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To study the contact sensitivity pattern in patients of hand eczema

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Abstract
Introduction: The word eczema refers to a broad range of conditions that begin as spongiotic dermatitis and may progress to a lichenified stage. Hand eczema (HE) implies that the eczema is largely confined to hands.
Aims and objectives: To study the pattern of contact sensitization in hand eczema by the use of patch test.
Materials and methods: All new consecutive patients of hand eczema, regardless of age and sex were included. Each hand was divided into five areas (finger tips, fingers, palms, back of hands and wrist) and the intensity of the six following clinical signs: erythema, induration/papulation, vesicles, fissuring, scaling and edema were graded. The patients were then underwent patch testing (Indian Standard Battery).
Results: A total of 40 patients of hand eczema were included in the study. Hyperkeratotic eczema (36.3%) was the most common type of hand eczema followed by housewife eczema (26.3%).27 patients showed positivity to various allergens. Potassium dichromate was the most common allergen with 10 (47.6%) patients sensitive to it followed by Nickel sulphate 7 (38.1%), Fragrance mix 3 (11.9%), PPD 2 (9.5%), Wool alcohol 2 (9.5%),Balsum of Peru, Cobalt Chloride and Parthenium allergy was detected in 1 (4.8%) each.
Conclusion: HE is a common multifactorial dermatosis. Patch testing is the common investigation done to find out contact sensitivity in cases of HE. Identification of contact sensitizer helps in the management of patients by adopting appropriate preventive and therapeutic measures.
Limitations: The limitation of our study was small sample size.

Keywords: hand eczema, contact sensitization, patch test

Introduction

The word eczema is derived from the Greek word ekzein which means “to boil forth” or “to effervesce”. Now a days, the term refers to the broad range of conditions that begin as spongiotic dermatitis and may progress to a lichenified stage [1].

The signs of eczema in the order of their evolution are: erythema and swelling of the skin, oozing or vesiculation, crusting and scaling, lichenification or thickening and evidence of repeated excoriation, hyperpigmentation and/or hypopigmentation. The first three changes are those of acute eczema. The latter two are seen only if the process persists for several weeks or longer. All stages may be seen on various areas of the skin at one time [2].

Hand eczema (HE) implies that the eczema is largely confined to hands. It is one of the most frequently seen occupational skin diseases causing severe physical and emotional distress [3, 4].

Inadolescents, the prevalence of HE increases in girls with age, whereas boys tend to improve [5].

There are various morphological patterns of hand eczema like hyperkeratotic palmar eczema, pompholyx, recurrent focal palmar peeling, housewives eczema, fingertip eczema, ring eczema and gut eczema. However, HE is often wrongly diagnosed as other skin dermatoses such as psoriasis and dermatophytosis.

Various endogenous and exogenous factors contribute to the development of HE.Atopic dermatitis is the major cause of hand and foot eczema [6, 7, 8].

The frequency of contact sensitization in HE patients varies from 23% in mild cases to 62% in severe cases [9, 10]. The common allergens identified in most studies include nickel, fragrance mix, p-phenylenediamine (PPD) and balsum of peru [11].

Patch testing is considered mandatory in all patients of hand eczema lasting for more than four weeks in order to identify a specific cause, if present, and counsel the patients accordingly [12]. Patients with positive patch test reaction can have significant improvement in Dermatology life quality index (DLQI) after taking precautionary measures [13].

This study was undertaken to evaluate the pattern of contact sensitivity in patients of HE. Identification of contact sensitizerhelps in the management of HE patients by adopting appropriate preventive and therapeutic measures, thus, leading to improvement in QOL of the patients.

Aims and Objectives

To study the pattern of contact sensitization in hand eczema by the use of patch test.

Materials and Methods

This study was carried out in the department of dermatology, venereology and leprosy at a tertiary care hospitalover a period of 6 months. In the study, all new consecutive patients of hand eczema, regardless of age and sex were included in the study after obtaining written and informed consent.

Inclusion Criteria

1. All cases of hand eczema.
2. Patients with acute dermatitis were taken after the acute

episode subsided.
3. Patients on systemic corticosteroids were included when the daily dose was reduced to less than 20 mg of prednisolone.

Exclusion Criteria
1. Patients of hand eczema having predominant involvement of other body parts.
2. Patients having scabies, dermatophytosis and psoriasis involving hands were excluded after confirming the diagnosis using KOH examination and skin histopathology, if required.
3. Patients having primary irritant contact dermatitis.
4. Pregnant women.

Methodology

A detailed demographic profile of each patient was recorded. Details regarding onset, duration and progress of dermatitis, aggravating factors, seasonal variations, present and past treatment taken, personal and family history of atopywererecorded. Place of residence was considered as urban (all places with a municipality, corporation, cantonment board or notified town area committee, etc) or rural area (all areas which are not categorized as urban areas).Detailed history regarding occupation, day to day work and hobbies of patients were taken. A note was made of symptoms and signs like itching, discharge, erythema, infiltration and pain. During clinical examination, following signs were looked for- erythema, induration/population, vesicles, fissuring, scaling and edema.

Patch testing

1. Application of patch tests

The patch test was applied on the upper part of the back of the patient. The area selected were non-hairy and free of any skin lesions. The area was thoroughly cleaned with ethanol without rubbing and dried before placing the patch. After peeling off the patch from release paper, semisolids were directly applied to the chamber to fill more than 50% of the chamber volume. Liquids were placed on a filter paper disc in the chamber and moistened thoroughly. Other products were diluted as required to avoid irritant or strong reactions and applied immediately. The various products taken included the suspected allergens brought by the patients like topical antibiotics, cement samples etc. The test strip chamber sites were numbered for later identification.

2. The patients were instructed

a. To leave the patch test in place for two days and two nights.
b. Not to take bath or wash or wet the back during this period.
c. To avoid exercise / heavy work that may cause sweating.
d. To avoid friction or rubbing and lying on the back lest the patches should become loose.
e. To avoid scratching the patch test site and report immediately if there is severe itching or irritation.
f. To avoid exposure to sunlight.
g. To come after 48 hours for patch test reading.

3. Reading of patch test

a. Readings were taken at 48hours, 72 hours and one week time.
b. After 48 hours the patches were removed. 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 signs of dermatitis.

4. Results

Results were graded according to the International Contact Dermatitis Research Group criteria.
- Negative.
? + Doubtful reaction; faint erythema only.
+ Weak positive reaction; palpable erythema, infiltration, possibly papules.
++ Strong positive reaction; erythema, infiltration, papules, vesicles.
+++ Extreme positive reaction; intense erythema and infiltration and coalescing vesicles.
IR Irritant reaction of different types.

The Indian standard battery included
1. Control (petrolatum 100%)
2. Potassium dichromate (0.1%)
3. Neomycin sulphate (20.0%)
4. Cobalt chloride (5%)
5. Benzocaine (5.0%)
6. PPD (p-phenylenediamine (1.0%)
7. Parabens mix (9.0%)
8. Nickel sulphate (5.0%)
9. Colophony (10.0%)
10. Epoxy resin (1.0%)
11. Fragrance mix (8.0%)
12. Mercaptobenzothiazole (1.0%)
13. Nitrofurazone (1.0%)
14. Chlorocresol (1.0%)
15. Wool alcohol (30.0%)
16. Myroxylonpereirae (10.0%)/balsum of peru
17. Thiuram mix (1.0%)
18. Black rubber mix (0.6%)
19. Formaldehyde (2.0%)
20. Parthenium (15%)

Results

In this study, 40 consecutive patients of hand eczema, who fulfilled the inclusion criteria were enrolled in the study over a period of 6 months. The following results were made:
In our study, majority of the subjects were in 21-40 years (56.2%) age group, followed by 41-60 years (30%), ≤20 years (10%) and >60 years (3.8%) in that order. Youngest patient was 12 years old and the oldest was 65 years of age. Of the 40 patients, 22 (54%) were males and 18 (46%) females, with a male to female ratio of 1.16:1.Majority (57.5%) of the patients, were from rural background, while 42.5%. belonged to urban areas. (Table 1).
Overall, housewives formed the largest group constituting 26.2% of the subjects followed by Mason (21.2%), students (13.8%), Industrial workers (12.5%) and farmers (10%). The subjects involved in other occupations were less than 10%, in each category. All masons, industrial workers and farmers were males. (Table 2).
Overall, the duration of disease was 6 months-1 years in 35% of the subjects followed by 1-2 years (30%), <6 months (25%) and >2 years (10%). The duration of disease was<6 months in majority of males (75%) compared to females (25%). However, the duration of disease between 6 months-1year was observed to be more in females (64.3%)

than males (35.7%). No gender predilection was found when duration of disease was ≥1 year. (Fig 1).

Itching (97.5%) was observed in majority of the subjects, followed by oozing (73.8%), fissuring (56.2%), pain (51.2%) and redness (43.8%) in that order. (Table 3).

Induration was found to be most common (96.2%), followed by scaling (90%), fissuring (70%), discharge (47.5%), erythema (43.8%), oedema (37.5%) and vesiculation (12.5%). Erythema was higher in females than males. (Fig 2).

Nail changes were also noted in many patients. Pitting was observed to be most common (16.2%) nail finding, followed by shiny nails (13.8%), subungual hyperkeratosis (10%), longitudinal ridges (5%), dystrophy (2.5%) and melanonychia (1.2%). Almost all the nail changes were higher among male subjects compared to females. (Fig 3).

In our study, majority of the subjects had no personal history of atopy. However, history of allergic rhinitis was present in 17.5% subjects and atopic dermatitis in 12.5% of the subjects. The personal history of atopic dermatitis was present in 5 patients, out of which 3(70%) were females and 2(30%) were males. The personal history of allergic rhinitis was found to be more in males (57.1%) than females (42.9%). Personal history of bronchial asthma was found in 8.8% of the subjects. The family history of atopywas absent in majority of the subjects (90%). (Table 4).

The aggravating factors, as told by patients, were soap, detergent, vegetables, chemicals like hair colour and cement. Out of 40 patients, 10 (25%) gave history of aggravation on contact with detergents, 7 (17.5%) with soaps, 10 (25%) with cement, 2 (3.8%) and 1 (2.5%) with chemicals and vegetables, respectively. (Table 5).

Hyperkeratotic eczema was the most common type of hand eczema (36.3%) followed by wear& tear dermatitis (26.3%), and pompholyx (12.5%). The percentage of other types of eczema present was found to be less than 10%. While all cases of housewives dermatitis were seen in females, patchy vesiculosquamous eczema and ring eczema were observed only in male subjects. No case of apron eczema, chronic acral eczema and gut eczema were seen. (Table 6).

All the 40 patients underwent patch test (Indian Standard Series), out of these 27 patients (16 males & 11 females) showed positivity to various allergens. Potassium dichromate was the most common allergen with 10 (47.6%) patients sensitive to it. This was followed by Nickel sulphate in 7 (38.1%) patients. Fragrance mix sensitivity was found in 3 (11.9%), PPD in 2 (9.5%) patients, Wool alcohol in 2 (9.5%) and Balsam of Peru, Cobalt Chloride and Parthenium allergy was detected in 1 (4.8%) each. (Table 7). Potassium dichromate was causative allergen in labourers and masons and PPD was common allergen in housewives.

Patch test to more than one allergen was positive in 21 patients. (Table 8).

Summer exaggeration of HE was seen in 40% of the subjects followed by winter (28.8%) and monsoon (7.5%). Seasonal variation of HE was found to be more common in males than females. (Table 9).

Table 1: Demographic distribution of study subjects (n=40)

Age, Gender and Residence	No.(n=40)	Percentage (%)
Age in years		
≤20	4	10
21-40	22	56.2
41-60	12	30
>60	2	3.8
Gender		
Male	22	54
Female	18	46
Place of residence		
Rural	23	57.5
Urban	17	42.5

Table 2: Distribution of study subjects according to occupation

Occupation	Male(n=22)		Female(n=18)		Total (n=40)	
	No.	%	No.	%	No.	%
Housewife	0	0	10	55.6	10	25
Mason	7	31.8	1	5.6	8	20
Farmer	10	45.6	4	22.2	14	35
Student	2	9	1	5.6	3	7.5
Laborer	3	13.6	2	11.1	5	12.5
Industrial worker	05	100.0	0	0	05	12.5
Office worker	01	16.7	02	83.3	03	7.5
Others	02	100.0	0	0.0	02	3.8

Table 3: Distribution of study subjects according to presenting symptoms

Symptoms	Male		Female		Total	
	No.	%	No.	%	No.	%
Redness	7	40.0	10	60.0	17	43.8
Itching	11	53.8	18	46.2	39	97.5
Oozing	16	54.2	14	45.8	30	73.8
Pain	11	51.2	10	48.8	21	51.2
Induration	12	51.1	11	48.9	23	56.2

Table 4: Distribution of study subjects according to history of atopy

History of atopy	Male		Female		Total	
	No.	%	No.	%	No.	%
Personal						
Atopic dermatitis (AD)	2	30.0	3	70.0	5	12.5
Allergic rhinitis (AR)	4	57.1	3	42.9	7	17.5
Bronchial asthma (BA)	1	28.6	3	71.4	4	8.8
None	15	61.2	9	38.8	24	61.2
Family						
AD	0	0.0	1	100.0	1	2.5
AR	1	25.0	2	75.0	3	7
BA	0	50.0	1	100	1	2.5
None	16	56.9	15	43.1	36	90.0

Table 5: Distribution of study subjects according to aggravating factors

Aggravating factors	Male		Female		Total	
	No.	%	No.	%	No.	%
Detergent	4	11.6	6	40.5	10	25.0
Cement	10	46.5	0	0.0	10	25.0
Soap	2	9.3	5	27	7	17.5
Vegetables	0	0.0	1	5.4	1	2.5
Chemical (Hair colour)	2	6.9	0	0.0	2	3.8

Table 6: Types of hand eczema in study subjects

Type of eczema	Male		Female		Total (n=40)	
	No.	%	No.	%	No.	%
Fingertip eczema	1	28.6	2	71.4	3	8.8
Wear & tear dermatitis (housewife)	0	0	10	100	10	26.3
Hyperkeratotic eczema	10	86.2	4	13.8	14	36.3
Patchy vesiculosquamous eczema	3	100	0	0	3	6.2
Pompholyx	2	40	3	60	5	12.5
Recurrent focal palmar peeling	0	0	1	100	1	2.5
Ring eczema	1	100	0	0	1	2.5
Unspecified eczema	3	100	0	0	3	6.2

Table 7: Pattern of contact sensitivity (Patch test positivity)

Type of antigen positivity	No. (n=27)		Total %
	Male	Female	
Nickel (Ni)	4	3	38.1
Fragrance mix (Frg)	2	1	11.9
Potassium dichromate (PD)	6	4	47.6
Paraphenylene-diamine (PPD)	0	2	9.5
Balsum of Peru (BP)	1	0	4.8
Cobalt chloride (CCL)	1	0	4.8
Wool alcohol (WA)	1	1	9.5
Parthenium (Par)	1	0	4.8

Table 8: Distribution of contact sensitivity (Patch test positivity)

Allergens	No. (n=21)	%
Ni, Frg, PPD	1	2.4
BP	1	2.4
Frg	2	7.1
Ni	4	28.6
Ni, BP	1	2.4
Ni, Frg, WA	1	2.4
Ni, PPD, CCL, WA	1	2.4
PD	6	40.5
PD, CCL	1	2.4
PD, Par	1	2.4
PPD	1	2.4
WA, PPD	1	2.4

Table 9: Distribution of study subjects according to seasonal variation

Season	Male		Female		Total(n=40)	
	No.	%	No.	%	No.	%
Monsoon	2	83.3	1	16.7	3	7.5
Summer	9	62.5	6	37.5	15	40.0
Winter	7	56.5	5	43.5	12	28.8
None	4	26.3	6	73.7	10	23.8

Fig 4: Patch test antigen kit

Fig 5: Patch test kit with fin chamber

Fig 6: Fingertip eczema

Fig 8: Patch test positive to nickel

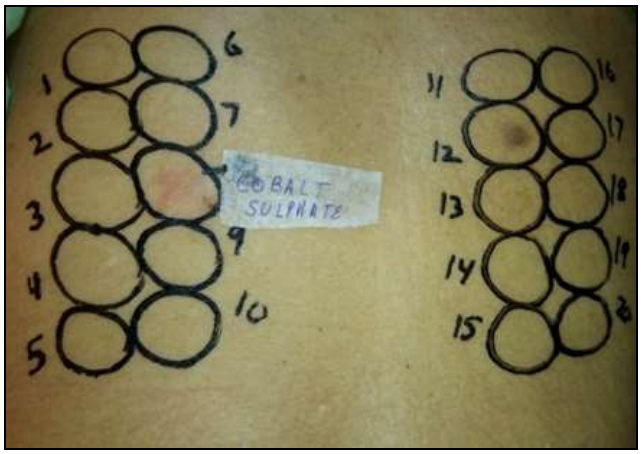

Fig 9: Patch test positive to cobalt

Fig 10: Patch test positive to Parthenium

Fig 11: Multiple patch test positivity

Discussion

The present study included 40 patients presenting to the Dermatology, Venereology & Leprosy OPD of a tertiary care centre with clinical diagnosis of hand eczema. A detailed demographic profile of each patient was recorded and patch test was performed in all patients. The present study was conducted to evaluate the pattern of contact sensitivity in patients of HE.

HE is a common problem with multifactorial etiology. The pathogenesis is often complex. Various endogenous and exogenous factors contribute to the development of HE. Atopic dermatitis is the major cause of hand and foot eczema. There are various morphological patterns of hand eczema like hyperkeratotic palmar eczema, pompholyx, recurrent focal palmar peeling, housewives eczema, fingertip eczema, ring eczema and gut eczema [2, 4, 10].

The common allergens identified in most of the studies include nickel, fragrance mix, p-phenylenediamine (PPD) and balsum of peru [11]. Patch testing is considered mandatory in all patients of hand eczema lasting for more than four weeks in order to identify a specific cause and counsel the patients accordingly [12]. Patch testing has shown to influence the quality of life (QOL) of HE patients. In a study by Agarwal *et al.* [13], found that out of 50 patients of hand eczema, patients with positive patch test reaction had a significant improvement in Dermatology life quality index after taking precautionary measures.

Occupations, which involve wet work and exposure to various chemical agents, like housewives, masons, industrial workers, farmers, laborers, are at higher risk for developing hand dermatitis [14]. Housewives are more prone to come in contact with various chemicals, soaps, detergents and cosmetics that may act as irritants or allergens.

Pitting (16.2%) was the most common nail finding in our patients, followed by shiny nails (13.8%), subungual hyperkeratosis (10%), longitudinal ridging (5%), dystrophy (2.5%) and melanonychia (1.2%). Similar nail changes were observed by Lerbaek *et al.* [15] and Kishore *et al.* [16].

Hyperkeratotic eczema was the commonest morphological type, accounting for 36.3% of cases, in our study. This is near similar to 32% cases of hyperkeratotic eczema, reported by Raghu *et al.* [14], but much higher than 9%, reported by Handa *et al.* [11].

The second most common type of eczema was housewives eczema, accounting for 26.3% cases which is higher than 10% cases, reported by Handa *et al.* [11]. Pompholyx accounted for 12.5% cases on our study, higher than 1% (9) and 8% (29), reported in other studies [13, 14, 16].

Potassium dichromate was the most common sensitizer in our study, with 47.6% positivity. This is at variance with positivity of 12.1%, 4.9% and 32% reported by Anger *et al.* [17], Hald *et al.* [18] and Kishore *et al.* [16], respectively. Chromate as a common sensitizer in hand dermatitis has also been reported by Suman *et al.* [19]. This is especially true in the developing countries, where ferrous sulphate is not added to cement to keep it's concentration low [20].

The second most common allergen, in our study, was nickel sulphate with positivity in 7 (38.1%) patients. Nickel has also been reported to be common sensitizer in similar studies by Goh *et al.* [21] and Duarte *et al.* [22]. Female sex and wet work have been found to be important risk factors for the development of nickel dermatitis [23]. Nickel has been implicated to be the common allergen in pompholyx. Nickel sensitivity was primarily attributed to use of imitation jewellery, watches, jeans, buttons etc. It is common in the environment, in drinking water, kitchen ware etc [11].

Conclusion

The present study included 40 patients, out of which 27 patients showed positivity to patch test. HE is a common multifactorial dermatosis. Both exogenous and endogenous factors play important role in its causation. Exogenous factors could be an allergen or irritant. Endogenous factors include atopy, dyshidrosis and stress. Patch testing is the common investigation done to find out contact sensitivity in cases of HE. Identification of contact sensitizer helps in the management of patients by adopting appropriate preventive and therapeutic measures, thus, leading to improvement in QOL of the patients.

Limitations

The limitation of our study was small sample size.

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