

# Clinical and patch testing correlation in allergic contact dermatitis

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## Abstract

**Background:** Allergic contact dermatitis (ACD) is an acute or chronic inflammatory condition which is T-cell mediated type IV hypersensitivity reaction on the skin following contact with exogenous allergen. Patch testing is the gold standard test to diagnose ACD. Patch testing is a noninvasive, cost effective, OPD procedure with good patient compliance and it provides earliest diagnosis of ACD so as to make appropriate interventions. **Methodology:** A prospective observational study was done on suspected ACD patients attending dermatology. Study was carried out in a tertiary care hospital over a period of 2 years. All these patients were subjected to patch testing. Clinical and patch testing findings were correlated. **Results:** A total of 50 patients with suspicion of ACD were included in our study. Out of total fifty patients studied; thirty patients were found to be patch test positive. There was a male predominance (4:2) and majority belonged to age group of 30 – 45 years. The common allergens found was parthenium followed by potassium dichromate followed by PPD. **Conclusion:** Patients with ACD have a varied clinical presentation. Patch testing is the confirmatory diagnostic tool for ACD which can help in finding allergen and for earliest intervention. **Key Words:** ACD, Parthenium, PPD.

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## INTRODUCTION

Allergic contact dermatitis (ACD) is an inflammatory, T-cell mediated type IV hypersensitivity reaction on the skin following contact with an exogenous antigen. <sup>[1]</sup> Contact dermatitis is one of the most common skin disorders all over the worlds which accounts for 4 – 7% of all dermatological consultations.<sup>2</sup> Patch test is the gold standard for the diagnosis of ACD.<sup>3</sup> Due to complex life style and industrialization our skin exposed to various

chemicals and allergens, thereby increasing allergic sensitization leading to ACD. ACD can affect physical, mental and social wellbeing of the individual. Avoidance of causative allergen is the only effective management without which ACD patients will have persistent or recurrent dermatitis. Patch test is inexpensive, less time consuming, day to day OPD procedure with good patient compliance, to reach an early diagnosis of ACD and can undertake timely intervention, thus improving the quality of life of the patient. The study was done to determine various clinical presentations of ACD and its correlation to patch testing.

## MATERIALS AND METHODS

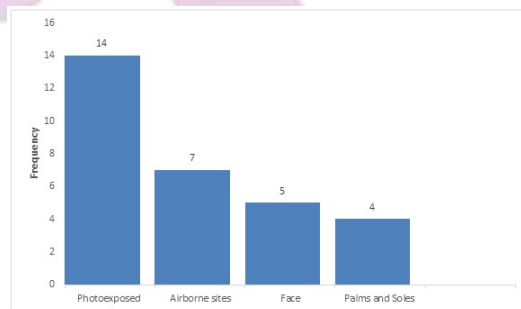
50 suspected cases of ACD who attended the OPD of department of dermatology in a tertiary care hospital in Karnataka from October 2019 to March 2021 and who consented for the patch test were included in the study. A thorough clinical history was elicited, regarding address, occupation, nature and duration of eczema and contact with any specific allergen. Also, personal and family

history of atopy were obtained. A detailed dermatological examination to determine the involvement and morphology of the lesions was done. Patients with active disease, those less than 18 years of age, pregnant and lactating females, and those taking steroids and antihistamines for last 2 weeks were excluded from the study. Patch testing was done using Indian Standard Series from Systopic laboratories, approved by the Contact and Occupational Dermatoses Forum of India, which contains 19 allergens and one control (Vaseline). Aluminum Finn chambers with allergen were applied on the upper back mounted on a micropore tape. Day 2 and Day 4 readings were taken and were interpreted according to the International Contact Dermatitis Research Group (ICDRG) grade, and only those reactions which persisted beyond day 2 were considered positive.

### OBSERVATIONS AND RESULTS

Out of the total 50 patients, with the age group between 18 and 70 years (mean 41.02), 30 (60%) were found to be patch test positive. Many of the patch test positive patients belonged to the age group of 30 – 45 years. There was a male predominance (4:2). Among all 50 patient's majority of them were farmers by occupation (43.6%) followed by manual laborers/construction workers (25.8%), housewives and elderly (19.7%) and shop owners and others (10.9%). Majority of patients (44.8%) had symptoms of ACD for 6 months to 18 months. Most of them had frequent episodes rather than continuous course of ACD. Out of 30 patch test positive patients 23 (76%) of them presented with pruritus and 4 (13%) with burning sensation and photosensitivity and 3 were asymptomatic. Out of 35 patch test positive patients 11 (36%) had a positive history of atopy in the past. All 30-patch test positive patients had taken some topical and systemic treatment like antihistamines, steroids, ayurvedic and homeopathic medications before presenting to us with ACD. Out of 30 patch test positive patients 16 (53.33%) patients showed morphology of papules and plaques followed by erythematous papules and hyperkeratotic/lichenified plaques. [Graph 1 shows the distribution of the lesion.] Out of total 30 patch test positive patients 14 patients were found to be positive to one or more allergen while 16 were positive to single allergen. The most common allergen found was Parthenium followed by Potassium Dichromate followed by Para-Phenylenediamine. Upon history and clinical examination, 24 (80%) patients showed the positivity of suspected allergen. In the 14 Parthenium-positive patients, 10 were males while 4 were females. Out of total 14 Parthenium positive patients, 13 had given history of

Parthenium exposure and most common clinical pattern was photodermatitis like predominantly on photo exposed areas with sparing of retro auricular area. [Figure 1] Out of these 14 Parthenium positive patients, eight patients were found positive only to Parthenium while rest 6 patients were positive to one or more allergen along with Parthenium: Potassium Dichromate (2), Para-Phenylamine Diamine (1), Nickel sulfate (1), black rubber mix (1), Paraben (1), Thiuram mix (1), fragrance mix (1). [Figure 2 and Figure 3]. Aggravation on sun exposure was present in 66% patients. Out of total 30 patch positive patients nine patients showed positivity to potassium dichromate among which seven patients were also positive to other allergens like: Parthenium (2), PPD (1), paraben (1), thiuram mix (1), nickel sulfate (1) and mercaptobenzothiazole (1). As patch test had shown multiple positive allergens, significant and predominant allergen causing symptoms was found out by detailed history about occupation, residence, history of exposure, duration of symptoms and by thorough clinical examination. Reading of patch testing was done at Day 2 and day 4 and results were interpreted according to ICDRG grading. [Table 1] Out of total 30 patch test positive patients, twelve patients had developed some side effects after performing patch test. All these twelve patients had developed side effects after 48 hrs reading. Itching was the most common side effect followed by development of urticarial wheals. Itching was more on the site of patch testing.



Graph 1: Distribution of Lesions in ACD patients.



Figure 1: Parthenium Dermatitis



**Figure 2:** Multiple allergens positive on Patch Test **Figure 3:** Multiple allergens positive on Patch Test

**Table 1:** Evaluation of Patch Test Readings (ICDRG Grades)<sup>12</sup>

Grading	Description	Interpretation
-	No erythema or papules	Negative reaction
+/- or ?	Erythema only	Doubtful positive
+	Erythema, mild infiltration, discrete papules	Weak positive
++	Erythema, infiltration, papules and vesicles	Strong positive
+++	Intense erythema, coalescing vesicles	Extreme positive
IR	Sharply demarcated erythema or epidermal necrosis	Irritant reaction
NT	-----	Not tested

## DISCUSSION

ACD is the most prevalent form of immunotoxicity in humans characterized by clinical manifestation such as red rashes, itchy skin and blisters. It occurs when an allergen comes in contact with the previously sensitized skin due to cell mediated immunity. Allergens are low molecular weight chemicals. ACD is a typical type IV hypersensitivity response that develops in two phases, the initiation phase in which the immune system is sensitized and the elicitation phase in which the clinical symptoms develop. In last few years, there is increased urbanization, industrialization and heavy use of various cosmetic products leads to rising cases of ACD. The allergens in standard series to be tested in patch testing are different in various regions. Our study included a total of 50 patients who either had a history suggestive of ACD or had clinical manifestations of ACD. Patch test was performed on all these 50 patients, out of which 30 were found to be patch test positive. In our study male to female ratio was 4:1. Similar observation was also made by George NM *et al.* and G. Narendra *et al.* where men outnumbered women.<sup>4,5</sup> Our study had the patch test positive patients with the age group of 30 – 45 years which was found similar in study done by Singhal V *et al.* which showed most common age group as 20 – 39 years.<sup>6</sup> The reason behind male preponderance and young age group could be due to occupational reason as young population makes up the working age group and is exposed to many allergens on day-to-day basis. In our study, out of 35 patch test positive patients 11 (36%) had a positive history of atopy in the

past. In study done by Josefson *et al.* found that atopic dermatitis is the most important risk factor for ACD.<sup>7</sup> Atopic dermatitis have barrier dysfunction that contributes to ACD.<sup>8</sup> Similar finding was found in study done by George NM *et al.* More than 4350 chemicals have been identified as contact allergens.<sup>[9]</sup> Out of total 50 patients only 30 patients were found to be positive in our study. This could be due to limited no. allergens available in the Indian Standard Series. ACD to parthenium was the most common dermatitis found in our study group. 15 % Parthenium hysterophorus was the commonest allergen implicated. This finding is unlikely to the study done by Pillai *et al.* where ACD to cement that is potassium dichromate was the most common allergen found.<sup>[10]</sup> Sunlight exposure aggravates the symptoms of ACD to parthenium which is seen in our study and similar finding was found in study done by Jindal N *et al.*<sup>11</sup>

## CONCLUSION

ACD can present with various clinical patterns and can mimic other dermatological conditions, thereby making it difficult to diagnose. Suspicion of ACD can be made by detailed history and clinical examination and can be confirmed by patch testing. Patch testing is very useful tool which is non-invasive, cost effective, OPD procedure with good patient compliance. Patch testing helps in earliest diagnosis and intervention of ACD, hence saving the resources. As there is rise in ACD cases, more such studies on a larger group of patients is the need of hour.

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