmundsen thought it is an idiosyncratic reaction.[1] Experimental studies have shown that cutaneous inflammation increases the number and size of the melanocytes and enhances their enzymatic activity.[6] The allergen responsible for PCD may have a special affinity for melanin, inciting an inflammatory reaction first around the melanocytes and then around the cells incorporating melanin granules.[7] In their study on pigmented cosmetic dermatitis, Nakayawa *et al.* hypothesized that the concentrations of allergens in commercial preparations were too low to produce spongiotic dermatitis. Instead, they produced cytolytic type of type IV allergy mainly at the basal layer of the epidermis that resulted in pigmentary incontinence.[2]

CLINICAL MANIFESTATIONS

Patients present with reticulate slate grey or brown pigmentation; there may be subtle signs of preceding dermatitis in the form of erythema, edema and pruritus in a few patients. The site of dermatitis depends on the allergen responsible; face being the most common site affected in pigmented cosmetic dermatitis. Leow *et al.* described pigmented contact cheilitis due to ricinoleic acid in lipsticks.[8] Dress or shirt dye dermatitis affects the axillary borders, sparing the vault; and trouser dye dermatitis presents initially on the anterior thigh.

PCD AND PATCH TEST

Patch testing is of immense value in the diagnosis of PCD. Closed patch testing should be carried out with standard series, cosmetic series, fragrance series and the personnel products of the patients. Photo patch test should be done as a part of further evaluation. The International Contact Dermatitis Research Group (ICDRG) scoring system should be followed to record the reaction. Apart from a papule or vesicle, a brown pigment may develop at the site of patch test site. A study from Israel on the utility of screening patch test in PCD has revealed highest yield with European standard series (ESS) and Scandinavian photo series.[9] The provocative use test (PUT) or repeated open application test (ROAT) may identify a reaction if closed patch testing reaction is equivocal. The suspected product is rubbed into the antecubital skin twice daily for 4-5 days. Alternatively, PUT or ROAT may be performed on the face or other affected areas.[10]

The accepted criterion of the relevance of a positive patch test reaction i.e., the disappearance of the eczema after discontinuing the exposure to the allergen, cannot be applied to PCD as the pigmentation will probably persist for months or even years.[1]

Patch testing for fragrance allergy: Patch testing with Balsam of Peru and fragrance mix will probably detect over 90% of the cases with fragrance allergy.[11] If a patient is tested positive with a fragrance mix, patch testing with individual agent should be carried out. A request may be sent to the manufacturer to provide the breakdown of the fragrance components for conducting the patch test. The Cosmetics, Toiletry and Fragrance Association (ITFA) and/or the Research Institute for Fragrance Materials (RFFM) assist physicians in the United States in investigating fragrance or cosmetic allergies by supplying necessary information.[10]

Patch testing for cosmetic allergy: A majority of the cosmetic allergy cases occurs due to either preservatives (32%) or fragrances (27%).[12] ROAT should be done when closed patch test with cosmetic series is negative, as the concentration of allergen may be too low to produce a positive reaction on the back. This is especially true of fragrances and preservatives. In the United States, the diagnosis of a reaction to cosmetics has been facilitated by the FDA's regulation requiring the ingredients labeling of all the retailed cosmetics. Because of the complexity of the composition of fragrances and trade secrecy concern, their compositions are not given but listed simply as "fragrances."[13] Unfortunately, ingredient labeling is not required outside the United States.

PCD: INDIAN PERSPECTIVE

There is a paucity of data on the occurrence of PCD among Indian patients. Commonest allergen causing PCD in India is kumkum. It appears that only red kumkum can sensitize

and cause PCD. Commercially available red kumkum contains azo dyes, coal tar dyes, toludine red, erythrosine, lithal red calcium salts, fragrances, ground nut oil, tragacanth gum, turmeric powder, paraben and cananga oil. Goh *et al.* reported three cases PCD due to kumkum.[14] Patch test revealed positive reactions to kumkum powder in all the three cases and also to dyes (Brilliant Lake Red R, Sudan I, aminoazobenzene) in one case and cananga oil in another case. Kumar *et al.* reported pigmentation following the use of "bindi;" however, the patch test was negative in these patients.[15] A recent study from South India revealed that PCD is the commonest type of presentation of kumkum dermatitis.[16]

A multicentric study should be undertaken in our country under the leadership of Contact and Occupational Dermatitis Forum of India (CODFI) to identify the common allergens responsible for PCD. Ingredient labeling should be made mandatory in all the personal skin-care products. The industry should be instructed to avoid the common allergens in their products.

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