CASE REPORT

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Chlorhexidine Mouthwash Hypersensitivity: A Paradox of Preventive Care: A Case Report

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Abstract

Background: Chlorhexidine is a widely used antiseptic in medical and non-medical settings. Although sensitization is relatively uncommon, the number of reported allergic reactions has increased, particularly during perioperative and procedural care. Clinical manifestations range from mild dermatological symptoms to severe anaphylaxis, with potentially fatal outcomes.

Case Report: We present a case of hypersensitivity to chlorhexidine mouthwash. The patient developed allergic manifestations following exposure, emphasizing the role of chlorhexidine as a hidden trigger in routine preventive care.

Conclusion: Even though chlorhexidine is considered safe and effective, clinicians should be vigilant about its potential to cause hypersensitivity. Recognition of allergic reactions and avoidance of re-exposure are essential to prevent serious complications.

Keywords: Chlorhexidine, Allergic reactions, Hypersensitivity

Introduction

Chlorhexidine (CHX) has been extensively employed in dentistry, general medicine, and cosmetic procedures for more than five decades, and its use continues to expand worldwide [1]. Originally synthesized in the United Kingdom during the 1940s, CHX is a BI biguanide compound that was later recognized for its anti-inflammatory effects in the 1970s [2]. In dental practice, it is valued as a broad-spectrum antiseptic capable of targeting Gram-positive and Gram-negative bacteria, fungi such as yeasts, and certain viruses, making it a cornerstone in plaque control and oral hygiene protocols [3].

The mechanism of action of CHX involves disruption of the bacterial cell membrane through alterations in protein structure, which increases permeability, causes leakage of intracellular macromolecules, and ultimately leads to cell lysis and bacterial death [4]. An additional advantage is its substantivity, as it can remain bound to oral soft tissues for up to 12 hours, prolonging its antimicrobial effect (3). Because of these properties, CHX mouthwash is widely recommended as an adjunct to oral hygiene measures. Although its pH typically ranges from 5 to 7, making it nearly neutral, CHX is formulated exclusively for topical use rather than systemic administration [5].

Despite its effectiveness, adverse effects have been documented. These include altered taste perception, staining of teeth and oral mucosa, discoloration of the tongue, and increased calculus deposition [6]. While such side effects are generally mild, more concerning are hypersensitivity reactions, which remain underrecognized relative to their widespread use in both medical and non-medical contexts. Reported manifestations vary from delayed allergic responses, such as contact dermatitis and persistent rashes, to

photosensitivity reactions. More recently, immediate hypersensitivity events, including severe allergic reactions, have been increasingly reported, underscoring the importance of understanding sensitization mechanisms [7]. This case report describes a patient who developed hypersensitivity following the use of chlorhexidine mouthwash, emphasizing the need for clinical awareness regarding this uncommon but potentially serious adverse effect.

Case Report

Patient information

A 21-year-old woman presented to the Department of Periodontology with concerns about dark discoloration of the gums and discomfort while brushing in the maxillary anterior region, persisting for approximately two years. She denied systemic illness, allergy, medication use, smoking, alcohol consumption, or prior adverse reactions to oral hygiene products. Family history was non-contributory.

Clinical findings

Extraoral examination was unremarkable. Intraorally, generalized melanin hyperpigmentation was evident on both maxillary and mandibular gingiva. A high maxillary labial frenum with tension on smiling was noted. The surrounding mucosa appeared healthy with no ulcerations or white lesions. Based on chief complaints and aesthetic expectations, definitive treatment was planned.

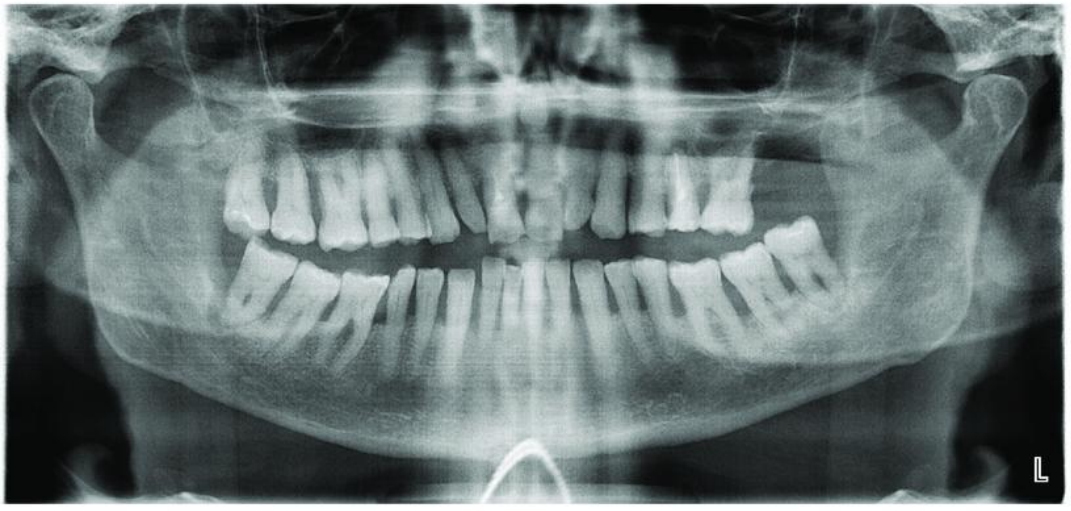

Figure 1: X-ray findings of melanin hyperpigmentation

Diagnostic assessment and treatment planning

The pigmentation pattern and history were consistent with physiologic melanin pigmentation. Differential diagnoses (e.g., smoker's melanosis, drug-induced pigmentation, endocrine disorders, and syndromic causes) were considered and ruled out by history, examination, and absence of systemic signs. The frenum position suggested a functional and aesthetic indication for frenectomy.

A plan for laser-assisted gingival depigmentation and labial frenectomy was formulated following a comprehensive periodontal assessment and discussion of risks, benefits, and alternatives.

Therapeutic intervention

Routine preoperative laboratory investigations were within normal limits, and written informed consent was obtained. Under appropriate asepsis and local anaesthesia, laser-assisted depigmentation of the pigmented gingiva was performed, followed by maxillary labial frenectomy using a diode laser. Haemostasis was achieved intraoperatively; sutures were placed, and a periodontal dressing was applied. Standard postoperative instructions were given. Analgesia/anti-inflammatory therapy (Tab. Zeranol-SP) was prescribed twice daily for 3 days. An antiseptic mouthrinse containing chlorhexidine was advised twice daily for 15 days. The patient was scheduled for review and suture removal at 10 days.

Adverse event: presentation and timeline

The patient returned on postoperative day 2 with new symptoms temporally related to the initiation of the mouthrinse:

- Immediate burning sensation after the first use of the rinse
- Intense pruritus within 6–8 hours
- Diffuse lip swelling noted on waking the following day
- Painful erythematous patches and ulcerations in the oral cavity by day 2
- Difficulty eating and speaking due to labial swelling and mucosal pain

Adverse event: examination

Extraoral examination revealed edema of both lips, more pronounced in the upper lip. Intraorally, multiple well-demarcated erythematous areas (approximately 2–3 cm) involved the marginal and attached gingiva and the labial mucosa. The affected gingiva appeared bright red and oedematous. The lateral borders of the tongue showed sharply outlined erythematous inflammatory patches. No wheeze, urticaria elsewhere, dysphonia, or signs of airway compromise were present.

Diagnostic reasoning for hypersensitivity

A diagnosis of probable chlorhexidine-induced immediate-type hypersensitivity was made based on:

1. A clear temporal relationship with onset after first exposures;
2. Distribution of lesions corresponding to areas of rinse contact;
3. Angioedema of the lips compatible with immediate hypersensitivity;
4. Typical progression from burning → pruritus → erythema/edema → ulceration;
5. Exclusion of alternative causes (no new foods/medications other than prescribed, no thermal/chemical trauma, and surgical sites otherwise healthy).

Dechallenge was positive: symptoms improved after discontinuation of the mouthrinse.

Management of the adverse event

Chlorhexidine was stopped immediately. The patient was started on Tab. cetirizine twice daily for 5 days and advised cold compresses for comfort, bland/soft diet, and avoidance of spicy/acidic foods. Reinforcement of gentle mechanical plaque control with a soft brush was provided, avoiding trauma to the surgical site. No rechallenge with chlorhexidine was attempted. The patient was counselled to list chlorhexidine as a documented allergy in all dental/medical records and to avoid products (swabs, gels, dressings, catheters, adhesive patches) that may contain chlorhexidine in future healthcare encounters.

Follow-up and outcomes

At day 7 telephone check-in, the patient reported a reduction in pruritus and swelling. At the 21-day clinical review, there was complete resolution of erythema, edema, and ulcerations, with comfortable oral function. The surgical sites exhibited satisfactory healing following suture removal, with stable gingival contours and a functional frenum position. No secondary infection or scarring was observed.

Patient perspective

The patient reported concern about rapid lip swelling and impaired speech/eating but expressed relief after prompt medication and cessation of the rinse. She understood the need to avoid chlorhexidine-containing products henceforth.

Discussion

Chlorhexidine (CHX) has long been considered the gold standard antimicrobial in dentistry and surgery due to its broad-spectrum efficacy and substantivity. Since its medical introduction in the late 1950s, it has been widely applied for wound care, surgical preparation, and later in oral health for plaque control and

gingivitis prevention [7,8]. Löe and Schiött's et al landmark 1970 trial demonstrated significant plaque inhibition with 0.2% CHX rinses, establishing its dental role [9]. Despite these benefits, recent evidence highlights a growing concern over hypersensitivity reactions, ranging from localized mucosal irritation to severe systemic anaphylaxis [10].

Epidemiology and Risk Populations

The prevalence of CHX hypersensitivity varies considerably across populations. Large-scale epidemiological reviews have placed the general population prevalence at 0.2–2%, while healthcare workers and dental professionals—due to repeated exposure—show higher sensitization rates, sometimes exceeding 5% [11,12]. A meta-analysis by Chen et al. (2020) of 47 studies confirmed heterogeneity in prevalence, emphasizing geographic variability and exposure-dependent risks [13]. In agreement, Patel et al. (2021) reported significantly higher CHX sensitization among operating room staff compared to non-clinical personnel [14]. Our case aligns with these findings, underscoring the need for awareness even in routine dental practice, where repeated low-dose exposure may trigger delayed hypersensitivity.

Immunopathogenesis

The immunological mechanisms underpinning CHX hypersensitivity are complex. Wang et al. (2019) mapped both immediate (Type I IgE-mediated) and delayed (Type IV T-cell–mediated) pathways [15]. Similarly, Toletone et al. (2018) demonstrated specific T-cell proliferation in CHX-sensitized individuals, reinforcing its potential as a potent allergen [16]. More recently, Martinez-Pizarro et al. (2022) provided evidence of basophil activation as a biomarker for acute IgE-mediated CHX allergy [17]. These findings parallel Opstrup's (2018) review, which classified CHX reactions into immediate and delayed hypersensitivity responses [18]. The clinical presentation in our patient resembled delayed mucocutaneous hypersensitivity, consistent with previous oral case reports [19,20].

Clinical Spectrum of Reactions

The clinical manifestations of CHX hypersensitivity are broad. Localized responses include erythema, burning, ulceration, and gingival swelling [21]. Systemic features may range from urticaria and angioedema to full-blown anaphylaxis. Kim et al. (2020) reviewed 2,374 hypersensitivity cases, highlighting that anaphylaxis, although rare, carries significant perioperative risks [22]. Buonomo et al. (2024) also documented a case of severe intraoperative anaphylaxis confirmed by IgE and basophil activation testing, reinforcing the perioperative importance of CHX recognition [23]. Our case showed a delayed oral mucosal reaction with erythema and burning after CHX rinse, which subsided upon discontinuation and antihistamine use. This is consistent with the report by Bhandari et al. (2023), who observed resolution after withdrawal of CHX and symptomatic treatment [24]. Similarly, Kotsailidi et al. (2020) reported a delayed-type gingival hypersensitivity presenting as a well-demarcated erythematous lesion following initial exposure [25].

Diagnostic Considerations

Diagnosing CHX hypersensitivity is challenging, as oral symptoms may mimic stomatitis, candidiasis, or aphthous ulcers. Skin-prick testing and serum-specific IgE assays are valuable in immediate reactions, while patch testing is often required for delayed responses [26]. A study by Yilmaz et al. (2021) emphasized that negative IgE tests do not exclude delayed hypersensitivity, supporting a multimodal diagnostic approach [27]. Moreover, basophil activation tests have emerged as promising adjuncts, particularly in perioperative anaphylaxis cases [28].

Comparisons with Recent Literature: Several recent reports mirror our findings

- Perlova et al. (2024) highlighted inconsistencies in causality but acknowledged isolated allergic cases that could not be explained by confounding agents [29].

- Sastre et al. (2019) described recurrent mucosal ulcerations linked to CHX, resolving only after discontinuation [30].
- Rodríguez-Jiménez et al. (2020) reported oral erosions mimicking autoimmune lesions but confirmed as CHX allergy by patch testing.
- Hulten et al. (2022) emphasized that even low concentrations (<0.1%) may elicit reactions in sensitized individuals, questioning the safety of "cosmetic" CHX-containing rinses.

These observations reinforce that hypersensitivity is not dose-dependent and may occur even after short-term or first-time use, as seen in our case.

Clinical Implications

Given CHX's widespread availability in prescription and over-the-counter oral rinses, clinicians must maintain a high index of suspicion when patients present with unexplained mucosal or systemic allergic symptoms. A detailed drug and product history is crucial. Alternative antimicrobials (e.g., povidone-iodine, essential oil rinses) may be considered in sensitized patients. Professional bodies such as the European Medicines Agency (EMA, 2020) and MHRA (UK, 2021) have issued warnings regarding perioperative CHX-induced anaphylaxis, recommending vigilance and documentation of CHX allergy in patient records . Our case adds to the growing body of evidence that CHX, though effective as an antiseptic, poses a clinically relevant risk of hypersensitivity. The delayed mucosal reaction observed parallels previously reported cases and underscores the importance of clinician awareness, accurate diagnosis, and patient education. As hypersensitivity to CHX continues to be documented globally, integrating routine allergy assessment into clinical practice remains essential.

Conclusion

This case emphasizes that chlorhexidine, though widely used as an antiseptic, can act as a potential allergen in dental and medical practice. The reaction observed highlights the need for clinicians to maintain vigilance and promptly identify and discontinue the causative agent. With increasing reports of chlorhexidine hypersensitivity, a careful allergy history should be taken before its use, and alternative rinses should be considered for at-risk patients. Even commonly trusted antiseptics can cause significant adverse effects, underscoring the importance of cautious use and close monitoring.

Conflict of Interest: Nil

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