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Case Report

Allergic Contact Dermatitis due to Methacrylates in a Dental Technician – a Clinical Case

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Abstract

Introduction: Methacrylate-based materials are used daily in dental practice. Specialized publications report these materials as allergens with a high sensitizing potential.

Aim: To draw the attention of dental doctors and personnel to risk factors of developing occupational allergies.

Materials and methods: History and dermatological status of the patient were taken and he was given an epicutaneous test.

Results: The allergy testing revealed a strong positive allergic reaction to methacrylates which persisted and was observed at 72 hours as well as on day 7. A diagnosis of allergic contact dermatitis was made on the basis of the patient's history, the clinical examination and the results of the epicutaneous test.

Conclusion: The presented clinical case shows that early identification of the specific causative agents allows clinicians to take adequate measures and achieve results without having to use a medicine, and stop the progression of the occupational disease and the development of complications.

Keywords

dental technician, methacrylates, occupational allergy

INTRODUCTION

Dental technicians are exposed to numerous occupational hazardous substances with irritant or sensitizing potential. After repeated exposure these chemicals can cause occupational skin diseases.[1]

Materials based on acrylic resins are widely used for a variety of dental treatments. Acrylates and methacrylates are derivatives of the (meth)acrylic acid. Esterification of the acid forms monomers that are polymerized and fabricated into plastic products.[2] Many experimental and clinical examples have demonstrated irritant and sensitizing potential of these monomers.[3] Contemporary methods of dental treatment utilize increasingly often (meth)acrylate materials, which results in constant exposure to this type of chemical agents and increases the risk of sensitization.[4,5] The toxicity of dental resins has been determined as low and their sensitization potential is moderate to mild – these characteristics refer mainly to monomer molecules.[6,7] Dental technicians are in daily contact with the non-polymerized constituents of dental resins, which results in occurrence of dermatitis on the hands.[8] Most dental professionals develop irritant dermatitis, but some authors are of the opinion that the percentage of allergic dermatitis has started to increase.[9,10] (Meth)acrylates, which are used in the ma-

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nufacture and repair of dental prostheses, were identified as the main causes of allergic dermatoses many years ago. This widespread presence of contact reactions highlights the areas where preventative measures need to be taken.[11]

CASE REPORT

A 24-year-old male dental technician was referred to the Faculty of Dental Medicine – Plovdiv for allergy testing to haptens from occupational environment. He presented with a 3-month history of itching, redness and chapped skin of the fingers. The patient reported that he had been consulted by dermatologist, who prescribed topical corticosteroids and oral antihistamines, but the skin condition did not improve and his complaints persisted. At the initial visit, he did not report personnel or family history of allergy. He had been working as a dental technician for a year, occupied mainly with manufacturing of removable acrylic dentures. In addition to this, for the last 3 years he had been working as a waiter. He reported not using protective gloves and mask at work, handling frequently washing detergents for kitchen utensils, and being in the habit of washing his hands multiple times a day.

The clinical examination revealed redness of the fingers, mild infiltration and desquamation of the skin of the distal phalanges of the fingers and palms of both hands ***(Fig. 1).***

Figure 1. Mild redness of the fingers, infiltration and desquamation of the skin.

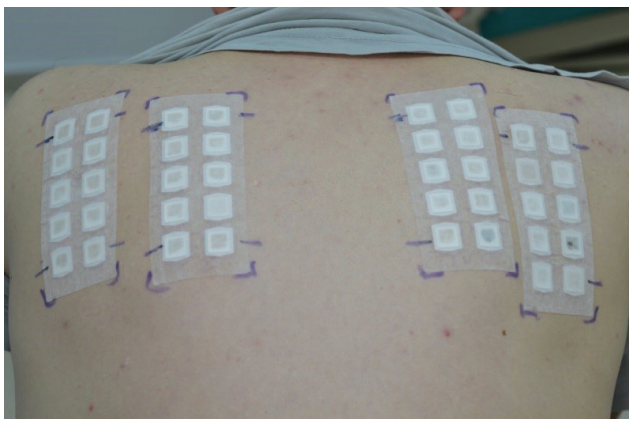

Figure 2. Epicutaneous test.

We selected Dental Screening Series for patch testing ***(Table 1)****. Patch test units were applied on the skin of the upper back and left for 48 hours* ***(Fig. 2)****. The first reading was made on the second day according to the guidelines of the International Contact Dermatitis Research Group System (ICDRG), as follows:*

+? doubtful reaction – mild erythema

+ mild positive reaction – mild erythema and edema, presence of papules is possible

+ + strong positive reaction - erythema, infiltrate, papules and single small vesicles

+ + + extremely strong positive reaction – either marked erythema, infiltrate, multiple papules and vesicles, bullae or a generalized reaction

Table 1. List of the selected allergens which the patient was tested for*

1. Methyl methacrylate	2.0 pet
2. Triethylene glycol dimethacrylate	2.0 pet
3. Urethane dimethacrylate	2.0% pet
4. Ethylene glycol dimethacrylate	2.0 % pet
5. Bisphenol A glycerolate dimethacrylate (BIS-GMA)	2.0 % pet
6. N,N-Dimethyl-4-toluidine	5.0 % pet
7. Benzophenone-3	10.0 % pet
8. 1,4-Butanediol dimethacrylate	2.0 % pet
9. Bisphenol A dimethacrylate (BIS-MA)	2.0 % pet
10. Potassium dichromate	0.5% pet
11. Mercury	0.5 % pet
12. Cobalt(II) chloride hexahydrate	1.0% pet
13. 2-Hydroxyethyl methacrylate	2.0% pet
14. Gold(I) sodium thiosulfate dihydrate	2.0% pet
15. Nickel(II) sulfate hexahydrate	5.0% pet
16. Eugenol	2.0% pet
17. Colophonium	20.0% pet
18. N-Ethyl-p-toluenesulfonamide	0.1% pet
19. Formaldehyde	2.0% aq
20. 4-tolyl diethanolamine	2.0% pet
21. Copper(II) sulfate pentahydrate	2.0% pet
22. Methyl hydroquinone	1.0% pet
23. Palladium(II) chloride	2.0% pet
24. Aluminium(III)chloride hexahydrate	2.0% pet
25. Bornanedione	1.0% pet
26. Dimethylaminoethyl methacrylate	0.2% pet
27. 1,6-Hexanediol diacrylate	0.1% pet
28. Drometrizole	1.0% pet
29. Tetrahydrofurfuryl methacrylate	2.0% pet
30. Tin	50.0% pet
31 Sodium tetrachloropalladate(II) hydrate	3.0% pet
32. Carvone	5.0% pet
33. 2,2-bis(4-(2-Methacryl-oxyethoxy)phenyl) propane (BIS-EMA)	2.0% pet
34. Glutaral	0.2% pet

* Dental Screening Series, Chemotechnique Diagnostics, Malmo, Sweden

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– negative reaction
IR irritant reaction – subsides rapidly after patch removal

The first reading performed at 48 hours revealed a strong positive allergic reaction to methyl methacrylate, 2-hydroxypropyl methacrylate, and ethylene glycol dimethacrylate ***(Fig. 3)****. The reactions persisted for 72 hours and until day 7* ***(Table 2)****. A diagnosis of allergic contact dermatitis was made on the basis of the patient's history, the clinical examination and the results of the epicutaneous test.*

The patient was advised to use protective gloves at work in both places, to apply regularly hydrating and oily creams and reduce the number of hand washings per day. He was also advised to use hand instruments and devices while handling plastic materials at work without touching them at the dental laboratory. The patient complied with the doctor's recommendations and his complaints resolved within a month. The normal appearance of the skin of his hands was restored without using any allergy medications, and he did not have to leave his workplace ***(Figs 4, 5)****.*

Figure 3. First reading at 48 hours.

DISCUSSION

Dental laboratory work is conducive to the development of adverse reactions and their subsequent evolution into allergic diseases.[12] Among the factors contributing to these complications are frequent hand washing, the direct contact of the skin with various aggressive substances and ignoring use of protection.[13] The presented clinical case involves a combination of all predisposing factors, which determined the appearance of allergic contact dermatitis at the beginning of the patient's career.

The allergens that most frequently induce sensitization in subjects who are in contact with (meth)acrylates include 2-hydroxyethyl methacrylate (2-HEMA), ethyleneglycol dimethacrylate (EGDMA), triethyleneglycol dimethacrylate (TREGDMA), and methyl methacrylate (MMA). Out of all monomers mentioned, sensitization to 2-hydroxyethyl methacrylate (2-HEMA) does occur most frequently, so it is considered to be a good screening al-

Table 2. Results of readings on days 2, 3, and 7.

Compound	Concentration %	Results		
		Day 2	Day 3	Day 7
Methyl methacrylate	2.0% petrolatum	++	++	++
2-Hydroxypropyl methacrylate	2.0 % petrolatum	++	++	++
Ethylene glycol dimethacrylate	2.0 % petrolatum	++	++	++

Figures 4, 5. After avoiding the allergens for a month, the patient's skin healed and returned its normal appearance.

lergen in cases of suspected (meth)acrylate allergy.[14] In patients allergic to (meth)acrylates, positive reactions occur simultaneously to several monomers without patients having been previously in contact with any of them. It is still unclear whether this is due to cross-reactive hypersensitivity or to simultaneous sensitization. It is difficult to follow up in detail all the materials used throughout the years of practice.[15]

Successful treatment of skin symptoms is mainly a result of correct identification of the causes. Early detection and elimination underlines the importance of diagnosis. This particular patient improved without any drug therapy and the related side effects after their prolonged administration.

CONCLUSION

Initiation of risk perception among laboratory personnel is the first step of minimizing the occupational risk. Constant contact with a multitude of agents aggressive to the skin results in changes that deteriorate the quality of life and work.

Regarding the presented case, we should note that despite constant purification and improved chemical qualities, dental (met)acrylate resins still contain common allergens. The list of haptens to which the patient was sensitized demonstrates that major screening allergens remain unchanged as compared with those four decades ago.

Use of protective equipment, adequate skin care and careful work technique are obligatory as part of the professional requirements. The presented clinical case shows that early identification of the specific causative agents allows clinicians to take adequate measures and achieve results without having to use a medicine, and stop the progression of the occupational disease and the development of complications.

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Аллергический контактный дерматит, вызванный метакрилатами у зубного техника – клинический случай

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Резюме

Введение: Материалы на основе метакрилата ежедневно используются в стоматологической практике. В специализированной литературе сообщается, что эти материалы являются аллергенами с высоким сенсибилизирующим потенциалом.

Цель: Привлечь внимание стоматологов и персонала к факторам риска развития профессиональной аллергии.

Материалы и методы: Были сняты анамнез и дерматологический статус пациентов, проведён кожный тест.

Результаты: Тест на аллергию выявил сильную положительную аллергическую реакцию на метакрилаты, которая сохранялась и наблюдалась через 72 часа, а также на 7-й день. Аллергический контактный дерматит был диагностирован на основании истории болезни пациента, клинического обследования и результатов кожного теста.

Заключение: Представленный клинический случай показывает, что ранняя идентификация конкретных возбудителей позволяет врачам принимать адекватные меры и достигать результатов без необходимости использования лекарств и останавливать развитие профессионального заболевания и развитие осложнений.

Ключевые слова

зубной техник, метакрилаты, профессиональная аллергия