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Original Research Article

Allergic phytodermatitis due to *Toxicodendron succedaneum* in sub Himalayan region of North India: a clinical study

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ABSTRACT

Background: Phytodermatitis refers to inflammation of the skin caused by a plant. The clinical patterns of dermatitis due to plants can present as allergic phytodermatitis, photophytodermatitis, irritant contact dermatitis or in the form of mechanical injury. The commonest plant causing allergic contact dermatitis in India is *Parthenium hysterophorus*, followed by other plants. Phytodermatitis due to *Toxicodendron succedaneum* is not uncommon in sub Himalayan range of North India and it has variable clinical presentation. The aim of the study was to study and evaluate the patients of allergic contact dermatitis due to *T. succedaneum*.
Methods: All patients having allergic contact dermatitis due to *T. succedaneum* from August 2015 to July 2016 were enrolled for the study.
Results: Our study included 13 (76.4%) males and 4 (23.5%) females with a mean age of 32 years. 76.4% patients developed lesions within 24-48 hours after contact with plant, 17.6% after 48 hours and 5.8% developed in less than 24 hours. Most of the (88.2%) patients presented with disseminated lesions and 11.7% had localised lesions involving only hands and forearms. Urticaria (41.1%) was the commonest finding followed by papuloplaque lesions (in 29.4% patients), further followed by erythema multiforme like lesions (in 11.7% patients) and maculopapular, vesiculobullous lesions and angiodema (in 5.8% of each patients). Patch test was positive in 16 (94.1%) cases. Majority of patients required systemic steroids to settle the dermatitis.
Conclusions: Allergic contact dermatitis due to *T. succedaneum* is very common in this region. Although it presents with widespread clinical presentations but adequate literature was not found on this plant. This plant further requires more study to know the dermatitis caused by it.

Keywords: Phytodermatitis, Allergic contact dermatitis, *Toxicodendron succedaneum*

INTRODUCTION

Several families in the plant kingdom are notorious causes of allergic phytodermatitis. Of particular importance are the Anacardiaceae (i.e., the cashew or sumac family) and Compositae. Of these, more than 200 species are important causes of contact dermatitis, worldwide.[1,2] The Anacardiaceae family is a very broad

family of flowering plants. This family includes about 70 genera and 650 species of evergreen deciduous trees, shrubs and woody vines. These plants are native to tropical and subtropical areas of the world, but some species are also found in temperate regions. In Anacardiaceae family, members of the *Toxicodendron* genus (common poison ivy, poison oak, poison sumac found in North America) are most allergenic.

As such, in India, allergic phytodermatitis due to Anacardiaceae family is not as common as seen in North America. Similarly, *Toxicodendron succedaneum*, a member of Anacardiaceae family is not a common cause of allergic contact dermatitis in India. It is a large shrub or tree with height upto 8 meters. It is native to Indian sub-continent (i.e. Bhutan, Nepal, northern India and northern Pakistan) and eastern Asia. Small yellow flowers are followed by pendulous clusters of tawny fruit. The leaves turn orange, red in autumn as shown in Figure 1 (a-c).

Figure 1: (a) Orange, red leaves of *T. succedaneum* in autumn; (b) young leaves in spring; (c) clusters of immature fruit.

When damaged, all parts of the plant exude a sticky, strongly allergenic oleoresin, called urushiol. The allergens are pentadecylcatechols or heptadecylcatechols which possess benzene rings that bear hydroxyl groups at position 1 and 2, and aliphatic side chains at position 3.[3]

Urushiol is found in the stems, roots, leaves, and skin of the fruits of these plants and also on fomites, where it retains its antigenic potential in the dry state for indefinite period.[4] Amount of urushiol is found more in younger leaves than the older ones.[5] Contact dermatitis primarily results from direct contact with the oleoresin obtained from a portion of a bruised or injured plant. Antigen remains in finger nails which act as reservoirs and may lead to re-exposure and contamination.[6,7]

Contact dermatitis usually appears within 2-4 days; however it may appear as late as 2 weeks after contact. It is characterized by intense pruritus and an erythematous reaction followed by the appearance of multiple papules and vesiculo-bullous lesions in a linear distribution. The face, neck, and genitalia are commonly affected and usually show intense edema. The dermatitis has a self-limiting course, lasting approximately 1-2 weeks, but it can last up to 6 weeks.[8] Other clinical presentations may include erythema multiforme- like reactions, exanthematous and urticarial eruptions.[9]

Several cases of allergic contact dermatitis due to *T. succedaneum* have been reported in New Zealand.[10] However to the best of our knowledge, phytodermatitis due to *T. succedaneum* in India has not been reported. Therefore, we planned a study to evaluate cases of allergic contact dermatitis secondary to *T. succedaneum* and its various clinical presentations.

METHODS

This study was carried out in out-patient department (OPD) of Civil Hospital Rohru, district Shimla, (Himachal Pradesh) between August 2015 to July 2016. Seventeen patients with age of ten years or above who randomly attended OPD having contact with plant, which later on was identified as *T. succedaneum*, were recruited in the study. Patients having acute dermatitis were taken after the acute episode had subsided. Patients on systemic corticosteroids were included when the daily dose was reduced to less than 20 mg of prednisolone or equivalent dose of other steroids. Patients having widespread dermatitis involving back, those on systemic steroids (prednisolone >20 mg/day or equivalent dose of other steroids) in past 4 weeks, immunosuppressants, topical steroids in past 2 week, unwilling patients, lactating mother, pregnant females and children less than ten years of age were excluded from the study. A written informed consent was obtained from all patients. A detailed history coupled with thorough clinical examination was carried out for each of the patients and findings entered in a proforma. Clinical details regarding age, sex, onset, duration, progression of dermatitis, pattern of distribution of lesions and occupation profile were taken. History of aggravation of symptoms on contact with any of the sensitizers was also noted. All patients were patch tested after subsidence of acute dermatitis.

Patch test was done with antigen impregnated discs prepared using an aqueous extract of the plant material (leaves) as per method described by Pasricha and Singh.[11] The antigen was standardized in the laboratory. For this, mature, healthy looking leaves of *T. succedaneum* were cleaned, air dried at room temperature over 7–10 days and powdered in a blender. Fifty grams of the dried leaf powder was thoroughly mixed with 300 ml of water and filtered through Whatman no. 1 filter paper to obtain a clear filtrate which was standard plant extract.

The patch test was applied on non-hairy, lesion free skin, usually over upper back of the patient after explaining the procedure and obtaining written consent for the same. Patches were removed at 48 hours and the patients were instructed to avoid scratching and wait for one hour for

the skin to regain its normal contour and non-specific skin irritation to subside. Sites were then examined for reactions. Second reading was taken at 72 hours. If needed, patients were called at 96 hours for reading of late reaction.

Results obtained were analysed statistically. The data for results were compiled, tabulated and statistically analysed using standard statistical methods. The relevance of the results in the light of statistical analysis was displayed and discussed.

RESULTS

The study included 17 patients out of which 13 (76.4%) were males and 4 (23.5%) were females. The age of the patients ranged between 10-49 (mean age- 32 years). Maximum number of patients i.e. 8 (47%) were in the age group of 30-40 years as shown in Table 1.

Table 1: Distribution of patients according to age group.

Age groups (in years)	No of patients (N=17)	Percentage (%)
0-10	1	5.8
11-20	2	11.7
21-30	3	17.6
31-40	8	47
41-50	3	17.6

76.4% of patients developed lesions within 48 hours after contact with plant, 17.6% after 48 hours and 5.8% developed in less than 24 hours as in Figure 2.

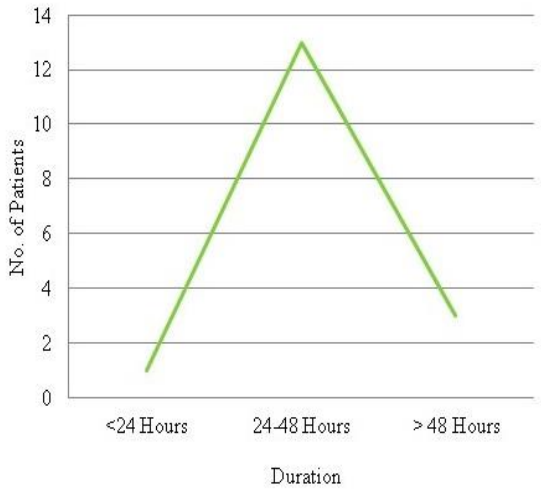

Figure 2: Duration of dermatitis of patients after contact with *T. succedaneum*.

Most of the patients (88.2%) presented with disseminated lesions and 11.7% had localised lesions involving only hands and forearms as given in Figure 3.

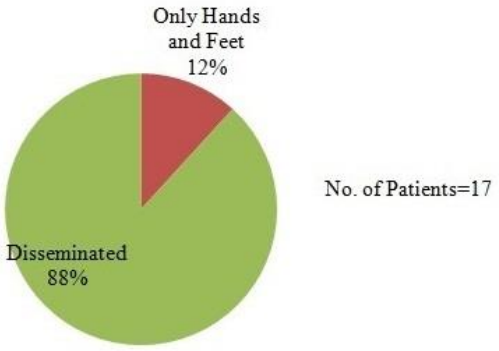

Figure 3: Distribution according to the sites of involvement.

Urticaria (41.1% patients) was the commonest finding followed by papuloplaque lesions (in 29.4% patients), further followed by erythema multiforme like lesions (in 11.7% patients) and maculopapular, vesiculobullous lesions and angiodema (in 5.8% of each patients) as shown in Figure 4.

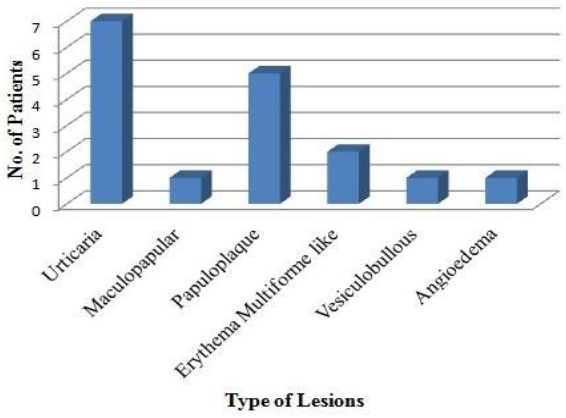

Figure 4: Distribution of patients according to type of lesions.

Of seventeen patients, 14 (82.3%) patients presented during autumn and 3 (17.6) patients in presented in summer as in Figure 5.

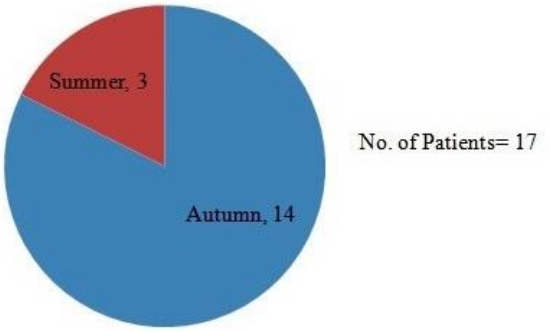

Figure 5: Seasonal variation.

Personal or family history of atopy was absent in maximum number of patients i.e. 70.6%. Patch test was positive in 16 (94.1%) cases.

DISCUSSION

Allergic contact dermatitis due to plants is common. Potentially allergenic plants and plant products are countered in day to day practice. The frequencies of contact sensitization to different plants are variable and determined by the loco-regional distribution of plants, frequency and degree of exposure to these plants, antigenic potential of the chemicals contained in them and individual sensitivity.[12]

Toxicodendron is the most allergenic genus of Anacardiaceae family. Allergic contact dermatitis caused by Toxicodendron species poison ivy, poison oak and poison sumac-affects millions of North Americans every year. Phytodermatitis due to *T. succedaneum* is common in New Zealand (where it is named as New Zealand's poison ivy) particularly during the autumn months. It also grows as wild plant in sub-Himalayan range of North India, where people come in contact with wild plant whilst gardening. However, we were unable to find any documented cases of allergic contact dermatitis due to *T. succedaneum* in Indian literature.

This was a prospective study which evaluated the clinical features of patients presenting with suspected plant dermatitis. A total of seventeen patients participated in present study. The predominance of dermatitis was in male sex (76.4%) as compared to female sex (23.5%). This may be related to the likelihood of increased exposure to the antigens in men as male patients are daily working in forests and fields in this region. Similar findings were observed in a study by Rademaker and Duffill, where male patients outnumbered the female patients.[10]

Age distribution ranged from 10-49 years with mean age of 32 years. Maximum (47%) patients in the age group of 30-40 years were agriculturists. The increased incidence of dermatitis in these groups was directly proportional to plant exposure. The severity of plant induced contact dermatitis not only depends on the plants' irritant or allergic potential but also on the degree and duration of exposure and the sensitivity of the individual.

Allergic phytodermatitis occurs 24 hours after contact with an allergen and as late as two weeks depending upon the amount of allergen. However, if there is re-exposure to same allergen then dermatitis develops in less than 24 hours. 76.4% of our patients had first time contact with plant and developed lesion 1 -2 days after contact while 17.6% patient developed dermatitis after 48 hours of first exposure with plant but. 5.8% patients had a history of past contact with same plant and developed lesions in less than 24 hours. This can be explained by individual sensitivity of patients to this particular antigen.

The clinical features in all the patients depended on the site of involvement and the duration of contact. All patients who participated in the study showed variable clinical presentation: urticaria (41.1% patients), papuloplaque lesions (in 29.4% patients), erythema multiforme like lesions (in 11.7% patients) and maculopapular, vesiculobullous lesions, angiodema (in 5.8% of each patient). Disseminated lesions were seen in 88.2% whereas 11.7% had localised lesions involving only hands and forearms. Fourteen out of seventeen patients (82.3%) presented in autumn with the remainder (17.6%) presenting in summer. Autumn epidemic of *T. succedaneum* was also demonstrated in a study of Rademaker and Duffill.[10]

Indian standard plant series does not contain Toxicodendron allergen.

Our maximum patients patch tested with native plant extract prepared by standard technique were sensitive to *T. succedaneum*. None of the patients developed any side effects after patch test. Patch test studies with this plant have not been described in Indian literature. Hence more such studies should be done further to evaluate hypersensitivity reactions secondary to this plant and its cross sensitivity with other plants.

CONCLUSION

Avoidance of the causative plants is impractical in most set-ups; therefore prevention plays an important role in reducing the dermatitis. Working habits and hygienic measures are of paramount importance in preventing allergic contact dermatitis. *T. succedaneum* and allergic contact dermatitis developing after exposure to it has to be studied further since this is a commonly growing wild plant in the sub Himalayan region of North India.

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