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THE PATHOPHYSIOLOGY AND MANAGEMENT OF XEROSTOMIA: A COMPREHENSIVE REVIEW

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ABSTRAK

Xerostomia, atau yang lebih dikenal dengan sebutan mulut kering, merupakan kondisi klinis umum yang secara signifikan memengaruhi kenyamanan dan kesehatan mulut, ditandai tidak hanya oleh sensasi subjektif kekeringan di rongga mulut tetapi juga oleh penurunan objektif fungsi kelenjar ludah yang terukur. Etiologinya multifaktorial, sering kali terkait dengan efek samping dari lebih dari ratusan jenis obat, konsekuensi radioterapi pada area kepala dan leher, manifestasi penyakit sistemik seperti Sindrom Sjögren dan diabetes, serta proses penuaan alami. Penurunan kuantitas dan kualitas air liur ini secara langsung mengganggu mekanisme pertahanan alami mulut, meningkatkan risiko karies gigi yang merajalela, infeksi oportunistik seperti kandidiasis oral, dan menyebabkan kesulitan yang signifikan dalam mengunyah, menelan, dan bersuara, yang pada akhirnya berdampak negatif pada kualitas hidup penderitanya. Oleh karena itu, penanganan xerostomia yang efektif memerlukan pendekatan multidisiplin yang komprehensif, mulai dari diagnosis yang akurat melalui anamnesis, pemeriksaan klinis dan sialometri, hingga penerapan strategi pengobatan yang disesuaikan dengan penyebab dan tingkat keparahan, serta edukasi pasien yang berkelanjutan. Artikel perspektif yang komprehensif ini bertujuan untuk memberikan tinjauan mendalam tentang etiologi, pendekatan diagnostik, dan spektrum penanganan xerostomia saat ini, yang menyoroti kemajuan terkini dalam modalitas terapi termasuk stimulan saliva, saliva buatan, dan agen pelindung mukosa serta strategi untuk pencegahan komplikasi oral. Perhatian khusus diberikan pada pentingnya perspektif interdisipliner, yang menekankan peran penting kolaborasi antara dokter gigi, dokter umum/spesialis, dan apoteker dalam mengembangkan rencana perawatan pasien yang holistik dan terintegrasi untuk meningkatkan kesehatan mulut dan kualitas hidup individu yang terkena xerostomia.

Kata kunci: *xerostomia, hiposalivasi, disfungsi kelenjar saliva*

ABSTRACT

Xerostomia, or more commonly known as dry mouth, is a common clinical condition that significantly affects oral comfort and health, characterized not only by the subjective sensation of dryness in the oral cavity but also by an objective decrease in the measured function of the salivary glands. Its etiology is multifactorial, often related to the side effects of more than hundreds of types of drugs, the consequences of radiotherapy to the head and neck area, manifestations of systemic diseases such as Sjögren's Syndrome and diabetes, and the natural aging process. This decrease in the quantity and quality of saliva directly interferes with the natural defense mechanisms of the mouth, increasing the risk of rampant dental caries, opportunistic infections such as oral candidiasis, and causing significant difficulties in mastication, deglutition and phonation, which ultimately negatively impact the quality of life of the sufferer. Therefore, effective management of xerostomia requires a comprehensive multidisciplinary approach, starting from an accurate diagnosis through anamnesis, clinical

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examination and sialometry, to the implementation of a treatment strategy tailored to the cause and severity, and ongoing patient education. This comprehensive perspective article aims to provide an in-depth review of the etiology, diagnostic approaches, and current spectrum of xerostomia management, highlighting recent advances in therapeutic modalities including salivary stimulants, artificial saliva, and mucosal protective agents as well as strategies for the prevention of oral complications. Particular attention is paid to the importance of an interdisciplinary perspective, emphasizing the vital role of collaboration between dentists, general practitioners/specialists, and pharmacists in developing a holistic and integrated patient care plan to improve the oral health and quality of life of individuals affected by xerostomia.
Keywords: xerostomia, hyposalivation, salivary gland dysfunction

INTRODUCTION

Xerostomia, commonly described as the subjective sensation of dry mouth, represents a significant clinical challenge with far-reaching implications for oral health and overall well-being (Millsop et al., 2017; Pabois et al., 2023). The condition is characterized not only by a perceived lack of saliva but also by its potential to substantially diminish the quality of life for those affected (Hopcraft & Tan, 2010). Distinguishing between subjective complaints of xerostomia and measurable salivary gland dysfunction is crucial for proper diagnosis (Napeñas et al., 2009). While xerostomia is frequently associated with older adults, it is important to recognize that it can affect individuals of all ages (Millsop et al., 2017). The fundamental basis of xerostomia involves changes to the function of the salivary glands, both in how much saliva is produced and its makeup (Baharvand et al., 2014). These changes can then have a wide-ranging effect on the health of the mouth and the well-being of people who have the condition.

A multitude of factors can contribute to the development of xerostomia, with medications being among the most prevalent (Stack & Papas, 2001). Polypharmacy, the concurrent use of multiple medications, is particularly implicated, as the synergistic effects of various drugs can compound the risk of xerostomia (Assery, 2019). Certain systemic diseases, such as Sjögren's syndrome, rheumatoid arthritis, and diabetes mellitus, are strongly associated with salivary gland dysfunction and subsequent xerostomia (Anil et al., 2014). Radiation therapy to the head and neck region, often employed in the treatment of malignancies, can irreversibly damage salivary gland tissue, leading to chronic xerostomia (Alhejoury et al., 2021). Furthermore, lifestyle factors such as smoking, alcohol consumption, and inadequate hydration can exacerbate xerostomia symptoms. It's also been observed that xerostomia impacts a notable segment of the populace, with estimations suggesting that approximately 12-47% of older individuals and 10-19.3% of those in their early thirties experience the condition (Baharvand et al., 2014). Psychological conditions like anxiety and depression can also alter saliva production, contributing to dry mouth. Therefore, a thorough medical history and clinical examination are essential to identify the underlying causes and contributing factors in each individual case.

RESEARCH METHODS

This perspective article is based on a comprehensive literature review that aims to explore in depth the various aspects of xerostomia. The scope of the review includes multifactorial etiology, clinical and ancillary diagnostic approaches such as sialometry, and the spectrum of current xerostomia management strategies. Particular emphasis is placed on current therapeutic modalities, including the use of salivary stimulants, artificial saliva, and mucosal protective agents, as well as strategies for the prevention of oral complications and the importance of an interdisciplinary approach.

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The literature collection process was carried out through a systematic search of leading electronic scientific databases, such as PubMed, Medline, Scopus, and Google Scholar. Keywords used in the search included combinations of the terms "xerostomia", "dry mouth", "salivary gland hypofunction", "etiology of xerostomia", "diagnosis of xerostomia", "management of xerostomia", "current xerostomia therapy", and "interdisciplinary treatment of xerostomia". The selection criteria focused on scientific articles published in peer-reviewed journals (including clinical studies, systematic reviews, meta-analyses, and clinical guidelines) within the last 15 years (approximately 2010-2025) to ensure relevance and currency of the information, with priority given to English-language studies.

Articles identified from the initial search results were then evaluated based on their title and abstract to determine their relevance to the review topic. Subsequently, articles meeting the initial criteria were subjected to full-text review for final eligibility confirmation. Key information from each selected article—including data on etiology, diagnostic methods, effectiveness of various therapeutic interventions, prevention strategies, and interdisciplinary collaboration models—was extracted, categorized, and narratively synthesized. This synthesis aimed to present a coherent, critical, and up-to-date picture of the holistic management of xerostomia.

RESULTS AND DISCUSSION

A. Clinical Manifestations And Diagnostic Approaches

The clinical manifestations of xerostomia extend beyond the mere sensation of dryness, encompassing a spectrum of oral and systemic complications. Patients often report difficulty speaking, chewing, and swallowing, which can significantly impair their nutritional intake and social interactions (Stack & Papas, 2001). Altered taste perception, particularly a metallic or bitter taste, is a common complaint, further diminishing the enjoyment of food. The oral mucosa may appear dry, pale, and inflamed, with an increased susceptibility to opportunistic infections such as candidiasis (Baharvand et al., 2014). The tongue may exhibit signs of atrophy of the filiform papillae, resulting in a smooth, glossy appearance.

Moreover, reduced salivary flow predisposes individuals to dental caries, particularly root caries, due to the diminished buffering capacity and remineralization potential of saliva. Diagnosis of xerostomia involves a comprehensive assessment of salivary flow rates, both stimulated and unstimulated, as well as a detailed evaluation of the patient's medical history and medication list. Sialometry, the quantitative measurement of salivary flow, is a valuable diagnostic tool to differentiate between subjective xerostomia and objective salivary gland hypofunction. Additional diagnostic modalities, such as salivary gland scintigraphy and magnetic resonance imaging, may be employed to assess salivary gland structure and function in complex cases.

B. Management Strategies For Xerostomia

The management of xerostomia necessitates a multifaceted approach tailored to the individual patient's needs and underlying etiology (Mhatre et al., 2024). Palliative treatments, such as saliva substitutes or artificial saliva, can be used for extended periods in people with chronic dry mouth as a preferred treatment option or as a supplement (Ingle, 2020). These products typically contain carboxymethylcellulose or hyaluronic acid to provide lubrication and moisture to the oral mucosa (Stack & Papas, 2001). Stimulating saliva production with sugar-free chewing gum or lozenges can also provide temporary relief (Atkinson et al., 2005). Prescription medications like pilocarpine or cevimeline, which act as cholinergic agonists, can stimulate salivary gland secretion in patients with residual salivary gland function. However, these medications are associated with potential side effects, such as sweating, flushing, and

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gastrointestinal disturbances, and should be used with caution. In addition to these symptomatic treatments, addressing the underlying cause of xerostomia is crucial.

In people who have had radiation-induced damage to their salivary glands, new treatment options like stem cell transplantation are being explored, focusing on regenerating the damaged glands. For patients with medication-induced xerostomia, adjusting the dosage or switching to alternative medications with less xerostomic potential may be warranted.

C. The Interdisciplinary Perspective On Xerostomia Management

Optimal management of xerostomia necessitates a collaborative, interdisciplinary approach involving dentists, physicians, pharmacists, and other healthcare professionals. Dental professionals play a pivotal role in the early detection, diagnosis, and management of xerostomia, providing preventive strategies such as fluoride therapy and oral hygiene instructions to mitigate the risk of dental caries and oral infections (Diaz-Arnold & Marek, 2002). Physicians are essential in identifying and managing underlying systemic diseases that contribute to xerostomia, as well as in reviewing and adjusting medication regimens to minimize xerostomic effects. Pharmacists can provide valuable information on the xerostomic potential of various medications and suggest alternative formulations or administration routes to reduce xerostomia symptoms.

Furthermore, patient education and self-management strategies are paramount in empowering individuals to actively participate in their care. Xerostomia management is quite difficult because of the number of factors and diseases that are linked to it, so using several treatment methods together is becoming a more effective strategy (Aitha et al., 2015). Patients should be educated on the importance of maintaining good oral hygiene, staying well-hydrated, and avoiding irritants such as alcohol and tobacco.

D. Novel Therapeutic Modalities And Future Directions

In recent years, significant advances have been made in the development of novel therapeutic modalities for xerostomia, offering hope for improved management and enhanced quality of life for affected individuals. Gene therapy, which involves introducing genes into salivary gland cells to stimulate saliva production, is being investigated as a potential long-term solution for radiation-induced xerostomia. Similarly, regenerative medicine approaches, such as stem cell transplantation, hold promise for restoring salivary gland function in patients with irreversible damage (Saleh et al., 2014). The use of conformal radiation therapy techniques, which limit radiation exposure to the salivary glands, is crucial in preventing xerostomia (Varra et al., 2018). Furthermore, advancements in biocompatible materials and drug delivery systems have led to the development of more effective and longer-lasting saliva substitutes (Austin et al., 2024). Clinical trials have shown that polyethylene oxide could be helpful in the future. Future research should focus on identifying novel targets for therapeutic intervention, developing personalized treatment strategies based on individual patient characteristics, and conducting rigorous clinical trials to evaluate the efficacy and safety of emerging therapies (Saleh et al., 2014).

Xerostomia, a pervasive condition characterized by subjective dry mouth and objective salivary gland hypofunction, poses a significant challenge to both patients and clinicians (Hiremath et al., 2021). The psychosocial effects of xerostomia can range from a minor impact on self-rated oral health to sentiments of frustration, embarrassment, unhappiness, or considerable disruptions in quality of life (Anil et al., 2014). While palliative treatments offer symptomatic relief, addressing the underlying etiology is crucial for long-term management. A comprehensive and multidisciplinary approach, encompassing meticulous diagnostics, tailored treatment strategies, and patient education, is essential for mitigating the impact of xerostomia and enhancing the oral health and overall well-being of affected individuals (Zrubáková et al., 2020).

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Continued research into novel therapeutic modalities and preventive strategies holds promise for further improving the management of this challenging condition (Kaplan et al., 2008; Reeves, 2006; Saleh et al., 2014). During treatment planning, especially for head and neck malignancies requiring radiation therapy, it is imperative to prioritize techniques that minimize the radiation dosage delivered to uninvolved salivary glands and the oral cavity to preserve salivary function and diminish the likelihood of developing xerostomia (Little et al., 2010). For patients who have undergone radiotherapy, dental implant-supported prostheses are becoming increasingly popular as a dependable option for oral rehabilitation. Further studies can provide valuable information for creating a replacement fluid that will effectively treat xerostomia (Spirk et al., 2019). Dental care professionals should be aware of how to assess and support this growing group of patients (Coxon, 2009). The ultimate goal is to improve the quality of life for individuals suffering from xerostomia by restoring optimal oral function and promoting overall health.

CONCLUSION

Based on the research results, xerostomia manifests as a complex clinical condition, more than just a dry mouth sensation, because it includes various oral and systemic complications such as difficulty speaking, chewing, swallowing, changes in taste perception, increased risk of opportunistic infections such as candidiasis, and susceptibility to dental caries, which can significantly reduce the patient's quality of life. Diagnosis of this condition requires a comprehensive approach through evaluation of salivary flow rate, medical history, and patient medication list, with sialometry as an important diagnostic tool. Management of xerostomia is multifaceted and tailored to the etiology and individual needs, including palliative therapy such as salivary substitution and salivary stimulants, the use of sialogogic medications such as pilocarpine or cevimeline, to treating the underlying cause and exploring new therapeutic options such as stem cell transplantation for radiation-induced glandular damage. To achieve optimal outcomes, an interdisciplinary approach involving collaboration between dentists, general practitioners, pharmacists and other healthcare professionals is required, supported by strong patient education, while ongoing research into innovative therapeutic modalities such as gene therapy and regenerative medicine promises significant improvements in the management and quality of life of individuals affected by xerostomia in the future.

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