

Approach to occupational contact dermatitis in an industrialized region of Spain

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Occupational contact dermatitis (OCD) is a skin condition characterized by the development of eczema due to contact with substances from the workplace. It is a frequent entity, with a known impact in quality of life and financial costs [1,2]. OCD can be classified as either allergic OCD, when the cause is a sensitization to a known workplace allergen, or irritant OCD, when no contact sensitizations are found or these are not clinically relevant. Recent studies conducted in Spain have found a higher incidence of allergic OCD –between 53% and 73%– compared to irritant OCD [3,4]. The aim of this study was to determine the characteristics of patients with OCD and their most frequent sensitizations in a well-characterized population from a heavily industrialized region of northern Spain.

A retrospective study was conducted in all 45 patients evaluated by the Allergy Department of Clínica Universidad de Navarra in Pamplona, Spain between May 2017 and January 2020, for which the clinical suspicion was of OCD (considering compatible clinical presentation and a temporal relation between the skin lesions and workplace exposure to potential contact allergens). This evaluation included a complete occupational history, a physical examination and patch testing with both the Spanish

standard patch test series (Martí Tor Alergia S.L.) as well as individual specific allergens according to their occupation and the patient's own products, when this applied [5]. All of the patients came from Navarre and the Basque Country, and most of them were referred to the department by mutual insurance companies. Study variables were tested for normality by employing the Shapiro-Wilk test. Values for quantitative variables found not to have a normal distribution were described employing median and interquartile range, and comparative analyses were conducted employing the Mann-Whitney U (Wilcoxon rank-sum) test. Differences of $p < 0.05$ were considered to be statistically significant. All statistical analyses were conducted employing Stata/IC 15.1. The study was approved by the Universidad de Navarra Ethics Committee for Investigation.

Among the 45 studied patients, 28 (62.2%) were male and 17 (37.8%) were female, with a mean age of 40 (SD 11.2). A diagnosis of OCD was made in 35 (77.8%) of them; 8 patients (17.8%) were diagnosed with other skin-related conditions and 2 patients (4.4%) had non-conclusive studies. Among the 35 cases of OCD, the cause was allergic in 25 (71.4%) and irritant in 10 (28.6%). History of atopy (allergic rhinoconjunctivitis, extrinsic asthma or atopic dermatitis) was present in 20% of OCD patients. The hands were the most frequently affected anatomic location [27 (77.1%)], followed by the eyelids and surrounding area [9 (25.7%)] and the rest of the face [8 (22.9%)]. The occupation with the highest incidence of OCD was the automotive and mechanical industry (31.4%), followed by the health and pharmaceutical industry (14.3%). Most of the patients (91.4%) used at least one form of protection, with gloves being the most frequently used equipment (82.9%). Failure to use protection was identified in the painters, the health and pharmaceutical industry and the automotive and mechanical industry, with 33%, 20% and 9% rates of non-usage, respectively.

Among the patients with allergic OCD, the most frequent, clinically relevant sensitization was to epoxy systems [9 (36%)], followed by formaldehyde and formaldehyde-releasers [4 (16%)], rubber additives [3 (12%)] and paraphenylenediamine [3 (12%)] (Table). Sensitization to epoxy systems was especially prevalent in workers from the automotive and mechanical industry, accounting for 50% of allergic OCD cases in this group. Median OCD latency time (the time between initial allergen exposure and development of symptoms) seemed to be lower in patients with a history of atopy compared to those without it [6.4 (IQR 0.5-15.9) and 23.5 (IQR 4-96) months, respectively]; however, this difference was not statistically significant ($p=0.14$). Among the cases of allergic OCD, seven (28%) were compatible with airborne OCD.

Incidence of allergic OCD in our population was higher than that of irritant OCD, which is compatible with recent studies conducted in Spain [3, 4]. We detected a higher prevalence of OCD patients with a history of atopy (20%) than what was reported in these studies (15% and 8%, respectively). The role of pre-existent atopy –particularly atopic dermatitis– in the development of OCD has been discussed in the literature, with varied results depending on the allergen type [6, 7]. Regarding our study, we measured the time between the initial allergen exposure and the development of symptoms –the OCD latency time– and compared it between atopic and non-atopic patients. We found no statistical difference between the two, although median latency time in atopic individuals seemed to be about 18 months lower than that of non-atopic patients.

The most frequent cause of OCD in our population was contact with epoxy systems (resins and hardeners). This may be explained by the fact that the most prevalent industry in our population was the automotive and mechanical industry, in which epoxy resins are a known sensitizer [4]. It is worth noting that, currently, the two industries

with the highest income in Navarre are the automotive and wind power industries, and that epoxy resins are a known cause of OCD in both of them [4, 8, 9].

The automotive and mechanical industry was also one of the industries where incomplete protection usage was identified. This is worrying and highlights the need for effective sanitary education in these workplaces, especially when it is known that sensitization to epoxy resins is usually clinically relevant [8]. Therefore, accurate education for workers is of utmost importance in order to prevent sensitization. Unfortunately, there are factors for which data was not available in our study, such as the continuity of the usage of protection equipment, its adequate removal (especially in the case of gloves, as removal sometimes exposes the clear skin directly to the allergen) and the quality of said equipment.

In conclusion, most cases of OCD in our study's population were of allergic etiology. This finding, which is congruent with similar studies conducted in Spain, underlines the importance of performing allergy tests in this type of patients. Sanitary education should be adequately imparted in industries in order to improve the usage rate and effectiveness of protection equipment, as a means of lowering the risk and impact of developing OCD.

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Table

| Relevant sensitizations among allergic OCD patients | N (%) |
|--|--------------|
| Epoxy systems | 9 (36,0%) |
| Bisphenol A | 9 (36,0%) |
| Diaminodiphenylmethane | 1 (4,0%) |
| Formaldehyde and formaldehyde-releasers | 4 (16,0%) |
| Rubber additives | 3 (12,0%) |
| PPD | 3 (12,0%) |
| Bioban P | 2 (8,0%) |
| MI/MCI | 2 (8,0%) |
| Metals | 2 (8,0%) |
| Drugs | 2 (8,0%) |
| Others | 3 (12,0%) |

Table legend: clinically relevant sensitizations among the allergic OCD patients. PPD: paraphenylenediamine, MI: methylisothiazolinone, MCI: methylchloroisothiazolinone.