Global Academic Journal of Dentistry and Oral Health

Available online at https://www.gajrc.com
DOI: https://doi.org/10.36348/gajdoh.2026.v08i01.004

OPEN ACCESS

ISSN-2706-8994 (P)
ISSN-2707-8868 (O)

Review Article

Oral Mucosal Allergic Reactions to Acrylic Dentures: An Overview

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Article History
Received: 04.12.2025
Accepted: 02.02.2026
Published: 05.02.2026

Abstract: Allergic reactions to acrylic denture materials are uncommon yet clinically significant complications in prosthodontics. These reactions primarily result from residual methyl methacrylate monomers and other additives leaching from inadequately polymerized denture base resins. The clinical manifestations include burning sensations, mucosal erythema, and stomatitis. Diagnosis relies on a detailed patient history, clinical examination, and patch testing with dental allergen panels. Management strategies involve denture modification through extended water immersion, alternative material selection, and complete prosthesis replacement. Understanding the pathophysiology, diagnostic approach, and treatment options enables clinicians to provide effective care to affected patients.

Keywords: Denture Allergy, Contact Dermatitis, Stomatitis Venenata, Residual Monomer.

INTRODUCTION

Polymethyl methacrylate-based acrylic resins have served as the predominant denture base material since their introduction in the 1930s, owing to their favorable properties, including ease of manipulation, aesthetic appeal, and cost-effectiveness. Allergic reactions to these materials, although uncommon, can significantly compromise patient comfort and prosthesis acceptance [1]. The prevalence of contact allergy to methyl methacrylate is approximates one percent in the general population [1], with denture wearers with previous allergic diseases and burning mouth syndrome representing a particular risk group [2]. These hypersensitivity reactions constitute a Type IV delayed cell-mediated immune response, triggered primarily by residual unpolymerized monomers rather than the fully cured polymer itself [1]. Understanding the diagnostic approach and management options is essential for dental clinicians to encounter these challenging cases. Therefore, this review provides a concise summary of the pathophysiology, clinical presentation, diagnosis, and management of oral mucosal allergic reactions to acrylic dentures.

Etiology and Pathophysiology

The primary causative agent in acrylic denture allergies is residual methyl methacrylate monomer, which remains unpolymerized within the denture base material [3]. Autopolymerized or self-cured acrylic resins have significantly higher residual monomer content than heat-cured materials, resulting in greater allergenic potential [1]. Additional sensitizing compounds include benzoyl peroxide initiators, hydroquinone inhibitors, and formaldehyde [4]. Methyl methacrylate and related monomers have been documented to cause adverse health effects, including mucosal irritation, allergic dermatitis, and stomatitis [5]. These substances can leach from denture materials into saliva and oral

tissues, particularly during the initial weeks after denture fabrication [4]. The extent of monomer release depends on multiple factors, including the polymerization method, curing conditions, water storage duration, and resin formulation [1]. Incomplete polymerization during denture fabrication leaves higher concentrations of allergenic residual monomers capable of inducing sensitization reactions in susceptible individuals [3].

Clinical Manifestations

The most frequently reported symptoms in patients experiencing allergic reactions to denture-base acrylic resins include mouth soreness and burning sensations [1]. The commonly affected areas include the palate, tongue, oral mucosa, and oropharynx [6]. Clinical presentations may also encompass lichenoid reactions, nonspecific stomatitis, cheilitis, perioral eczema, and mucosal erythema [7].

Patients sensitized to dental acrylates may present with severely painful mucosal inflammation localized to the denture contact sites [3]. The onset of oral symptoms typically occurs between one and twelve weeks following denture insertion or adjustment procedures [7]. Symptom severity can range from mild discomfort to significant pain that prevents denture use [8]. Clinicians should maintain heightened awareness that these presentations may initially be misattributed to denture fit issues, poor oral hygiene, or other etiologies of oral lesions.

Diagnostic Approach

When denture wearers present with the aforementioned signs and symptoms, the possibility of an allergic reaction should always be considered, requiring a thorough investigation to achieve an accurate diagnosis [1]. A comprehensive patient assessment includes a detailed allergy history, clinical examination of oral tissues, and appropriate confirmatory testing [16].

Patch testing is a reliable and essential diagnostic method for detecting potential allergic reactions to dental materials [7]. Testing should be performed using a comprehensive battery of acrylate allergens, including methyl methacrylate, 2-hydroxyethyl methacrylate, triethylene glycol dimethacrylate, and small samples of the actual denture material [3]. Additional relevant allergens include benzoyl peroxide, dimethyl-para-toluidine, hydroquinone, and methylhydroquinone [7].

Multiple positive reactions to various acrylate test substances commonly occur because of cross-reactivity between acrylic monomers, even when patients have not been exposed to all positive compounds [7]. For immediate and delayed hypersensitivity reactions, blood tests or allergen-specific immunoglobulin E testing can be performed as adjunctive diagnostic measures [1]. Material safety data sheets are unreliable for identifying specific acrylate components, necessitating direct patch-testing protocols.

Management Strategies

Management of acrylic denture allergies includes conservative denture modification techniques and alternative prosthetic solutions. Immersion of newly fabricated dentures in hot water at 50°C for one hour before oral insertion can reduce leachable monomer substances and minimize sensitization risk [4]. This procedure is particularly important for autopolymerized resins used for rebasing or denture base construction [5].

For confirmed allergic cases, prolonged boiling of the existing denture may result in symptom reversal by eliminating the residual uncured monomer [3]. Patients with known or suspected methyl methacrylate allergy should be managed using alternative treatment methods that minimize mucosal contact with this monomer [8].

Alternative denture base materials include heat-polymerized high-impact acrylics, thermoplastic resins such as polyamide and acetal, light-cured resins, digitally milled materials, and metal-based frameworks. For patients with metal allergies who cannot tolerate acrylic dentures, titanium alloy frameworks represent a successful alternative [9]. Modern computer-aided design and manufacturing technologies enable the fabrication of monomer-free denture bases that avoid patient exposure to allergenic compounds during the manufacturing process. A summary of the management strategies is provided in Table 1.

Table 1: Summary of management strategies of allergy to acrylic dentures

Management Strategy	Mechanism	Clinical Application
Hot water immersion (50°C, 1 hour)	Reduces residual monomer leaching	Pre-insertion treatment for new dentures
Prolonged denture boiling	Eliminates uncured monomer	Treatment for existing allergic reactions
Heat-cured acrylic resins	Lower residual monomer vs. auto-polymerized	Preferred polymerization method

Management Strategy	Mechanism	Clinical Application
Alternative polymers (polyamide, acetal)	Monomer-free materials	Complete denture replacement
Metal frameworks (titanium alloy)	Eliminates acrylic contact	Patients with severe sensitivity
CAD/CAM milled dentures	No monomer exposure during fabrication	Modern alternative approach

CONCLUSION

Allergic reactions to acrylic denture materials, although relatively uncommon, present significant clinical challenges that require systematic diagnostic evaluation and appropriate management. Recognition of characteristic symptoms, including burning sensations and mucosal inflammation, combined with comprehensive patch testing using dental allergen panels, enables accurate diagnosis. Management options range from conservative denture modification through extended water immersion to the selection of alternative biocompatible materials, including thermoplastic resins, metal frameworks, and digitally manufactured prostheses. Clinicians should be aware of these reactions when evaluating denture-related complaints to ensure optimal patient outcomes through evidence-based diagnostic and therapeutic approaches.

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