ORIGINAL ARTICLE
Iran J Allergy Asthma Immunol
September 2011; 10(3): 195-205.

Epidemiological Study of Periocular Dermatitis in a Specialised Hospital Department

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Received: 27 October 2010 ; Received in revised form: 20 January 2011 ; Accepted: 15 March 2011

ABSTRACT

Contact dermatitis is frequent skin pathology and eyelids are one of the more frequent locations of this pathology. The objective of the present work was to study the population distribution of periocular dermatitis, determine the allergens which most frequently indicate positive in patch tests and in provocative use tests, and analyse the clinical relevance of the positive tests.

Patients with periocular dermatitis (N=93) underwent a thorough physical examination and a patch test with standard series. According to clinical suspicions, 76 patients underwent a patch test with specific series. Finally a provocative use test was done for 36 patients with suspected products that the patients brought. The tests were classified according their relevance.

The most frequently observed allergen in the patch tests (with standard and specific series) was nickel followed by mercury, and anti-glaucoma drops in the provocative use tests with patients products.

Patients' sex, age, occupation, clinical status, presence of associated periocular symptoms, and presence of atopic or seborrheic dermatitis and/or rosacea did not relate with relevance.

We conclude that a clinical diagnosis may not always be made with patch tests with standard and specific series due to lack of relevance. It is important to do provocative use tests with the products suspected as allergens in those cases where patch tests with standard and specific series indicated positive for more than one allergen.

Key words: Allergens; Contact Dermatitis; Periocular Dermatitis; Population Distribution; Patch Test; Provocative Test

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INTRODUCTION

Eczema or dermatitis encompasses all skin lesions that appear as inflamed rashes with exuding vesicles-

papules.[1] Causes may be endogenous (atopic/seborrheic dermatitis) or exogenous (contact dermatitis). Contact dermatitis may also be irritative or allergic.[2,3] Irritative contact dermatitis is caused by a direct local toxic effect when skin comes into contact with irritant chemical agents: detergents, organic dissolvents, oils, acids, alkalis, oxidising agents, reducing agents, water. This process may be influenced by other endogenous (hyperirritability, atopy, hyperkeratosis, race, age, skin phototype) or exogenous (humidity, temperature) factors. However, allergic contact dermatitis is a reaction of delayed hypersensitivity caused by skin coming into contact with a chemical agent that a person has become sensitised to previously.[1]

In general, contact dermatitis is a frequent skin pathology that affects millions of people worldwide.[4] It is a considerable public health problem, particularly in the work domain where 40% of occupational pathologies involve contact dermatitis with significant economic losses owing to workers visiting doctors.[5]

Some usual chemical agents are cosmetics, personal hygiene products, plants, topic medicines like eye drops, and agents present in the work domain.[6,7] The most frequent locations are hands and eyelids.[8-10]

Eyelids are particularly sensitive as their skin is thinner than the rest of the tegument: approximately 0.55 mm as compared to 2 mm. So eyelids are predisposed to contact dermatitis, and skin rashes are the most frequent sign.[7] Besides, eyes are in continuous contact with fingers that are constantly exposed to numerous substances.[11]

Eyelids are a place where allergens like cosmetics, make-up and eye drops are frequently found. Here allergenic agents are often transmitted by direct hand contact.[7]

Nowadays, the general population use more face-care products (cosmetics and make-up) as image and socio-cultural implications have become more important. Furthermore with an ageing population, the incidence of ocular pathologies associated with the elderly has increased, and a greater use of topic ophthalmic medications is necessary.[12] In recent years, these factors have led to a larger number of potential allergenic agents coming into contact with the periocular area.

Eczematous lesions that emerge near eyes are more irritable than in other areas. Besides, the face is fundamental for interpersonal relationships. So emotional affection is another symptom of this process.

Therefore we believe it is necessary to analyse the current situation, assess the diagnostic methods and determine their relevance to update daily clinical practice. Therefore, this work aims to study the population distribution of periocular dermatitis, determine the allergens which most frequently indicate positive in patch tests and provocative use tests, and analyse the clinical relevance of the positive tests.

MATERIALS AND METHODS

Study Design

A descriptive, cross-sectional study.

Population

The study population included all the patients with periocular dermatitis who came to the specialised contact dermatitis department at the Doctor Peset University Hospital in Valencia in the period 2001-2008 (N=93). We used the Hanifin's and Rajka's criteria for the diagnosis of atopic dermatitis.[13]

Methodology

Each patient underwent a thorough physical examination. Then, a patch test with standard series was routinely done with all the patients (N=93). It consisted in applying a large number of allergens on the patient's skin on different vehicles inside a Finn chamber covered with hypoallergenic adhesive. These patches were placed on the patient's back in most cases. The standard allergens used were those most frequently used, and had been agreed by the Spanish Contact Dermatitis Research Group[14] (Table 1).

Patches remained in place for 48 hours. During this time, patients were asked to avoid sunlight, or doing intense physical exercise and wetting the patches. After this period, the patches were removed and assessed. Readings were repeated 96 hours after tests began.

There is a general consensus that patch tests with standard series are a useful screening test for 70% of those cases suspected as allergic contact dermatitis. In one third of these cases, however, it was necessary to use specific series according to clinical suspicions.

This was the case for 76 of the 93 patients who underwent a patch test with the products suspected to cause the pathology. Patients brought these products, and the ingredients and excipients they contained were used as isolated allergens (Table 1) in accordance with the aforementioned methodology.

Table 1. Allergens used in patch tests and provocative use tests

Patch test with standard series	
Nickel sulphate	Wool alcohols
Neomicin sulphate E.P 200	Potassium dichromate 25
Mixture of caines	Mixture of perfumes
Rosin	Epoxy resin
Mixture of quinolins	Peru balsam
Ethylendiamine dihydrochloride	Cobalt chloride
Para-tertiary butylphenol formaldehyde	Parabens
Carba mix	Black rubber mix
Kathon (methylisothiazolinone)	Quaternium 15
Mercaptobenzodiazol	Paraphenylendiamine
Formaldehyde	Mercapto mixture
Thiomersal	Thiuram
Diazolidinyl urea	Imidazolidinyl urea
Budesonide	Tixocortol Pivalate
Hydrocortisone butyrate	Mercury
Lactone mix	Euxyl k400 (phenoxyethanol+dibromocyanobutane)
Amerchol	Propylenglycol 5%
Patch tests with specific series	
Cosmetics	Perfumes
Ophthalmic/Benzalkonium chloride	Acrylates
Hairdressers	Others
Provocative use tests	
Drops for glaucoma (Carteolol 1%, Brimonidine 0.2% and Latanoprost-timolol 50 µg/ 5 mg/ 1ml)	Make-up
Other eye drops (phenylephrine 0.125%)	Nail varnish

Finally a provocative test was also done for 36 of the 93 patients with the suspected products that the patients brought (Table 1). These products were used directly by placing the product on the skin of the periocular area openly (uncovered), but only on one eyelid (cosmetics/make-up) or in one eye (drops). In most cases, they were applied as patches (23 patients), and were combined with an open use test on 4 occasions, while they were applied exclusively and openly with 13 patients.

These tests were not merely diagnostic tests, but provide both the patient's clinical relevance and treatment once the etiologic agent to avoid had been identified. So having verified the positivity of the various tests, their clinical relevance was determined if there was a clear temporal association between exposure and dermatitis appearing.

The tests were classified into three groups according to their relevance:

- Relevant: if positivity justified the patient's current clinical status.
- Possibly or probably relevant: if the patient's current clinical status could neither be ruled out nor attributed to the positive allergen.
- Irrelevant: if positivity did not justify the patient's current clinical status, even though it once had or will have clinical manifestations caused by this allergen.

Positive tests were always considered relevant if the patient used the products involved regularly and was allergic to them.

Data about the patients' sex, age and occupation were collected using a survey designed for this purpose. Occupations were classified into 10 categories according to International Standard Classification of Occupations 2008 (ISCO 2008)[15] (Table 1).

Data were also collected from studying the patients' medical records and anamneses. The number of

patients who came exclusively with periocular eczema was determined; that is, if only their periocular area was affected or if it was also combined with other areas, plus the appearance of ocular symptoms related with periocular dermatitis. We also determined the frequency of other forms of dermatitis (atopic, seborrheic and/or rosacea, and any others).

Data Analyses

The general characteristics (sex, age and occupation) and the patients' clinical status (extra-periocular problems, associated ocular problems, atopic dermatitis, seborrheic dermatitis and/or rosacea, and other dermatoses) were described using absolute and relative frequencies (%). For the latter, the corresponding 95% confidence intervals were calculated. The differences in the distribution of percentages were compared with a Chi-square test (P>0.05).

Absolute and relative frequencies (%) were calculated with their corresponding 95% CI for each positive patch test (standard and specific series) and provocative use test.

Clinical relevance was studied in terms of both the number of positive allergens in the tests and the patients' general and clinical characteristics. For this purpose, absolute and relative frequencies (%) were calculated with their corresponding 95% CI. Comparisons were made with a Chi-square test (P>0.05). Finally, absolute and relative frequencies (%) were calculated with their corresponding 95% CI for each relevant positive allergen.

All the data analyses were done using the SPSS Statistical Package for Social Sciences, version 17 for Windows.

RESULTS

Out of the 2000 patients attended to in the specialised contact dermatitis department at the Doctor Peset University Hospital in Valencia in the period 2001-2008, 93 had periocular dermatitis, that is 4.65% of all the consultations.

The general characteristics of these 93 patients with periocular dermatitis are shown in table 2. Most of the patients with periocular eczema in the study sample were women: 82.80% (p=0.001).

Patient's ages ranged from 16 to 84 years. Of these, more than half were aged over 51 years, and only 25% were under the age of 41. Therefore, the study population was mainly elderly. In terms of occupations, housewives predominated among patients with periocular dermatitis (36.56%), followed by professionals (23.66%).

Regarding patients' clinical characteristics, 38.71% of the patients presented dermatitis as the exclusive clinical manifestation in the periocular area. The remaining 61.29% also had dermatitis in other areas.

A quarter of the patients (24.73%) reported having some form of ocular symptoms associated with periocular dermatitis. The frequency of atopic dermatitis in the patients was 22.58%. Indeed, most of the patients were not known to be atopic dermatitis patients in the specialised hospital department. Only 11.83% of patients had seborrheic dermatitis and/or rosacea. Many other types of dermatosis could be associated with lesions in the periocular area, but this was rare and no patient in the study sample showed any of these types.

Patch tests (with standard and specific series) were positive for at least one allergen in 61 patients (65.59%). The remaining 32 patients (34.41%) obtained negative results for all the allergens analysed. Out of the 61 patients who tested positive, 23 were positive for more than one allergen (37.70%) and 38 tested positive to only one allergen (62.30%). Out of the 36 patients who underwent provocative use tests, 10 indicated positive for the analysed allergen (27.78%).

Table 3 shows the results of the patch test (with standard and specific series) and provocative use tests. There were a total of 106 positive results to individual allergens: 96 in the patch tests and 10 in the provocative use tests.

The most frequently observed allergen in the patch tests was nickel (28.30% of those which indicated positive), followed by mercury (16.04% of those which showed positive). On the other hand, anti-glaucoma drops were involved in 30% of all the positively provocative use tests.

Table 4 shows the clinical relevance of the overall positive patch tests in terms of the number of positive allergens, the patient's age, sex, occupation, provocative use test, use of specific series, the patient's clinical status in other areas other than periocular, presence of an associated ocular clinical status, atopic dermatitis, and seborrheic dermatitis and/or rosacea.

Table 2. The study sample's overall characteristics (N=93)

Topics	N	% (95% CI)	*P*-value
Sex			
Men	16	17.20 (10.53-25.89)	<0.001
Women	77	82.80 (74.11-89.47)	
Age			
<42 years	24	25.81 (17.69-35.41)	<0.001
42-51 years	19	20.43 (13.15-29.52)	
>51 years	50	53.76 (43.59-63.70)	
Occupation			
Housewives	34	36.56 (27.25-46.69)	<0.001
Managers and businesspeople	1	1.07 (0.05-5.19)	
Professionals	22	23.66 (15.85-33.08)	
Technicians and associated	5	5.38 (2.00-11.51)	
Professionals			
Service workers and salespeople	11	11.83 (6.38-19.62)	
Farmers, forest keepers and	1	1.07 (0.05-5.19)	
Fishermen/women			
Manipulators (metal, construction, factories)	8	8.60 (4.07-15.68)	
Drivers and machine operators	3	3.23 (0.83-8.53)	
Elemental occupations (cleaning, etc.)	4	4.30 (1.38-10.05)	
Students	4	4.30 (1.38-10.05)	
Effects			
Periocular	36	38.71 (29.23-48.89)	<0.001
And in other areas	57	61.29 (51.11-70.77)	
Associated eye symptoms			
No	70	75.27 (65.75-83.23)	<0.001
Yes	23	24.73 (16.77-34.24)	
Atopic dermatitis			
No	72	77.42 (68.10-85.05)	<0.001
Yes	21	22.58 (14.95-31.90)	
Seborrhoeic dermatitis and/or rosacea			
No	82	88.17 (80.38-93.62)	<0.001
Yes	11	11.83 (6.38-19.62)	
Other dermatosis types			
No	100,00	-	-
Yes	0	-	

95% CI, 95% Confidence Interval; *P*-value, Chi-square test.

Table 4 shows the clinical relevance of the overall positive patch tests in terms of the number of positive allergens, the patient's age, sex, occupation, provocative use test, use of specific series, the patient's clinical status in other areas other than periocular, presence of an associated ocular clinical status, atopic dermatitis, and seborrheic dermatitis and/or rosacea. Out of all the positive overall tests (61), 30 were clinically relevant (49.18%), 9 were possibly/probably relevant (14.75%) and 22 were irrelevant (36.07%).

We also noted how the clinically relevant patch tests mainly tested positively to more than one allergen. However those that were either irrelevant or possibly/probably relevant were mainly positive for a single allergen.

Table 3. Allergens which tested positively (N=106).

Topics	N	% (95% CI)
Patch tests (standard and specific series)		
Níckel	30	28.30 (20.35-37.43)
Mercury	17	16.04 (9.95-23.96)
Thiomersal	7	6.60 (2.93-12.62)
Kathon (methylisothiazolinone)	6	5.66 (2.33-11.40)
Cobalt	4	3.77 (1.21-8.85)
Mixture of perfumes	3	2.83 (0.72-7.51)
Rosin	3	2.83 (0.72-7.51)
Paraphenylendiamine	3	2.83 (0.72-7.51)
Propylenglycol	2	1.89 (0.32-6.09)
Euxyl k400 (phenoxyethanol + dibromocyanobutane)	2	1.89 (0.32-6.09)
Mixture of caines	2	1.89 (0.32-6.09)
Black rubber mix	2	1.89 (0.32-6.09)
Carba mix	2	1.89 (0.32-6.09)
Lactones	2	1.89 (0.32-6.09)
Para-tertiary butylphenol formaldehyde	2	1.89 (0.32-6.09)
Gold	1	0.94 (0.05-4.56)
Peru balsam	1	0.94 (0.05-4.56)
Propylgalate	1	0.94 (0.05-4.56)
Isoeugenol	1	0.94 (0.05-4.56)
Potassium dichromate	1	0.94 (0.05-4.56)
Thiuram	1	0.94 (0.05-4.56)
Propylenglycol	1	0.94 (0.05-4.56)
Quaternium-15	1	0.94 (0.05-4.56)
Tixocortol (hydrocortisone)	1	0.94 (0.05-4.56)
Provocative use tests		
Drops for glaucoma (Carteolol 1%, Brimonidine 0.2% and Latanoprost-timolol 50 µg/ 5 mg/ 1ml)	3	2.83 (0.72-7.51)
Other eye drops (phenylephrine 0.125%)	2	1.89 (0.32-6.09)
Make-up	2	1.89 (0.32-6.09)
Nail varnish	2	1.89 (0.32-6.09)
Cosmetics	1	0.94 (0.05-4.56)

Sixteen patients tested positively to more than one allergen

In other words, when patch tests were positive for several allergens, the likelihood of some of them being clinically relevant was higher than if the test was positive for a single agent (p=0.034).

Regarding the other study variables, table 4 indicates that patients' sex, age or occupation were not statistically and significantly related with clinical relevance. The patients' clinical status being, or not, only periocular, there being associated periocular symptoms, and the presence of atopic or seborrheic dermatitis and/or rosacea did not relate with relevance.

Neither was there a relationship between the use of specific series or provocative use tests with the products brought by patients suspected of causing symptoms irrespectively of using patches, open use tests, or a combination of both.

Table 4. Presence of some clinical relevance (N=61).

Topics	Clinical relevance						*P*-value
	Yes (N=30, 49.18%)		No (N=22, 36.07%)		Possibly or likely (N=9, 14.75%)		
	N	% (IC95%)	N	% (IC95%)	N	% (IC95%)	
No. of positive allergens							
1	14	46.67 (29.54-64.41)	18	81.82 (61.76-93.94)	6	66.67 (33.24-90.73)	0.034
>1	16	53.33 (35.59-70.46)	4	18.18 (6.06-38.24)	3	33.33 (9.27-66.76)	0.034
Sex							
Men	2	6.67 (1.13-20.32)	2	9.09 (1.55-26.92)	1	11.11 (0.56-43.86)	-
Women	28	93.33 (79.68-98.87)	20	90.91 (73.08-98.45)	8	88.89 (56.14-99.44)	-
Age							
<42 years	7	23.33 (10.82-40.79)	7	31.82 (15.11-53.05)	5	55.56 (24.04-83.95)	0.186
42-51 years	8	26.67 (13.22-44.43)	2	9.09 (1.55-26.92)	0	-	0.085
>51 years	15	50.00 (32.53-67.47)	13	59.09 (38.05-77.88)	4	44.44 (16.05-75.96)	0.707
Occupation							
Housewives	9	30.00 (15.73-47.97)	9	40.91 (22.12-61.95)	5	55.56 (24.04-83.95)	0.354
Professionals	6	20.00 (8.53-37.03)	6	27.27 (11.87-48.33)	1	11.11 (0.56-43.86)	0.590
Technicians and associated Professionals	1	3.33 (0.17-15.36)	1	4.55 (0.23-20.44)	1	11.11 (0.56-43.86)	-
Service workers and salespeople	7	23.33 (10.82-40.79)	2	9.09 (1.55-26.92)	1	11.11 (0.56-43.86)	0.351
Manipulators	3	10.00 (2.61-24.85)	2	9.09 (1.55-26.92)	0	-	-
Drivers and machine operators	1	3.33 (0.17-15.36)	0	-	0	-	-
Elemental occupations	2	6.67 (1.13-20.32)	0	-	0	-	-
Students	1	3.33 (0.17-15.36)	2	9.09 (1.55-26.92)	1	11.11 (0.56-43.86)	-
Provocative use test							
No	14	46.67 (29.54-64.41)	17	77.27 (56.59-91.16)	5	55.56 (24.04-83.95)	0.083
Yes, patch test	7	23.33 (10.82-40.79)	4	18.18 (6.06-38.24)	3	33.33 (9.27-66.76)	0.659
Yes, open use test	6	20.00 (8.53-37.03)	1	4.55 (0.23-20.44)	1	11.11 (0.56-43.86)	0.259
Yes, patch test+ open use test	3	10.00 (2.61-24.85)	0	-	0	-	-
Effects							
Only periocular	9	30.00 (15.73-47.97)	9	40.91 (22.12-61.95)	3	33.33 (9.27-66.76)	0.714
And in other areas	21	70.00 (52.03-84.27)	13	59.09 (38.05-77.88)	6	66.67 (33.24-90.73)	0.714
Use of specific series	26	86.67 (70.90-95.62)	14	63.64 (42.41-81.47)	8	88.89 (56.14-99.44)	0.097
Associated eye	7	23.33 (10.82-40.79)	6	27.27 (11.87-48.33)	4	44.44 (16.05-75.96)	0.463
Symptoms							
Atopic dermatitis	4	13.33 (4.38-29.10)	3	13.64 (3.59-32.78)	4	44.44 (16.05-75.96)	0.083
Seborrhoeic ermatitis and/or rosacea	3	10.00 (2.61-24.85)	4	18.18 (6.06-38.24)	1	11.11 (0.56-43.86)	0.676

95% CI, 95% Confidence Interval; *P*-value, Chi-square test.

Finally, table 5 identifies the positive clinically relevant allergens. Here we could see a total of 44 positive clinically relevant allergens, including the possibly/probably relevant ones. We highlight the products brought by patients who represent 22.73% of the positive clinically relevant allergens, followed by mercury (15.91%), kathon (13.64%) and thiomersal (11.30%).

Table 5. Positive clinically relevant allergens (N=44).

Topics	N	% (95% CI)
Patient's own products	10	22.73 (12.16-36.78)
Mercury	7	15.91 (7.23-28.95)
Kathon (methylisothiazolinone)	6	13.64 (5.72-26.22)
Thiomersal	5	11.36 (4.28-23.40)
Mixture of perfumes	3	6.82 (1.76-17.44)
Paraphenylendiamine	3	6.82 (1.76-17.44)
Rosin	2	4.54 (0.77-14.22)
Lactones	1	2.27 (0.11-10.70)
Quaternium-15	1	2.27 (0.11-10.70)
Nickel (eyelash curler)	1	2.27 (0.11-10.70)
Isoeugenol	1	2.27 (0.11-10.70)
Gold	1	2.27 (0.11-10.70)
Peru balsam	1	2.27 (0.11-10.70)
Chromium	1	2.27 (0.11-10.70)
Para-tertiary butylphenol formaldehyde	1	2.27 (0.11-10.70)

95% CI, 95% Confidence Interval.

DISCUSSION

Like other studies,[3,16-19] our periocular dermatitis population consisted mainly of women (82.80%). The incidence of contact pathologies is more frequent in women than in men as women tend to use more topic products (beautycare products and custom jewellery), and cleaning and hygiene products. The periocular area is particularly complicated because most frequent allergens originate from cosmetics, make-up, perfumes and hair dyes.[20] Another factor is that women consult the aesthetic implications more than men.

The patient's age is a key factor when analysing contact dermatitis since it requires previous contacts with the causing agent.[3] One logical explanation is that the older patients they more often have come into contact with various allergenic agents and the more time they have had to become sensitised to them. The age distribution of our study population reveals that the incidence of this pathology is higher in middle aged-elderly patients as 53.76% of the study sample was older than 51 years during the study period. Besides, the elderly use more topical eye medicines given the higher incidence of ophthalmic pathologies in this age group and more contact with potentially allergenic and/or irritative products.[12,16,21]

A patient's former or current occupation is of vital importance when assessing exposure to allergenic agents.[22] Our sample population include a considerable number of housewives, this being a risk group for contact dermatitis as women frequently use irritative agents (detergents, caustics, etc.). As mentioned earlier, women are more frequently exposed to beauty products and custom jewellery. The second highest risk group found was professional, possibly owing to this group's higher socio-economic level and its related use of beautycare products.

We must consider that other dermatoses could cause periocular eczema and may act as a confounder when it comes to identifying contact dermatitis. Of our study population, 22.58% were diagnosed with atopic dermatitis, a higher percentage than that found by Temesvari et al (10.70%).[7] However, the prevalence we found for seborrheic dermatitis and/or rosacea was 11.83%, while that of Temesvari et al was 18.40% .[7]

The diagnoses tests we performed (patch tests and provocative use tests) were positive for at least one allergen in 65.59% of the cases, and were clinically relevant in half of these cases (49.18%), which is 32.26% of our study sample. Temesvari et al reported an incidence of 34.40% for the whole study sample with relevant clinical tests.[7] This difference may lie in the divergences of the criteria followed to conduct tests. Although tests proved positive with the usual allergens in the periocular area in 14.75% of patients, we were unable to clinically confirm this. These patients fall within the error margin since a margin of subjectivity to establish the cause of allergies exists, and it depends on two fundamental factors: the researcher's experience and the patient's memory. That is, a patient may have come into contact with an allergenic product but may not be aware of it or remember having done so, and the researcher may be unaware of an allergen in a given environment.

Clinical suspicion is fundamental to manage contact dermatitis. Therefore, we chose to use both standard and specific series. Indeed, 81.72% of our study sample underwent both. No statistical evidence of increased incidence of the relevant positive tests was found when using both standard and specific series.

Provocative use tests are essential and may lead to a diagnosis as they show hypersensitivity to the same product the patient uses which is suspected of causing his/her clinical status; so if they test positively, they will always be relevant. Provocative use tests were done with 38.71% of patients since a product was neither suspected nor available. Most products the patients brought were simple chronic glaucoma eye drops, followed by non-glaucoma eye drops; this is logical because drops are easy to obtain, and the cause-effect and temporal relationship is obvious. The provocative use tests showed no statistically significant relationship with the clinical relevance found among the positive tests.

One piece of relevant information we obtained was the statistical evidence found asserting that when a patient is tested positively to more than one agent, then the probability of one of these agents being clinically relevant is greater than if only one allergen tests positively.

In contact dermatitis, the most usual sensitivity was to nickel; 28.30% of all the positive allergens tested. This result coincides with the bibliography, but with different values: 8.90%, Temesvari et al[7] and 19%, Feser et al.[3] Given the female predominance in our study population, the finding of high sensitivity to nickel is not surprising as it is present in make-up, metal eyelash curlers,[23,24] and traces may be found in mascaras,[25] eye shadow[26] and eye pencils[27]. Quite often, nickel does not appear in the ingredients, and is only present as a result of contamination during the production process.[28] It may come into contact with eyes on fingers after having used nail varnish or metal nail files,[11,29] or may derive distally from orthodontics.[30] Nickel may also be present in jewels and costume jewellery.[4,9,31]

The second most common agent with a high clinical relevance was mercury (15.91% of all the relevant agents). Mercury is found in cosmetics (foreign), topic medicines, disinfectants, silk processing, dental laboratories, paints, batteries, leathers, thermometers, printers, photographic material and insecticides, among others.[32] This percentage is below the figures presented in previous studies (1.70% in Temesvari et al[7]), but it would be necessary to study this in depth.

The products patients brought represent 9.44% of all the positive allergens, but 22.73% of all the clinically relevant positive allergens, and this finding coincides with similar studies, i.e., Feser et al.[3]

Kathon constitutes 5.66% of positive allergens and 13.64% of positive relevant allergens. Their incidence in the literature is much lower (0.70% of the positive allergens according to Temesvari et al[7]). Kathon is widespread as a preservative in cosmetics, shampoo, gels and other hygiene products.[32] Hypersensitivity to kathon in the periocular area is common as such products frequently come into contact with this area.

Thiomersal may be found in contact lens solutions and as a preservative in cosmetics, ophthalmic medicines,[3,16] toothpaste and germicides. It represents 6.60% of positive allergens and 11.36% of positive relevant ones. Temesvari et al[7] reported a somewhat lower prevalence (3.50%). However, our figures are similar to those found by Feser et al:[3] 9.20% of positive allergens and 100% of relevant positive allergens.

Perfumes often cause allergic contact periocular dermatitis and, in our study, they represent 2.83% of positive allergens and 6.82% of relevant ones. This latter percentage is higher in the literature (19%, Feser et al[3]).

Paraphenylendiamine is found in hair dyes and make-up,[7] and represents 2.83% of positive allergens (3.70% according to Temesvari et al[7]) and 6.82% of

relevant ones.

The low incidence of hypersensitivity to Peru Balsam, found in cosmetics and topic medicines, is stressed:[32] 0.94% of positive allergens and 2.27% of relevant ones; 6.60% and 10%, respectively, according to Feser et al;[32] and 4% of the positive results in Temesvari et al.[7] More data will be required to analyse these differences.

To conclude, our study reveals that despite patch tests identifying a considerable number of periocular allergens, a clinical diagnosis may not always be made with such tests due to lack of relevance. Therefore, it is important to do provocative use tests with the products suspected as allergens, brought by individual patients, particularly in those cases where patch tests have tested positively for more than one allergen.

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