

INDIVIDUALIZED SELECTION OF DENTAL MATERIALS IN PATIENTS WITH ALLERGIC DERMATOSES: CLINICAL CONSIDERATIONS AND PREVENTIVE STRATEGIES

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Abstract

The selection of dental materials is an important component of safe and effective dental treatment, particularly in patients with allergic dermatoses. The increasing application of resin composites, acrylic polymers, adhesive systems, orthodontic materials and digitally fabricated dental devices has created new challenges related to material biocompatibility and individual patient sensitivity. Although allergic reactions to dental materials are relatively uncommon, patients with a previous history of allergic skin disease require careful assessment before restorative or prosthetic procedures. The main clinically relevant substances include acrylates, methacrylates, residual monomers, photoinitiators and certain additives used in resin-based materials. In susceptible individuals, these substances may induce delayed hypersensitivity reactions and contribute to oral mucosal inflammation, cheilitis, perioral dermatitis or exacerbation of existing dermatological symptoms. However, allergic dermatosis itself should not be considered an absolute contraindication to synthetic dental materials. A rational approach should involve detailed medical history, identification of previous sensitization, appropriate selection of dental materials, adequate polymerization and strict control of contact with uncured substances. The present article discusses the principles of individualized material selection and preventive strategies for dental treatment in patients with allergic dermatoses.

Keywords: *allergic dermatoses, dental materials, biocompatibility, acrylates, methacrylates, dental composites, prosthodontics, hypersensitivity, contact allergy, preventive dentistry.*

Introduction

The development of modern dentistry has resulted in the widespread use of synthetic materials in almost every field of clinical practice. Composite restorative materials, acrylic polymers, dental adhesives, impression materials, orthodontic appliances and CAD/CAM-based materials provide dentists with numerous opportunities to restore dental function and aesthetics.

Despite their clinical advantages, the biological interaction between dental materials and the human organism remains an important area of investigation. Some components of synthetic materials may be released during manipulation, polymerization, degradation or mechanical processing. In susceptible patients, these substances can produce local irritation or immunologically mediated reactions.

This issue deserves particular attention in patients with allergic dermatoses. Such patients may have a history of eczema, allergic contact dermatitis or other hypersensitivity disorders. However, it is essential to recognize that the presence of an allergic skin condition does not necessarily mean that the patient will develop an allergy to dental materials. The risk depends on the type of sensitization, the chemical composition of the material, the duration and intensity of exposure, and the patient's individual immune response.

Acrylate and methacrylate compounds are among the most important substances requiring attention. They are widely used in restorative dentistry, prosthodontics and orthodontics. Incompletely polymerized resin materials may contain residual monomers capable of interacting with biological tissues.

Therefore, an individualized approach to material selection is particularly important for patients with allergic dermatoses.

Aim of the Article

The aim of this article is to analyze the principles of individualized selection of synthetic dental materials for patients with allergic dermatoses and to identify practical preventive measures that can reduce the risk of allergic and irritant complications during dental treatment.

Materials and Methods

The article is based on an analysis of scientific literature concerning the biocompatibility of synthetic dental materials, allergic contact reactions to acrylates and methacrylates, dental-material-associated hypersensitivity and clinical approaches to patients with suspected material allergy.

Particular attention was given to studies concerning resin-based restorative materials, acrylic prosthetic materials and dental adhesives. The available evidence indicates that methacrylate monomers represent an important group of potential contact allergens in both dental patients and dental professionals.

Results and Discussion

1. Importance of Individual Risk Assessment

The first stage of dental treatment in a patient with allergic dermatoses should be an individualized risk assessment.

The dentist should determine whether the patient has:

a history of allergic contact dermatitis;
previous reactions to dental prostheses or restorative materials;
sensitivity to acrylic or artificial nail products;
reactions to adhesives or cosmetic products;
previous episodes of oral burning or mucosal inflammation after dental treatment;
a family or personal history of significant allergic disease.

This information can help identify patients who may require additional investigation before placement of a permanent restoration or prosthesis.

An important principle is that **allergic dermatosis should not automatically lead to complete avoidance of synthetic dental materials**. Such an approach could unnecessarily restrict treatment options. Instead, the dentist should identify the patient's specific risk factors and select the most appropriate material.

2. Resin Composites and Residual Monomers

Composite resin materials are among the most frequently used synthetic materials in restorative dentistry. They contain an organic resin matrix, inorganic fillers, coupling agents, initiators and other components.

The polymerization process converts reactive monomers into a polymer network. Nevertheless, polymerization is not always complete. A certain proportion of unreacted monomers can remain within the material.

Residual monomers are clinically relevant because they may be released into saliva or come into contact with oral tissues. In sensitized individuals, certain monomers can participate in delayed hypersensitivity reactions.

HEMA, TEGDMA, EGDMA, Bis-GMA and related compounds have been investigated as potential sensitizers. Consequently, when a patient has a documented allergy to a particular methacrylate, the dentist should carefully examine the composition of the planned restorative material.

3. Acrylic Prosthetic Materials

Acrylic polymers, especially polymethyl methacrylate (PMMA), are widely used for removable dentures, temporary restorations and orthodontic appliances.

The principal concern is often related to residual methyl methacrylate monomer rather than the completely polymerized PMMA itself.

The quantity of residual monomer may depend on the processing technique, polymerization conditions, temperature and duration of curing. Therefore, appropriate laboratory processing is essential.

For patients with suspected acrylic allergy, the dentist should consider whether an alternative prosthetic material is clinically appropriate. The decision should be based on the

patient's allergy profile and not simply on the assumption that every acrylic material has the same allergenic potential.

4. Dental Adhesives

Adhesive systems are indispensable for many modern restorative procedures. However, because they are applied directly to dental tissues and may contain several reactive monomers, careful handling is required.

A major preventive principle is to avoid unnecessary contact between uncured adhesive material and oral mucosa or skin.

The clinician should use adequate isolation, apply the material precisely and follow the manufacturer's recommended polymerization parameters. Excess material should be removed before complete curing whenever clinically appropriate.

This is especially important for patients who already have a history of contact sensitization.

5. Orthodontic Materials

Orthodontic treatment may involve prolonged exposure to synthetic materials. Brackets, bonding systems, elastomeric components, acrylic appliances and retainers can remain in contact with oral tissues for extended periods.

In a patient with a previous history of allergic reactions, the composition of orthodontic materials should therefore be considered before treatment.

If symptoms such as persistent oral burning, mucosal erythema, lip inflammation or perioral dermatitis appear after placement of an orthodontic appliance, the possibility of contact allergy should be considered alongside mechanical irritation and other differential diagnoses.

6. Digital Dentistry and 3D-Printed Materials

The rapid development of digital dentistry has introduced new categories of synthetic materials.

Three-dimensional printing technologies are increasingly used to manufacture temporary crowns, surgical guides, orthodontic appliances, denture components and other dental devices.

Many printing resins contain reactive monomers before polymerization. Their biological safety depends not only on the chemical composition but also on the printing parameters, washing procedure, post-curing and finishing.

Therefore, in patients with known hypersensitivity, the dentist should consider the entire manufacturing process rather than evaluating the material only by its commercial name.

Inadequate post-processing may leave residual substances on the surface of the finished device. Appropriate washing and post-curing can reduce the amount of potentially reactive material available for contact with tissues.

7. Differentiation Between Irritation and Allergy

One of the most important clinical problems is distinguishing allergic reactions from nonspecific irritation.

A patient may develop oral discomfort following dental treatment because of:

- mechanical trauma;
- chemical irritation;
- residual monomers;
- excessive pressure from a prosthesis;
- oral infection;
- poor oral hygiene;
- food-related reactions;
- allergic contact dermatitis or stomatitis.

Therefore, the appearance of symptoms after dental treatment does not automatically prove the existence of an allergy.

A true allergic reaction should be evaluated through the clinical history, examination and, when indicated, dermatological or allergological testing.

8. Patch Testing and Specialist Consultation

When allergic contact dermatitis or allergic contact stomatitis is suspected, patch testing may be useful.

Testing should be selected according to the patient's exposure history. Standard allergen panels may be supplemented by dental material-specific allergens, particularly when the suspected material contains acrylates or methacrylates.

A dermatologist or allergologist can help determine the clinically relevant allergen and interpret the results.

This interdisciplinary approach is particularly valuable in patients with recurrent symptoms for whom changing the dental material alone has not resolved the problem.

9. Preventive Strategy

A preventive strategy for patients with allergic dermatoses can be divided into several stages.

Stage1 — Medical history.

The dentist collects detailed information regarding previous allergic reactions and exposure to dental, cosmetic and industrial materials.

Stage2 — Risk identification.

Patients with previous reactions to acrylic or methacrylate-containing products are considered higher-risk patients.

Stage3 — Material analysis.

The chemical composition of the proposed dental material is reviewed whenever clinically necessary.

Stage4 — Selection of an appropriate material.

Materials containing a confirmed allergen should be avoided when a clinically acceptable alternative is available.

Stage5 — Controlled clinical application. Direct contact with uncured materials is minimized.

Stage6 — Adequate polymerization and processing. The recommended curing and laboratory procedures are strictly followed.

Stage7 — Clinical observation. The patient is informed about possible symptoms and advised to report persistent burning, swelling, dermatitis or mucosal changes.

10. Role of Interdisciplinary Management

The management of patients with allergic dermatoses should not be limited to dentistry when the clinical history suggests significant hypersensitivity.

The cooperation of a dentist, dermatologist and allergologist may provide a more accurate diagnosis and safer treatment strategy.

Such cooperation is particularly important when:

- the patient has a confirmed allergy to several substances;
- symptoms persist after replacement of the suspected material;
- the diagnosis remains uncertain;
- multiple dental materials are required;
- extensive prosthetic treatment is planned.

An interdisciplinary approach reduces unnecessary repeated exposure and helps distinguish dermatological disease from dental-material-related reactions.

Practical Recommendations

Based on the available evidence, several recommendations can be proposed for clinical practice.

First, every patient with a history of allergic dermatoses should undergo a detailed allergy history before extensive restorative or prosthetic treatment.

Second, patients with a previous reaction to acrylic or methacrylate-containing products should be evaluated more carefully before using resin-based dental materials.

Third, the dentist should avoid unnecessary manipulation of uncured resin materials and should use appropriate isolation and protective techniques.

Fourth, polymerization protocols should be strictly followed because inadequate curing may increase the amount of residual reactive monomer.

Fifth, patients with suspected dental-material allergy should be referred for dermatological or allergological assessment when clinically indicated.

Finally, the choice of material should always balance biological safety, mechanical properties, longevity, aesthetic requirements and the patient's individual allergy profile.

Conclusion

The use of synthetic dental materials in patients with allergic dermatoses requires an individualized clinical approach. Modern synthetic materials provide significant advantages in restorative, prosthetic and orthodontic dentistry, but some of their components may cause irritation or allergic reactions in susceptible individuals.

Acrylates and methacrylates remain among the most clinically relevant potential sensitizers. Particular attention should be given to residual monomers in incompletely polymerized resin materials and acrylic prosthetic systems.

The presence of allergic dermatosis should not be considered an absolute contraindication to dental treatment with synthetic materials. Instead, it should encourage careful risk assessment, appropriate material selection, adequate polymerization and interdisciplinary cooperation.

The most effective preventive strategy is based on identifying individual sensitization, avoiding confirmed allergens, minimizing exposure to uncured materials and ensuring appropriate clinical and laboratory processing. Such an approach can improve the safety and predictability of dental treatment and reduce the likelihood of allergic complications in susceptible patients.

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