

CME Article

Contact allergy to dental materials

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Summary

The oral mucosa is constantly exposed to a large number of potentially irritating and sensitizing dental materials. Dental materials used for fillings and fixed or removable replacements must have a good biocompatibility. Metals including palladium are used in alloys for the production of the core of crowns, onto which porcelain is bonded for the generation of an artificial tooth to which the patient can develop an allergic contact dermatitis. The clinical manifestations of contact allergy to dental materials are not uniform. Objective symptoms of a contact allergy include a stomatitis and lichenoid reactions. However, patients may present with more subjective affections of the oral mucosa including burning, pain and dryness which need to be differentiated from a real contact allergic reaction. In this article we focus on the management of contact allergy to dental materials.

Introduction

The oral mucosa is an organ exposed to a variety of materials capable of inducing contact allergic reactions. The prevalence of a contact allergic reaction, for example, towards palladium chloride, which is employed as an alloy in crowns is reported to be 7.4 % in dental patients [1].

Not every application of dental metals to the oral mucosa leads to sensitization. Hoogstraten and colleagues found in a study including 2,176 patients that the application of braces at a young age results in a reduced hypersensitivity towards nickel in contrast to piercing the ears which increases sensitization towards nickel [2]. Exposure to allergens with their desensitizing effects is utilized in sublingual immunotherapy in order to alleviate symptoms to inhalative allergens [3]. Tooth replacement material such as crowns, bridges and inlays are exposed to high forces during chewing and must be made of material that is very stable. By mixing several materials (alloys) high biocompatibility with high stability, resistance to corrosion and ease of casting are attained. Thus, gold for bridges does not consist solely of pure gold, but can depending on the alloy also contain other metal such as, for example, silver, copper or palladium.

The symptoms in patients suspecting contact allergy towards their dental materials are often not explicit. Symptoms such as dryness of the mouth, pain or burning often reported by patients without contact allergy can actually also occur in true contact allergic reactions, which makes the diagnosis more difficult.

In the following we present a practical approach to clarify a contact allergic reaction to dental materials in which we particularly focus on the symptoms of the patient. Medical personnel also can be sensitized towards occupational substances in the

production of dental materials and develop contact allergic reactions which we will not examine more closely in this continual medical education article.

Diagnostic approach

To clarify an allergic reaction to dental materials inspection of the patient's oral mucosa comes first.

To clarify an allergic reaction to dental materials inspection of the patient's oral mucosa comes first. Particularly objective signs and symptoms such as stomatitis or lichenoid lesions of the oral mucosa can serve as indication of possible contact allergic reactions in the event of appropriate contact with fillings and dental materials. It is helpful when the patient can give exact information on new or old restorations, so that perhaps a temporal relationship between mucosal lesions and dental materials can be established.

Poorly polished or fitting restorations can lead to irritations of the oral mucosa.

Poorly polished or fitting restorations can lead to irritations of the oral mucosa. These irritations are not to be confused with allergic reactions and should be considered in the differential diagnosis.

Poor oral hygiene can also lead to formation of microbial plaques that can result in irritation of the oral mucosa and should be considered.

It becomes difficult in patients with dental fillings who complain of symptoms such as burning, dryness of the mouth or pain, but display no objective lesions of the oral mucosa. Here it must be determined if perhaps reduced saliva production due to medication such as anticholinergic agents, which can cause such symptoms had been taken. If the patient complains of burning and piercing pain of the tongue with a sensation of an open wound, glossodynia should be considered which only very rarely leads to inflammation of the tongue. The patients have a great level of suffering and often associate their complaints with previous dental treatments. Psychological causes have been reported for glossodynia, but it also can be a symptom associated with diabetes mellitus or Sjögren syndrome. At the interface between porcelain and metal alloy clinically relevant corrosion processes can occur leading to the release of components of dental materials, something that only the dentist can clarify.

Poor oral hygiene can also lead to formation of microbial plaques that can result in irritation of the oral mucosa and should be considered. Tongue lesions such as lingua plicata that are often viewed by the patients as a pathological reaction to dental materials are physiologic. Filiform warts that are occasionally found on the oral mucosa are not caused by dental materials but are triggered by human papilloma viruses.

Allergologic diagnostics

Allergologic work-up of a potential allergy towards dental materials is recommended when verifiable oral mucosal lesions are present.

Allergologic work-up of a potential allergy towards dental materials is recommended when verifiable oral mucosal lesions are present (Figure 1).

Prophetic testing of dental materials should not be performed.

Allergic reactions towards dental materials constitute T-cell-mediated allergic reactions of the delayed type. For diagnostics of this reaction, patch testing is employed according to the guideline of the German Contact Dermatitis Research Group (GCDRG) of the German Society of Dermatology [4]. Prophetic testing of patients with no oral mucosal lesions to exclude possible allergy to dental materials is advised against, as patch testing cannot provide a sensible answer here. Further, there is the danger that the patient may become sensitized through patch testing.

Patch testing belongs in the hands of an experienced allergist.

Patch testing belongs in the hands of an experienced allergist, as correct performance and reading of the test must be assured. Evaluation of the patch test reaction is done on the basis of morphology at the time of the 72-hour reading with a single positive reaction (erythema, infiltration, perhaps papules) up to a threefold positive reaction (erythema, infiltration, coalescent vesicles) being considered as positive reactions. When more than five positive reactions are observed the phenomenon of the "angry back" should be considered, where several of the positive reactions are interpreted as false positive.

When more than five positive reactions are observed the phenomenon of the "angry back" should be considered.

The lymphocyte stimulation test, which is also employed in the diagnostics of T cell-mediated allergic reactions [5], is not recommended for diagnosing allergy to dental materials.

Which test series is recommended by the GCDRG for diagnosing contact allergy to dental materials?

Nickel (II) sulfate which is contained in the standard series of the GCDRG frequently cross-reacts with palladium chloride.

In the current test series of the GCDRG of October 2011 eight metals used in alloys in the production of implants, crowns, bridges and other restorations in the oral mucosa are recommended for diagnostics of contact allergy (Table 1). These metals are not exclusively employed in dental materials but also in jewelry, surgical instruments

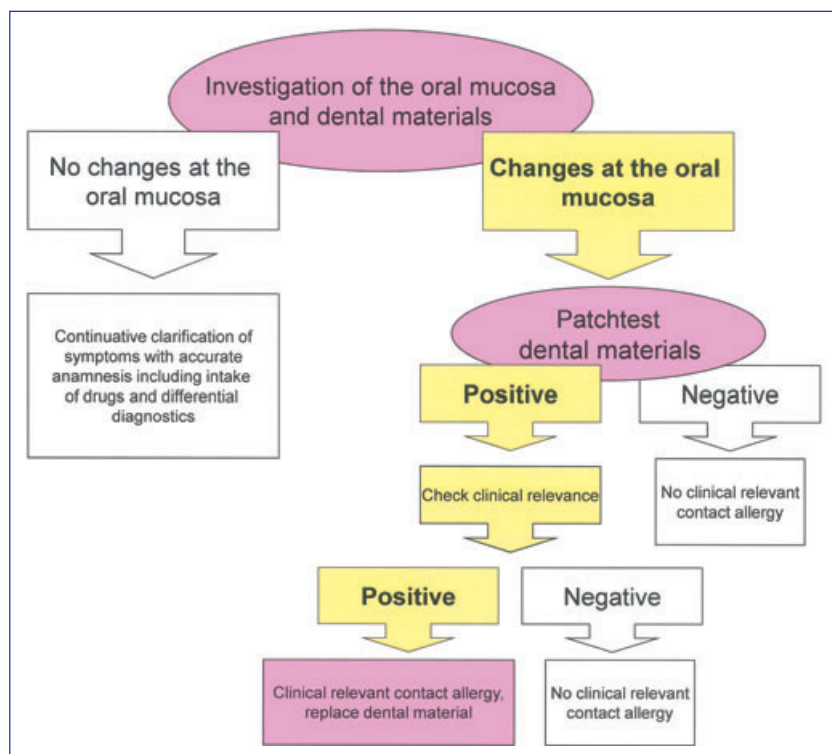


Figure 1: Algorithm for the stepwise approach in identifying contact allergy to dental materials.

Table 1: Test series of the German Contact Dermatitis Research Group for patch testing of dental metals.

GCDRG Dental Metals: Status October 2011		
Amalgam (with zinc)	5 %	Pet.
Sodium thiosulfatoaurate	0.25 %	Pet.
Palladium chloride	1.0 %	Pet.
Tin (II) chloride	0.5 %	Pet.
Amalgam alloying metals (silver, copper, tin, zinc)	20 %	Pet.
Copper (II) sulfate, 5*H ₂ O	1.0 %	Aqu.
Ammonium tetrachloroplatinate	0.25 %	Pet.
Ammoniated mercury	1.0 %	Pet.

or, for example, in the automobile industry, so that these metals might naturally be tested when a contact allergic reaction other than one towards dental materials is suspected. Nickel (II) sulfate which is contained in the standard series of the GCDRG frequently cross-reacts with palladium chloride. In our own studies on 206 patients we observed that 10 patients with a positive reaction to palladium chloride also reacted positively to nickel (II) sulfate [6]. Theoretically these reactions could be due to co-sensitization or due to cross-reactions. As was shown in a study by Hindsen and coworkers from Malmö, Sweden, positive patch test reactions to nickel and palladium speak for a cross-reactive mechanism [7]. In a contact allergic reaction to dental materials this cross-reaction can largely be ignored, as nickel (II) sulfate is usually not employed in dental materials. In contact allergic reactions to jewelry this cross-reaction can have clinical relevance, as both metals are used in the production of jewelry. Dentures, braces or even fillings can contain acrylates, plastics and composites that can lead to contact allergic reactions. Therefore patch testing with the dental technician series of the GCDRG is recommended.

Nickel (II) sulfate which is contained in the standard series of the GCDRG frequently cross-reacts with palladium chloride.

Current information indicates that the risk of toxic reactions caused by amalgam is very minute.

Bioresonance, kinesiologie and the substance test of electroacupuncture according to Voll are not suited for securing the diagnosis of contact allergy to dental materials.

In the event of a positive patch test dental materials should not be removed immediately.

The clinical relevance of a positive patch test must be evaluated carefully.

In diagnosing a contact allergy to dental materials interdisciplinary cooperation with the dentist is important.

According to the GCDRG testing of special series should always be combined with the standard series, which contains nickel, cobalt and chromate, as these are not again found in the special series.

Toxicological studies

Some patients request toxicological studies due to their suspected intolerance of dental implants. Current information indicates that the risk of toxic reactions caused by amalgam is very minute [8]. The contact allergic potential of this metal is also not high [6]. Further diagnostics such as the chewing gum test, as recommended in some case reports, is not recommended, as the chewing gum test only assesses mercury release from amalgam without determining the absorbed portion of mercury.

Diagnostic procedures from the field of complementary medicine

Diagnostic procedures of complementary medicine such as e. g. bioresonance, kinesiologie or the substance test by electroacupuncture according to Voll are not recommended due to the lack of scientific publications with respect to clarification of a contact allergy to dental materials [8].

Practical approach in the event of a positive patch test

In the event of a positive patch test dental materials should not be removed immediately. First it should in cooperation with the dentist carefully be determined if the dental materials actually contain the contact allergic material.

When an association of employed dental materials with the positive patch test is identified, the corresponding fillings, bridges etc. should be exchanged.

In an evaluation study of the Information Network of Departments of Dermatology (Informationsverbund Dermatologischer Kliniken, IVDK) with 756 patients with symptoms of the oral mucosa and/or problems with dental materials Richter and Geier determined that the most frequent positive reactions were towards nickel sulfate, palladium chloride, sodium thiosulfatoaurate, followed by benzoyl peroxide and amalgam [10]. The clinical relevance of these positive test reactions in this study could not be assessed, so that no statement can be made as to if removal of dental materials leads to improvement of symptoms [10].

In a study on 194 patients Koch and Bahmer showed that patients with lichenoid oral lesions and contact to amalgam fillings particularly have positive patch tests to mercury (78.1 %), patients with other oral lesions particularly to sodium thiosulfatoaurate (28.6 %) and patients with oral lichenoid lesions in the vicinity of amalgam fillings (21.09 %) as well as patients with complaints of a burning mouth (21.7 %) particularly react with a positive patch test to palladium chloride [11]. Fifty of these patients with oral lichenoid lesions or oral lichen planus were able to be observed in the follow-up. In 29 of these patients amalgam fillings were removed. This led to cure in 9 of 18 patients with oral lichenoid lesions in close contact to amalgam fillings, in 4 patients to improvement and in 5 patients to no improvement of signs and symptoms. All patients also had sensitizations towards anorganic mercury components.

With respect to amalgam allergy, that provoked virtual hysteria years ago, the GCDRG wrote in its statement of 1994 (www.ivdk.org) that in the event of a definitely positive patch test towards amalgam, amalgam fillings can be left in when no characteristic features such as contact stomatitis, gingivitis, lichen planus of the oral mucosa or recurrent aphthous lesions of the oral mucosa are present.

In a retrospective study on 206 patients tested for contact allergy to dental materials we observed in 14 of 28 patients with a positive test that the positive patch test possessed clinical relevance. It is notable that all patients with a clinically relevant patch test reaction also had visible oral mucosal lesions such as stomatitis or lichenoid lesions [6]. This supports the approach of performing patch testing with dental materials only when lesions of the oral mucosa are present.

Conclusions

Diagnosing a contact allergic reaction to dental materials in time first place demands careful inspection of the oral mucous membrane in interdisciplinary cooperation with the dentist who can check for corrosion and gaps in the restoration materials (see Table 1 algorithm for the stepwise approach in identifying contact allergy to dental materials).

When oral mucosal lesions are lacking, further allergological diagnostics are not recommended. Nonetheless, symptoms reported by the patients who complain of burning, pain and dryness of the oral mucosa should be further studied (e. g. drug history, examination of saliva flow etc.) and be treated accordingly (Figure 1).

The German Contact Dermatitis Research Group of the German Society of Dermatology recommends patch testing with the test series dental metals and perhaps the dental technician series as allergological diagnostics when contact allergy to dental materials is suspected. Should positive test reactions be seen, sensitization of the patient may be presumed. This sensitization should be evaluated as to its clinical relevance with respect to the dental restorations of the patients. An exchange of dental restoration is indicated in the case of a clear relationship between the identified contact allergen and the dental fillings (Figure 1). <<<

Conflicts of interest

None.

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