

Positive patch test reactions to allergens of the dental series and the relation to the clinical presentations

ZIAD KHAMAYSI, REUVEN BERGMAN AND SARA WELTFRIEND

Department of Dermatology, Rambam Medical Center, Haifa 31096, Israel

The clinical manifestations of contact allergic dermatitis to dental materials are not uniform. This study was performed to detect the frequent allergens in the dental series associated with contact dermatitis and to define the causal relationship between the different allergens and the relevant clinical presentations. Between the years 2000 and 2004, 134 patients, aged 20–80 years, were patch tested. 121 patients were included in the study. The most frequent oral manifestations were cheilitis and perioral dermatitis (25.6%), burning mouth (15.7%), lichenoid reaction (14.0%), and orofacial granulomatosis (10.7%). 18 (14.9%) patients were dental personnel, all of whom suffered from hand dermatitis. The common allergens detected included goldsodiumthiosulphate (14.0%), nickel sulfate (13.2%), mercury (9.9%), palladium chloride (7.4%), cobalt chloride (5.0%), and 2-hydroxyethyl methacrylate (5.8%). Positive reactions to metals were frequent in all the different clinical variants, and no specific association between a specific clinical presentation and a particular allergen was found. Allergy to mercury was not a significant factor contributing to the pathogenesis of oral lichenoid reactions. However, a strong association with contact allergy to mercury in dental fillings was found in 2 patients with orofacial granulomatosis.

Key words: contact; dental; dermatitis. © Blackwell Munksgaard, 2006.

Accepted for publication 10 April 2006

There has been a recent increase in the number of publications addressing contact allergy of the oral mucosa in response to different foods, oral hygiene products, and materials used in dental practice. Dental treatment involves the use of a wide range of materials, which may sensitize both the patients and the personnel. No single or specific clinical presentation of contact allergy to dental materials exists and it is a poorly understood entity (1). While patients usually present with different manifestations of the oral mucosa, dental personnel (dentists and their assistants) suffer mostly from hand dermatitis. Among patients, the commonly reported causes include metals like amalgams and gold, and resins (2), whereas among dental professionals metals, rubber additives, antimicrobials, preservatives, and methacrylates are reported (3). The reported frequency of skin problems among dental personnel varies between 30% and 50% (4–8). In the 1990s, the occurrence has increased threefold (9, 10). The aim of our study was to evaluate the extent and severity of adverse reactions to dental materials in an Israeli group of patients, to determine the frequent allergens of the dental series connected to allergic contact dermatitis, and to define the association

between the different allergens and the relevant clinical presentations.

Patients and Methods

A retrospective study based on patch test data collected from the patch test clinic, Rambam Medical Center, Haifa, Israel, between January 2000 and December 2004, was conducted. Only patients tested with the dental screening and bakery series were included. The age, sex, occupation, localization of the lesions, atopic background, and the indication for patch testing were recorded. The demographic characteristics were listed according to the MOAHLFA index (11); the legs were not included due to a complete lack of relevance in the population tested.

Patch testing

The allergens were supplied by Chemotechnique Diagnostics (Malmö, Sweden). All tests were applied with Finn Chambers[®] on Scanpor tape to the upper back. The strips were removed after 2 days, and readings were performed on day 2 and day 4. The results were evaluated according to the standard scoring system recommended.

Results

The study included 121 patients. There were 80 patients older than 40 years. 32 patients were males. 18 patients were dental professionals suffering from hand dermatitis. 103 patients had face and oral involvement. 19 patients had atopic background. The most common allergens detected included goldsodiumthiosulphate (14.0%), nickel sulfate (13.2%), mercury (9.9%), palladium chloride (7.4%), cobalt chloride (5.0%), and 2-hydroxyethyl methacrylate (5.8%). Only 3 patients (2.5%) reacted to allergens in the bakery series: cinnamic alcohol, 1 patient; cinnamic aldehyde, 1 patient; and eugenol, 1 patient. The frequent oral symptoms were cheilitis and perioral dermatitis (25.6%), burning mouth (15.7%), lichenoid reaction (14.0%), and orofacial granulomatosis (10.7%). Less frequent oral manifestations were glossodynia (6.6%) and recurrent aphthosis (5%). 18 patients (14.9%) were dental personnel, all of whom suffered from hand dermatitis. The frequent allergens in relation to the different clinical presentations are listed in Table 1.

Discussion

This study presents data about a heterogeneous group of patients with different manifestations supposedly related to contact allergy to dental materials. The most frequent oral manifestations included cheilitis, burning mouth, lichenoid reactions and orofacial granulomatosis. Several studies have demonstrated an association between oral lichen planus and allergy to mercury (12–15), but the proportion of patients varied according to the series reported of which the smallest proportion was 1 of 12 patients (16). In this study, 6 of 17 patients with a lichenoid reaction tested positive but only 1 patient reacted to mercury. The other positive tests to the metals were goldsodiumthiosulphate (2 patients) and nickel (1 patient). Positive reactions to mercury were also noted in 2 patients with orofacial granulomatosis. Removal of the amalgam restoration in both patients

resulted in a rapid healing of the disease. Orofacial granulomatosis is thought to be a reactive process and a possible role of contact sensitivity to dietary components has been proposed (17). However, an association with contact allergy to gold in dental crowns and, similar to our cases, a reaction to mercury in dental fillings were previously reported (18, 19).

There is controversy about the role of contact allergy in the pathogenesis of burning mouth syndrome (20). In this study, 8 of 19 patients with burning mouth tested positive mostly to gold, nickel, mercury, and palladium, but no correlation between the positive patch tests and exposure to any of the allergens tested was found.

31 patients suffered from cheilitis and perioral dermatitis. Cheilitis is a common clinical problem frequently related to liplicking (21). However, the cause in many cases remains obscure. Freeman and Stephens (21) described 75 cases of recalcitrant cheilitis of which one quarter was diagnosed as allergic contact dermatitis. The most frequent allergens detected were in medicaments, lipsticks, sunscreens, and toothpaste. In the present study, 13 patients with cheilitis tested positive, mostly to metals. Relevance of these reactions was not always found and the sensitization most likely developed from other sources. It seems advisable to test these patients to extended cosmetic series, standard series, and patient's own products in addition to dental screening allergens and flavouring agents.

All 18 dental professionals examined for a suspected occupational skin disease suffered from hand dermatitis. Only 7 patients tested positive and mostly to metals like nickel, gold, palladium, and cobalt. Jun Young Lee et al. (22) reported similar results in 49 Korean dental technicians. Reports from Europe and USA suggested gloves and dental restorative plastic materials to be the common causes of occupational allergy in dental professionals, whereby gloves caused both delayed and immediate-type allergy (23, 24). In our study, dental professionals with hand dermatitis

Table 1. The frequent positive tests in relation to the clinical presentation in 121 patients

Symptom (no. of patients, % of patients with positive tests)	Goldsodiumthiosulphate	Nickel sulfate	Palladium chloride	Mercury	Cobalt chloride	2-Hydroxyethyl methacrylate
Cheilitis and perioral dermatitis (31, 41.9)	7	8	4	5	3	3
Burning mouth (19, 42.1)	2	3	2	3	2	1
Hand eczema (18, 38.9)	2	3	2	1	0	2
Oral lichen planus (17, 35.3)	2	1	0	1	0	0
Orofacial granulomatosis (13, 46.2)	2	1	0	2	1	0
Glossodynia (8, 12.5)	0	0	0	0	0	0
Recurrent aphthosis (6, 16.7)	0	0	0	0	0	1
Other (9, 22.2)	2	0	1	0	0	0
Summary of allergens	17	16	9	12	6	7

represent a subgroup with a relatively high frequency of metal allergy. It is possible that the dental devices were not the main source of sensitization; however, some of the reactions observed were apparently relevant and related to the hand dermatitis.

As previously reported (2, 25–27), gold-sodium-thiosulphate, nickel sulfate, and mercury were the most common positive allergens (14.0%, 13.2%, and 9.9%, respectively). The number of patients tested positive to gold and nickel was relatively high, but for both allergens the relevance of the positive reactions was not always apparent and the sensitization most likely developed from other sources. About one half of nickel-allergic patients reacted to palladium chloride and one third to cobalt chloride, reflecting most probably cross-allergy to nickel and not necessarily sensitization from dental products. Contrary to gold and nickel, most of the reactions to mercury seemed to be relevant, and the sensitization appeared to derive from dental sources. Like previous studies (26) 2-hydroxyethyl methacrylate seems to be the best screening substance for (meth)acrylate allergy caused by dental (meth)acrylate products.

In the present study, negative patch test reactions were observed to most allergens in the bakery series, which doubts the necessity to add this series to the dental screening. A suggested alternative is to add only few selected allergens from the bakery series in addition to testing patients with their own materials.

In summary, although an association between a specific clinical presentation and positive reactions on patch testing was not always found, the possible role of hypersensitivity to dental components in selected patients with oral complaints and in dental professional with hand eczema must be considered.

References

- De Rossi S, Greenberg M. Intraoral contact allergy: a literature review and case reports. *J Am Dent Assoc* 1998; 129: 1435–1441.
- Mallo-Perez L, Diaz-Donado C. Intraoral contact allergy to materials used in dental practice. A critical review. *Med Oral* 2003; 8: 334–347.
- Hamann C P, Rodgers P A, Sullivan K. Allergic contact dermatitis in dental professionals: effective diagnosis and treatment. *J Am Dent Assoc* 2003; 134: 185–194.
- Estlander T, Rajaniemi R, Jolanki R. Hand dermatitis in dental technicians. *Contact Dermatitis* 1984; 10: 201–205.
- Rustemeyer T, Frosch P J. Occupational skin diseases in dental laboratory technicians (I). Clinical picture and causative factors. *Contact Dermatitis* 1996; 34: 125–133.
- Murer A J L, Poulsen O M, Roed-Petersen J, Tuchsén F. Skin problems among Danish dental technicians. A cross-sectional study. *Contact Dermatitis* 1993; 33: 42–47.
- Uveges R E, Grimwood R E, Stawsky L D, Mark J G Jr. Epidemiology of hand dermatitis in dental personnel. *Mil Med* 1995; 160: 335–338.
- Munksgaard E C, Hansen E K, Engen T, Holm U. Self reported occupational dermatological reactions among Danish dentist. *Eur J Oral Sci* 1996; 104: 396–402.
- Kanerva L, Lahtinen A, Toikkanen J et al. Increase in occupational skin diseases of dental personnel. *Contact Dermatitis* 1999; 40: 104–108.
- Kanerva L, Alanko K, Estlander T et al. Statistics on occupational contact dermatitis from (meth)acrylates in dental personnel. *Contact Dermatitis* 2000; 42: 175–176.
- Schnuch A, Geier J, Uter W et al. National rates and regional differences in sensitization to allergens of the standard series. Population adjusted frequencies of sensitization (PAFS) in 40,000 patients from a multicenter study (IVDK). *Contact Dermatitis* 1997; 37: 200–209.
- Laine J, Kalimo K, Happonen R-P. Contact allergy to dental restorative materials in patients with oral lichenoid lesions. *Contact Dermatitis* 1997; 36: 141–146.
- Yiannias J A, el-Azhary R A, Hand J H et al. Relevant contact sensitivities in patients with the diagnosis of oral lichen planus. *J Am Acad Dermatol* 2000; 42: 177–182.
- Wong L, Freeman S. Oral lichenoid lesions (OLL) and mercury in amalgam fillings. *Contact Dermatitis* 2003; 48: 74–79.
- Laeijendecker R, Dekker S K, Burger P M et al. Oral lichen planus and allergy to dental amalgam restorations. *Arch Dermatol* 2004; 140: 1434–1438.
- Hietanen J, Pihlman K, Forström L et al. No evidence of hypersensitivity to dental restorative metals in oral lichen planus. *Scand J Dent Res* 1987; 95: 320–327.
- Armstrong D K, Biagioni P, Lamey P J, Burrows D. Contact hypersensitivity in patients with orofacial granulomatosis. *Am J Contact Dermat* 1997; 8: 35–38.
- Guttman-Yassky E, Weltfriend S, Bergman R. Resolution of orofacial granulomatosis with amalgam removal. *J Eur Acad Dermatol Venereol* 2003; 17: 344–347.
- Lazarov A, Kidron D, Tulchinsky Z, Minkow B. Contact orofacial granulomatosis caused by delayed hypersensitivity to gold and mercury. *J Am Acad Dermatol* 2003; 49: 1117–1120.
- Eisen D, Eisenberg E. Oral lichen planus and the burning mouth syndrome. Is there a role for patch testing? *Am J Contact Dermat* 2000; 11: 111–114.
- Freeman S, Stephens R. Cheilitis: analysis of 75 cases referred to a contact dermatitis clinic. *Am J Contact Dermat* 1999; 10: 198–200.
- Lee J Y, Yoo J M, Cho B K, Kim H O. Contact dermatitis in Korean dental technicians. *Contact Dermatitis* 2001; 45: 13–16.
- Alanko K, Susitaival P, Jolanki R, Kanerva L. Occupational skin diseases among dental nurses. *Contact Dermatitis* 2004; 50: 77–82.
- Hamann C P, Rodgers P A, Sullivan K M. Occupational allergens in dentistry. *Curr Opin Allergy Clin Immunol* 2004; 4: 403–409.
- Marcusson J A. Contact allergies to nickel sulfate, gold-sodiumthiosulfate and palladium chloride in patients claiming side-effects from dental alloy components. *Contact Dermatitis* 1996; 34: 320–323.
- Kanerva L, Rantanen T, Aalto-Korte K et al. A multicenter study of patch test reactions with dental screening series. *Am J Contact Dermatitis* 2001; 12: 83–87.
- Møller H. Dental gold alloys and contact allergy. *Contact Dermatitis* 2002; 47: 63–66.

Address:

Dr Sara Weltfriend, MD
Department of Dermatology
Rambam Medical Center
Haifa 31096
Israel
Tel: +972-4-8542610
Fax: +972-4-8542951
e-mail: dermatology@Rambam.health.gov.il