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Patch test, a gold contact dermatitis diagnostic aid

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Abstract
Back Ground: Contact Dermatitis (CD) is a common skin disorder marked by erythematous vesicular, pander or lichenified pruritic skin lesions. It is caused by direct contact of an agent to the skin. It can be caused either by irritant triggers in 80 percent of patient versus allergic triggers in the remaining 20 percent of patients [1]. It can be estimated more than 3700 Substances can act as contact allergen [2]. Patch testing is the gold standard for identification of contact allergen. The diagnosis of contact dermatitis is made from history physical examination & the result of patch testing [3].
Aim of the study: To know the most powerful allergen, frequency and percentage of substances that cause contact dermatitis and gender distribution of contact dermatitis & the positivity difference between each gender.
Material and Method: A total of 103 patch positive patients were collected from 2 allergy private clinics at Mosul city those have contact dermatitis patients were male account 35 (33.9%) and female were 68 (66.1%), the study had been in the period from January 2018 to January 2019.The diagnosis of contact dermatitis patient was made by history physical examination and patch testing for 25 substances done to know the contact dermatitis causative allergy. The negative patch test result were excluded from the study in addition to Extremities of age, severely ill patients and steroid dependent patients.
Result: This study showed that female positive tests were 93 (66.4%) which are more than male positive tests were 47 (33.5%). Nickel Sulphate agent was the commonest causative contact allergen which accounted (32.1%) followed by fragrance mix and lanolin alcohol were account (8.5%) for each of them followed by Mercapto mix (7.1%).
Conclusion: Nickel Sulphate is the commonest material that causing allergic contact dermatitis followed by Fragrance mix. Female are more prone to contact dermatitis than male in number of patient & test positivity.

Keywords: contact dermatitis, patch test

Introduction

Contact dermatitis is one of the most common inflammatory skin disease in the industrialized world. Repeat exposure to chemicals in the environment, both at home in the work place, has resulted in a significant increase in cutaneous pathologic responses. It is a major health concern for patients has a major impact on the economy. A recent study in UK identified that occupational skin diseases account for approximately 20% of all work – related health complaints, resulting in an estimated 4 million lost work-days bringing on associated cost of almost $ 200 million per year. [4]

Classification and Etiology

Contact dermatitis represent the vast majority (79-90% annually) of skin related occupational complaint. [5, 6] It can divided into four categories based on etiology:

1. Irritant Contact Dermatitis (ICD) which is the most prevalent form (about 80%). An irritant will cause direct injury to the skin in any person if applied in sufficient concentration for sufficient amount of time such toxic chemicals, oxidants, alkali; surfactants solvents.
2. Photo Contact Dermatitis in which a chemical requites light-induced excitation in the ultraviolet spectrum to cause a cutaneous response.
3. Contact Urticaria: wheal & flare response & can be either immunologic (IgE – dependent) or non-immunologic (IgE-independent).
4. Allergic Contact Dermatitis (ACD), also known as contact hypersensitivity: complex immune – mediated process made up of two distinct phases (afferent or primary efferent or secondary). ACD can occur anywhere on the body, depending on the allergen involved for example: the frequent sites of nickel allergy are on the abdomen from snaps on pants or buckles & on the wrists & earlobes from Jewelry. Acute contact dermatitis manifests as erythematous papules, edema & vesiculation. There may be extreme pruritus & the lesions may spread beyond the area of initial contact. Chronic dermatitis will show lichenification & possibly hyper pigmentation of skin. Hand dermatitis is common comprising about 20 – 35 % of all cases of dermatitis [7]. There can be additional fissuring of the hands & it's usually bilateral. In many cases, hand dermatitis is a result of occupational exposure can be caused by an irritant [8].

Patch Test: Patch testing is the gold standard for identification of contact allergen & is indicated in any patient with acute & chronic pruritic, eczematous lichenified dermatitis if underlying or secondary ACD is suspected. Allergens are placed in chambers that are applied to the skin (particularly the back away from the spine) with good adhesion between the allergen & skin is necessary). The back should be free of hair, emollients & other dermatitis. Due to potential inhibition of response, topical corticosteroids & calcineurin inhibitors should be discontinued to the area of patch testing 1 week prior to placement. Oral corticosteroid greater than 20 mg of prednisolone daily (are equivalent) should be discontinued 3-4 week prior to patch placement to avoid false – ve results. Oral antihistamine need not to be discontinued during patch test. Commercially available panels include several types like: TRVE (thin layers rapid use epicutenous test) where panel of 35 allergens and a negative control are affixed to tape that is directly applied to the patients back. NACD panel from American Contact Dermatitis Group which is more extensive than 1st one, European standard series, Torlab, hernal & Dormer, Personal products is especially helpful in patients with facial, eyelid & lip dermatitis personal products that are washed off (ex :shampoo, conditioners, detergents, body facial washed) need to be diluted prior to placement (1 : 10 - 1 : 1000 dilution). Supplementary allergens can also be used for Patch test based on profession (cosmetic, hair dresser, bakers) medications (corticosteroid, antimicrobial &antibiotics) & specific exposures (shoes, plants & photo allergens). Patch test should be removed & read in 48 hs. Tests are need 30 minutes after removal of the Patch to allow resolution of erythema due to occluding pressure of the taps &/ or chamber. Since 30% of reactions may be negative at 2 day, additional readings should be performed at 72 – 96 hr & sometimes 7 – 10 days after the initial application. Metals–topical corticosteroids, p – phenylene diamine & topical antibiotics typically require a delayed reading [9]. Other technique of the Patch test (ROAT: Repeat Open Application Test) that involves the application of suspected allergen to the anticubital fossa twice daily up to 1 – 2 week & observing for dermatitis or the (use test) where the product is applied the same way as when the dermatitis developed (for example) facial cream or1*1 cm area of the face [10].

Patient & Method

A total of 103 patients were collected from clinical visit to 2 private clinics at Mosul city. 35 patients (33.9%) were male & 68 patients (66.1%) were female. The study was conducted in the period from January 2018 to January 2019. Diagnosis of allergic contact dermatitis was made by detailed history & physical examination then patch test application. After patient attendance, full history (detailed history with approach similar to standard medical history, history of present complain, past medical history, drug history, social history & habits, family history & review of systems) then physical examination done. If contact dermatitis was suspected, then an appointment for patch testing was given to the patient & told the patient to follow the following instructions before coming to patch testing.

1. The patient must be willing to return for 3 total office visits after patch testing.
2. Need to abstain from bathing & heavy exercises while the patches are in place.
3. At the time of patch testing, the patients dermatitis must be under excellent clinical control (ie dermatitis cannot be serves as acute, as this may result in false – positive (angry back) in which there are multiple strong positive patch test reactions that are not reproducible on repeat patch testing.
4. Patient should not be taking high dose of systemic steroid (low dose, up to 10 – 20 mg per day may be acceptable).
5. Avoid application of patient to topical corticostroids & calcinuren to the patch test sites on the back because this may cause false negative result.
6. Bathing & remove hair from the back before coming to the clinic.
7. Not exposed the skin of the patch test site (back) directly to the sunlight at last 5 days before patch testing [8].

Method and substances of patch testing: When the patient attended at the time of appointment, patch test was doing. Sweden Company: Chemotechnique MB diagnostics AB, vellinge / Sweden (www Chemotechnique. Se). The method for patch test application is using the following steps:

1. Remove the patch test haptens from the refrigeration.
2. Insert patch test unit into the application device.
3. Apply 25 ML of hapten in each patch test chamber starting with 1st hapten of the series in the corresponding chamber.
4. Position the patch test unit by holding it by it's protective cover & apply the tape on to the back of the patient.
5. Remove the plastic corner & press the palm on the tape for 5 seconds to enhance adhesion. Wipe the test site with ethanol before application to ensure good adhesion.
6. Marking the test site using the chemo skin marker.
7. After 48 hs remove the patch test unit with a gentle diagonal motion to minimize patient discomfort & do initial reading. [11]

The patient told to returns to the office in 96 hs for the final reading. Each area corresponding to a difference allergen is read, a positive reaction has only macular erythema:

+ Reaction consist papules.
+ + reaction contain papules.
+ + + reaction has vesicles or bullae.
– Reaction if no evidence of skin changes

Once patch testing is complete, we identified the position of reactions & determined if the allergen is relevant to the dermatitis that patient is experiencing for example patient present with scalp hair line & facial dermatitis & has positive reaction to para – phenylene diamine (PPD), this would be relevant because PPD is a component of permanent hair dyes & is a known cause of contact dermatitis.(12) The patient be questioned about exposures to hair dyes or other PPD – containing products such of black henna tattoos. With a positive history using products containing the allergen, there is a high likelihood that the specific allergen is causing the contact dermatitis.

1. Formaldehyde.
2. Mercopto benzo thinzile 2%.
3. Methyl dibromo glutaro nitrite (MDBGN) 0.3%.
4. Propolis 10%.
5. 2- Bromo – 2 nitro propane 1, diol (Bronopol) 0.5%.
6. Thiuram mix A 1%.
7. Lanolin alcohol 30%.
8. Balsam of Peru (Myroxyian pereire) 25%.

9. Zink bis (diethyl dithiocarbanode) 1%.
10. Nickel sulphate hexzhydrate 5%.
11. Potassium dichrom of 0.5%.
12. Fragrance mix 14%.
13. Lyral 5%.
14. Oil of turpentine 10%.
15. Colophany.
16. Para-phenylene diamine 0.1% (PPD)
17. Bufexamac 5%.
18. Methyl Chloro iso thiazal inone/methyliso – thiazslinose 0.01%.
19. B tert – butylphensl formal dehyde resin 1%.
20. Cobalt (11) chlorate hexa by drate 1%.
21. Cetylstearylalcohol 20%.
22. Paraben Mix [A] 16%.
23. Mercapto Mix [A] 1%.
24. Golden hapten.
25. Negative control.

Criteria for Exclusion: steroid dependent patients, severe acute dermatitis, severely ill patient, pregnant women, extremes of age (below 5 years, above 65 years) and negative patch test result.

Results: The most common patch test positive hapten is Nickel Sulphate which account (32.1%) and less common one are lyral, MDBGN, formaldehyde & methyl chloro iso thiazole inone which account (0.7%) for each of them as shown in table 1.

Table 1: Patch Test Positive Results Table

No	Patch test substances	Male	Female	Sum
1	Nickel Sulphate	10	35	45 (32.1%)
2	Fragrance mix	2	10	12 (8.5%)
3	Lanolin Alcohol	6	6	12 (8.5%)
4	Mercapto mix	6	4	10 (7.1%)
5	PPD (N-iso propyl-N-pheny1 –p- phenylene diamine 0.1%)	1	8	9 (6.4%)
6	Colophony	2	7	9 (6.4%)
7	Potassium dichromate	5	3	8 (5.7%)
8	P-tert – butylphenol formaldehyde resin 1%	4	4	8 (5.7%)
9	Golden	4	3	7 (5%)
10	Paraban mix	1	5	6 (4.2%)
11	Propolis	2	3	5 (3.5%)
12	Thiuram mix	1	3	4 (2.8%)
13	Mercapto benzothiazole	-	1	1 (0.7%)
14	Lyral	-	1	1 (0.7%)
15	MDBGN (methyl dibromo glutaro nitrate 0.3%)	1	-	1 (0.7%)
16	Formaldehyde	1	-	1 (0.7%)
17	Methyl chloro iso thiazole inone	1	-	1 (0.7%)
Sum		47(33.5%)	93 (66.4%)	140

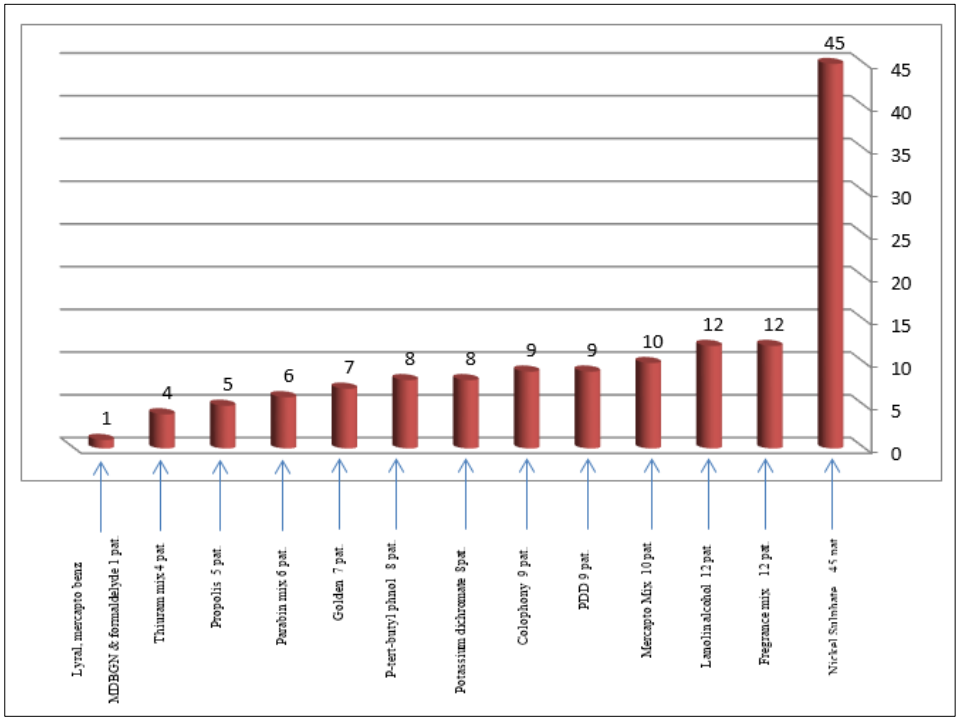

Fig 1: Show the frequency distribution of positive patch test results according to the number of positive test patients:

Table 2: The no. of positive allergen in each patient which shows that one positive allergen patients account 67 (65%) while two positive allergen patients account 29 (28.1%) and then three substance positive patients account 4 (3.8%), Angry back (which means false severe positive all tests) account 3 patients (2.9%) & those not considered in statistics of positive allergen in the study because the positivity of them is false positive.
* No. of + ve substance in one patient:

No.	No. of + ve substance in one patient	No. of patients	Percentage %
1-	Only 1 substance positive patients	67	65%
2-	2 substances positive patients	29	28.1%
3-	3 substances positive patients	4	3.8%
4-	Angery back(All substance + ve)	3	2.9%

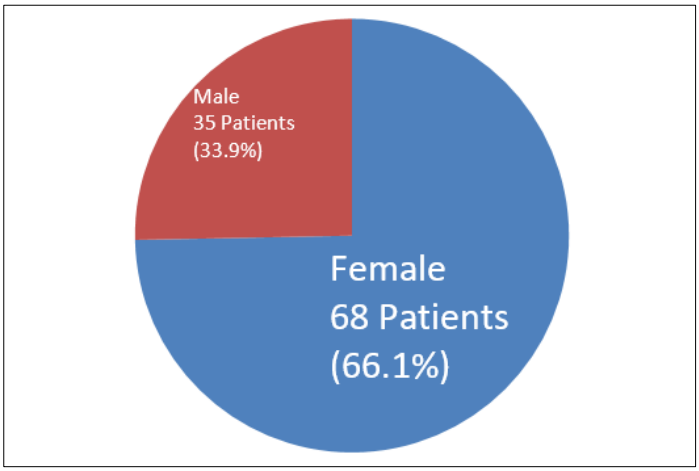

Fig 2: shows the male & female percent of patients participate in the study which shows that male were 35 (33.9%) while female 68 (66.1%).

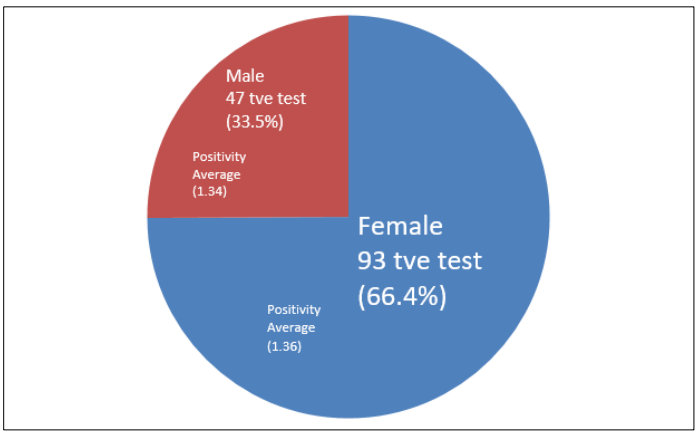

Fig 3: shows the percentage of positive patch test in male & female gender. It shows that male positive test account 47 (33.5%) with average positivity account (1.34) for each male patient while female positive test account 93 (66.4%) with average positivity account (1.36) for each female patient.

Discussion

The most common positive substance in this study As showed is the Nickel sulphate (32.1%) followed by fragrance mix & Lanolin alcohol(8.5%) for each of them while Mercapto mix & PPD came third (6.4%). Female in this study is more affected (66.1%) than male (33.9%) &this is may be due to that female use cosmotics more than males & main allergic contact substances are entered in cosmotic substances preparations. Most patients are positive for single allergen 67(65%), while positivity for 2 substances were 29 (28.1 %) & for 3 substances were 4 (3.8 %). Angry back (severe false positive reaction) occur in 3 (2.9%).These results are agreed with other studies & differ from other studies as shown in this discussion. One study in Iran named (patch test in Iranian patients: a ten years' experience) shows that data available from a trial of 222 patients out of them 145 patients (65.3 %) showed single allergen positive reaction & 34 patients(15.3%) had 2 or more positive reactions. The most common 5 patch test positive allergen in this study were Nickel sulphate 50(22.6%), Cobalt chloride 32(14.5%), Fragrance mix 30(13.6%), Potassium dichromate 21(9.5%), &Neomycin sulphate 20(9.0%). Contact allergy to Nickel sulphate was significantly more common in female & in younger patients ($p<0.05$) & this is similar to the result of our study. Fragrance mix was the most common allergen in male patients, but there was no significant difference in its frequency between male & female [13]. Another study in Srilanka named (A 7 years retrospective analysis of patch test data in a cohort of patients with contact dermatitis) showed that the top 3 sensitizers identified by all

series in 438 patients were Nickel sulphate 70(16%), followed by P-phenylenediamine 54 (12.3%), then mercapto mix 46(10.5%).[14]

Conclusions

Nickel Sulphate is the most powerful contact allergen, fragrance mix is the communist cosmetics that contribute to the contact dermatitis patch diagnosis. Female are more effected by contact substance with slight more positivity average than male.

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