



‘PATCH TEST’ IN PATIENTS WITH CONTACT DERMATITIS: ANALYSIS OF THE RESULTS OF THE CAMPAIGN ‘DIAGNOSTICS AND PROPHYLAXIS OF ALLERGIC SKIN DISEASES’ HELD IN THE CLINIC OF DERMATOLOGICAL AND VENEREAL DISEASES STARA ZAGORA IN NOVEMBER 2009

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ABSTRACT

Allergic skin diseases have significant social and economical importance. The Clinic of Dermatological and Venereal Diseases Stara Zagora in November 2009 took part in national campaign for diagnostics and prophylaxis of allergic skin diseases. **Purpose.** The aims of the clinical study are diagnostics of contact dermatitis, determining the most common allergens in Bulgaria, actualization of frequency and etiology of allergic skin diseases in Bulgaria and prophylaxis of allergic skin diseases. **Methods and patients.** Out of 48 patients which took part in our campaign, 28 were diagnosed with allergic skin disease. Patch testing with European Baseline Series was used in 19 contact dermatitis and 4 atopic dermatitis patients between in the age of 6 months and 83 years old. **Results.** Twelve patients had positive reactions, 6 with irritative and 5 with doubtful reactions. Overall 7 patients had reactions to more than one allergen, of which 2 with positive reaction. The most frequent contact allergen is Nickel. **Conclusions.** During our campaign more than half of the tested patients were diagnosed with contact dermatitis. Precise diagnosis of contact dermatitis and the knowledge of etiological factors helps accurate diagnosis to be made and adequate treatment of the disease.

Key words: Allergic skin diseases, Contact dermatitis, Patch test, Allergen, Nickel, Cobalt.

INTRODUCTION

Allergic skin diseases have significant social and economical importance. Skin allergies are seen in more than 30 % of the active population in the developed and developing countries. They are among the most common causes for temporary work disability (1). In Bulgaria the etiology and the frequency of the allergic skin diseases are not yet clarified.

In five University Clinics of Dermatology and Venereology a three-day study was held and it included the following few stages:

1. Introducing the problems of people with allergic skin complaints and information for free medical examinations and tests in the media to general practitioners and dermatologists.
2. Clinical tests including anamnesis of allergic skin diseases, dermatological status and making decision weather the patient is adequate for dermatological testing.
3. Performing Patch Test and reading the results at 48th and 72nd hour.
4. Determining treatment
5. Analysis of the results aiming actualization of the frequency and the etiology allergic skin diseases in Bulgaria.

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The aims of the clinical study are diagnostics of contact dermatitis, determining the most common allergens in Bulgaria, actualization of

frequency and etiology of allergic skin diseases in Bulgaria and prophylaxis of allergic skin diseases.

Allergic contact dermatitis is the most common allergic skin disease in the developed countries and second among the infectious skin diseases. It is caused when the skin makes contact with physical, chemical and biological agents. Despite allergic, other types of the contact dermatitis can be: irritant contact dermatitis, phototoxic contact dermatitis and photoallergic contact dermatitis (2).

Allergic contact dermatitis occurs as a result of allergic reaction of delayed type (type IV) towards low-molecular chemical substances in surrounding professional and living environment, cosmetic products and medicaments (3).

Irritant contact dermatitis results from exposure of the skin to toxic agents, such as strong acids or bases, which even with short exposure overwhelm the normal barrier function of the skin as a result of repeated or long-term exposures to mild irritants (4).

Irritant contact dermatitis in contrary to allergic dermatitis is not considered as an immunological disease. It is known that skin irritants further induce the occurrence of allergic contact dermatitis.

Phototoxic contact dermatitis – photochemical reaction caused by direct interaction of radiation and photosensitizing substance, producing a sunburn-like reaction (5).

Photoallergic contact dermatitis is a cutaneous reaction involving a photoallergen and UVA radiation. Previous exposure to the allergen is required (5).

Skin diseases in which Patch Tests are indicated are: Contact dermatitis, Contact urticaria, Occupational dermatitis, Atopic dermatitis, Dyshidrosis, Seborrheic dermatitis, Nummular Dermatitis, Lichenoid Chronic Dermatitis, Pruritus and Prurigo (5)

The diagnosis 'Contact Dermatitis' is based on detailed professional and habitual anamnesis, clinic, localization of the rash and positive 'Patch Test' results (2).

METHODS AND MATERIALS

In the allergy sector in the Clinic of Dermatological and Venereal Diseases- Stara Zagora within the 'Diagnostics and prophylaxis of allergic skin diseases' campaign, 48 patients were examined. 10 were men and 38 were women.

Allergic skin diseases are diagnosed in 28 of the patients (6 men and 22 women). Nineteen patients were diagnosed with contact dermatitis, 5 with atopic dermatitis and 4 with urticaria. Eighteen of the patients were diagnosed with non-allergic skin diseases and 2 without any skin problems, but anamnesis of asthmatic seizures. The age of the patients varied from 6 months old to 83 years old. The patients with Contact Dermatitis were diagnosed using three of the four criteria by Zlatkov.

Epicutaneous samples are used for identification of the contact allergens causing contact dermatitis. For accurate determination of the etiological agent so called 'Patch Test' is used. The technique is created by Jadasson and Bloch in 1895 and in its nature is epicutaneous provocative test (2). 'Patch Test' is an epicutaneous test for in vivo visualization of IV type allergic reaction (6) and is a model for occurrence and development of contact dermatitis (7). 'Patch Test' is a standard for diagnostics of Contact dermatitis.

Patch Tests can be performed with standard European set or additional target sets of allergens. The Standard European set contains 28 most common allergens in given concentration situated in vehiculum–Vaselinum album or Aqua Destilata as shown in **Table 1**.

The allergens of the standard set or additional target sets, in volume of 20µl, are placed in aluminum chambers and are fixed by hypoallergic tape onto pre-cleaned skin. The tests are performed on the patient's back, places with biggest occlusion- just lateral to the spine. The patient is educated that the tested area should be kept dry.

The results are read on the 2nd and 3rd day (48th and 72nd) by the Wilkinson et all scale. Most often positive results are present already on the 48th hour, as we observed in female patient 44 years old with strong positive allergic reaction to Nickel (**Figure 1**).

Table 1. European Standard Basic Series

No.	Allergen	Conc. (%)	Vehiculum
1	Kalium bichromas	0.5	Vaselineum album
2	4- phenylendiaminimum	1.0	Vaselineum album
3	Thiuram mix	1.0	Vaselineum album
4	Neomycinum sulfas	20.0	Vaselineum album
5	Cobaltum (II) chloridum	1.0	Vaselineum album
6	Benzocainum	5.0	Vaselineum album
7	Nickelum (II) sulfas	5.0	Vaselineum album
8	Clioquinol (Vioform)	5.0	Vaselineum album
9	Colophonium	20.0	Vaselineum album
10	Paraben mix	16.0	Vaselineum album
11	N-isopropyl-N-phenyl-4-phenylendiaminum	0.1	Vaselineum album
12	Lanolin alcohol	30.0	Vaselineum album
13	Mercapto mix	2.0	Vaselineum album
14	Epoxy resin	1.0	Vaselineum album
15	Balsamun peruvianum	25.0	Vaselineum album
16	4-tert-Butylphenol formaldehydum	1.0	Vaselineum album
17	2-Mercaptobenzothiazolum (MBT)	2.0	Vaselineum album
18	Formaldehydum	1.0	Aqua destillata
19	Parfum mix	8.0	Vaselineum album
20	Sesquiterpenum mix	0.1	Vaselineum album
21	Quaternium 15	1.0	Vaselineum album
22	Primin	0.01	Vaselineum album
23	Kathon CG (Cl+Me-isothiazolinonum)	0.01	Aqua destillata
24	Budesonidum	0.1	Vaselineum album
25	Tixocortol-21-pivalatum	0.1	Vaselineum album
26	Methyldibromoglutaronitrilum	0.5	Vaselineum album
27	Fragrance mix II	14,0	Vaselineum album
28	Lyral	5,0	Vaselineum album

**Figure 1.** Female patient 44 years old with strong positive allergic reaction to Nickel.

The scale is interpreted as in **Table 2**.

Table 2. Interpretation of 'Patch test' results

-	Negative
?+	Doubtful reaction- faint erythema, no infiltration
+	Weak positive reaction- erythema, infiltration, possibly papules
++	Strong positive reaction- erythema, infiltration, vesicles
+++	Extreme positive reaction- intense erythema, intense infiltration coalescing vesicles
IR	Irritant reaction- discrete patchy erythema, no infiltration

When the results are being read, false positive and false negative results should be taken into account(6).

RESULTS

Twenty three epicutaneous tests were used on patients with contact dermatitis.

Twelve of the patients had positive results(+), 6- irritative(IR) and 5- doubtful reactions (?).

Overall 7 patients had reactions to more than one allergen, of which 2 with positive reaction.

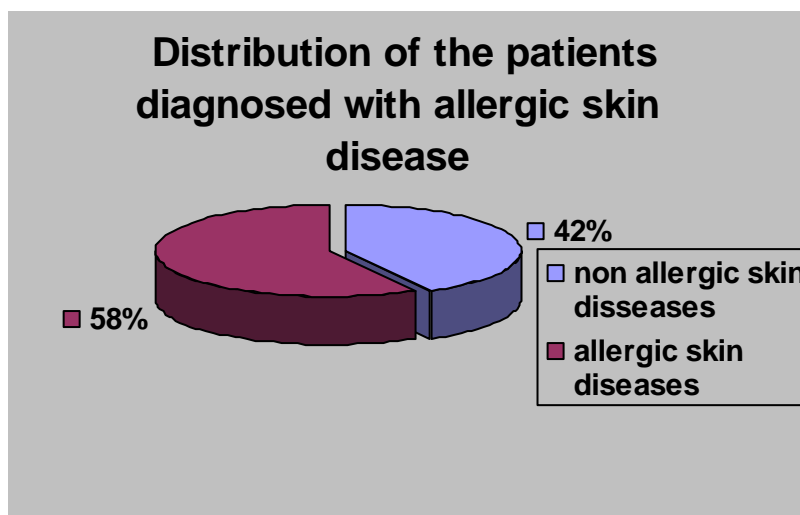
Positive reactions to allergens: Nickelum sulfas- 7, Cobaltum chloridum- 2, Kalium bichromas- 2, Colophon- 1. Irritant reaction to allergens: Nickelum sulfas- 1, Cobaltum chloridum- 2, Budesonidum- 1, Thiuram mix- 1, MDBGN- 1. Doubtful reaction to allergens: Nickelum sulfas- 1, Cobaltum chloridum- 2, Kalium bichromas- 1, Balsam Peru- 1, Budesonidum- 1 as in **Table 3**.

Table 3. Results of "Patch test"

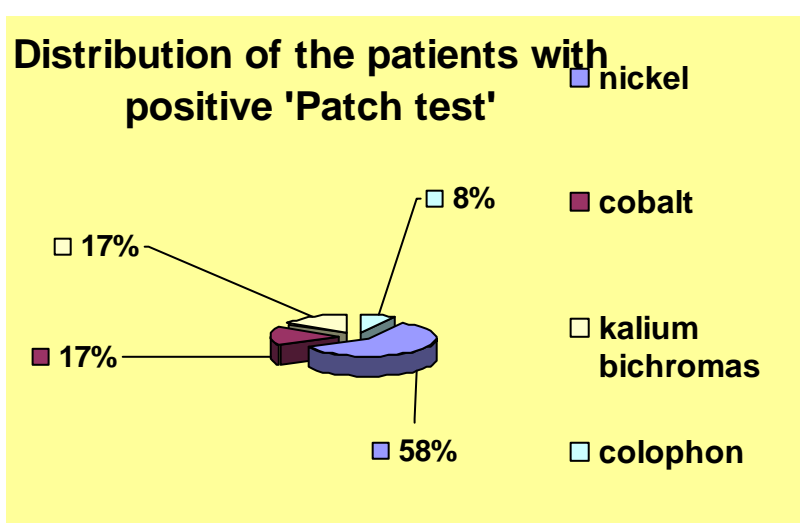
patients	48 th hour	72 nd hour
P1	NiSO4 (+++), CoCl2(+)	NiSO4 (+++), CoCl2(+)
P2	NiSO4 (++) , CoCl2(?)	NiSO4 (+++), CoCl2 (+)
P3	NiSO4 (++)	NiSO4 (++)
P4	NiSO4 (++) , CoCl2 (IR)	NiSO4 (++) , CoCl2 (IR)
P5	NiSO4 (IR)	NiSO4 (++)
P6	NiSO4 (+)	NiSO4 (+)
P7	NiSO4 (+), Kcr2(-), CoCl2 (-)	Ni(-), Kcr2(?), CoCl2 (?)
P8	Balsamun peruvianum(-), Budesonidum(-)	Balsamun peruvianum (?), Budesonidum (?)
P9	NiSO4 (IR)	NiSO4 (IR)
P10	Colophonium (+)	Colophonium (+)
P11	Kcr2(+), Co Cl2 (IR), Thiuram mix (IR)	Kcr2(+), Co Cl2 (IR), Thiuram mix (IR)
P12	Kcr2(-), NiSO4(-)	Kcr2 (+), NiSO4(?)
P13	Budesonidum (IR)	Budesonidum (5 day- IR)
P14	Methyldibromoglutaronitrilum(IR.)	Methyldibromoglutaronitrilum (IR)
P15	CoCl2 (?)	CoCl2 (?)
P16-23	(-)	(-)

In 58 % (28 patients) out of 48 patients allergic skin diseases were diagnosed as shown in **Graph 1**. Of those 23 were tested with 'Patch test'. Twelve of them had positive reactions. We found that the most common allergen in this study is

Nickel with 58 % (7 patients), followed by Cobalt with 17% (2 patients) and Potassium dichromate with 17% (2 patients) and Colophon with 8% (1 patient) as in **Graph 2**.



Graph 1. Distribution of the patients diagnosed with allergic skin disease



Graph 2. Distribution of the patients with positive 'Patch test'

DISCUSSION

During the past few years higher morbidity and prolonged and more severe symptoms of the allergic skin disease is observed, especially in industrially developed countries. The patients we followed in our study live and work in area which is highly industrialized, with presence of several high pollutants such as thermo-electric plants, coal mines, plants for production of heavy metals and many others. This leads to more frequent and longer exposition to allergic substances.

Allergic contact dermatitis is a commonly seen ailment of patients visiting general medical practices and dermatology clinics. (8) Dermatology and allergy specialists use patch testing to diagnose patients with allergic contact dermatitis. Patch testing is the gold standard for patients with allergic contact dermatitis (9).

According to the literature nickel is the most common allergen in the standard set of allergens (10,11), which correlates to our results. Occasionally reactions to more than one allergen can occur. This kind of reaction is described when patients are allergic to nickel and cobalt (12,13), which we observed in our study.

Nickel is contained in metal alloys used for making of: earrings, metal watchbands, buckles, metal buttons, lighters, rings, instruments, batteries, machine parts, some coins, keys, kitchen accessories, spectacle frames, tooth prosthesis, orthopedic plates, orthopedic prosthesis, needles, scissors, pigments in makeup, lubricating oils (6).

Cobalt is contained in metal alloys (machine parts, airplane parts, weapons), it is a component in glass coloring, different dyes. Traces of this element can be found in beer, some flours, cement (6).

The clinical studies during national campaign for diagnostics and prophylaxis of allergic skin diseases give us great opportunity to understand the problems of the population working and living in these conditions. Our mission should be not only treating the patients, but prophylaxis of the population. Every possible step of lowering the contact rate and shortening exposition time should be taken. In patients where allergic contact dermatitis was found it is obligatory to be removed from the environment where the allergens are present, contacts should be minimized and immediate treatment should be started.

CONCLUSION

Evolution and industrialization leads to more frequent contact of the population with the tested allergens. This leads to greater number of patients diagnosed with allergic skin diseases. Reduction of contact with the allergens should be our strategy for preventing further spread and developing new cases of contact dermatitis. Correctly diagnostics of contact dermatitis is very important for the dermatologist. The knowledge of etiological factors helps in making accurate diagnosis and adequate treatment of the disease. The patch test plays an important role in finding the etiology of contact dermatitis at an early stage to prevent chronicity of the condition.

REFERENCES

1. Cohen DE, Brancaccio R, Andersen D, Belsito DV. Utility of a standard allergen series alone in the evaluation of allergic contact dermatitis: a retrospective study of 732 patients. *J Am Acad Dermatol.* Jun 1997;36(6 Pt 1):914-8
2. Н. Златков, Дерматология и сексуално предавани болести, 1997г, стр. ст.238
3. European dermatology forum, White book dermatology and venereology in Europe, 2001, p. 114-115
4. O. Braun-Falco, G. , H. Wolff, W. Burgdorf, *Dermatology*, 2000, p. 458, p. 554, p. 557, p. 476
5. W. H. C Burgdorf, G. Plewig, H. H. Wolff, M. Landthaler, Braun-Falcos

- Dermatology*, Third Edition, Springer 2000, p. 357, p. 378.
6. J.-M. Lachapelle H. I. Maibach, Patch Testing and Prick Testing, A Practical Guide, Springer, 2003, p. 7
7. Geier J., Uter W., Pirker C., Frosch P.J. Patch testing with the irritant sodium lauryl sulfate (SLS) is useful in interpreting weak reactions to contact allergens as allergic or irritant. *Contact dermatitis* 2003, vol. 48, no2, pp. 99-107
8. Most Prevalent Skin Diseases Impact Millions of Americans: Burden of Skin Disease Study Finds Several Diseases to Be Quite Common. (2005). *Dermatology World*, 1, 24.
9. Krob, H.A., Fleischer, A.B., Jr., D'Agostino, R., Jr., Haverstock, C.L., & Feldman, S. (2004). Prevalence and relevance of contact dermatitis allergens: A meta-analysis of 15 years of published TRUE test data. *Journal of the American Academy of Dermatology*, 51(3), 349-353.
10. Mortz CG, Lauristen JM, Bndsllev-Jensesn C, Andersen KE(2002) Nickel sensitization in adolescents and association with ear piercing, use of dental braces and hand eczema. The Odence adolescence Cohort Study on Atopic Diseases and Dematitis(TOACS). *Acta Derm Venereol(Stockh)* 82: 359-364
11. Schnuch A, Geier J, Uter W, Frosch PJ, Lehmacher W, Aberer W, Agathos M, Arnold R, Fuchs T, Laubstein B, Lischka G, Pietrzyk PM, Rakoski J, Richter G, Rueff F(1997) National rates and regional differences in sensitization to allergens of the standart series. Population-adjusted frequencies of sensitization (PAFS) in 40,000 patients from a multicenter study (IVDK). *Contact Dermatitis* 37: 200- 209
12. Shafer T, Bohler E, Ruhdorfer S, Weigl L, Wessner D, Filipjak B, Wichmann HE, Ring J(2001) Epidemiology of contact allergy in adults. *Allergy* 56: 1192-1196
13. Kanerva L, Jolanki R, Estlander T, Alanko K, Savela A(2000) Incidence rates of occupational allergic contact dermatitis caused by metals. *Am J Contact Dermat* 11: 155-160