PROBLEMS OF DENTAL MEDICINE

Problems of Dental Medicine 52: 1–4
DOI: 10.3897/pdm.52.e203517

Review Article

Glaucoma - Dental Considerations and Patient Care Planning

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Received: 10 June 2026 ♦ **Accepted:** 20 June 2026 ♦ **Published:** 03 July 2026

Citation: Naydenov A, Draganova I (2026) Glaucoma - Dental Considerations and Patient Care Planning. Problems of Dental Medicine 52: 1–4. doi: 10.3897/pdm.52.e203517.

Abstract

Glaucoma is a progressive optic neuropathy and a major cause of irreversible blindness worldwide. Although primarily an ophthalmologic disease, it has important implications for dental medicine. This literature review discusses the clinical relevance of glaucoma in dental practice, focusing on antiglaucoma medications, dental treatment planning, and recognition of symptoms that may resemble dental pathology. Dental procedures involving stress, prolonged supine positioning, vasoconstrictors, or nitrous oxide may influence intraocular pressure or create additional risks in susceptible patients. Dentists should obtain a detailed medical history, identify glaucoma type and therapy, apply stress-reduction protocols, select anesthetic agents carefully, manage xerostomia proactively, and arrange urgent ophthalmologic referral when unexplained facial or dental pain is accompanied by visual symptoms. Close collaboration between dentists and ophthalmologists is essential for the safe treatment of patients.

Keywords

glaucoma, dental medicine, ocular pathologies, dental anxiety

Introduction

Glaucoma is defined as a progressive group of disorders with loss of the visual field, often associated with elevated intraocular pressure (9). Although intraocular pressure values exceeding 21 mmHg, glaucomatous optic neuropathy may also develop at lower pressure levels, leading to challenges in diagnosis (9,18). The disease affects millions of individuals worldwide and remains a leading cause of irreversible blindness.

From a dental perspective, glaucoma is relevant because some antiglaucoma medications may cause systemic and oral adverse effects (5,9), while dental procedures associated with stress, patient positioning may significantly influence intraocular pressure. Furthermore, acute glaucoma may present with specific orofacial pain mimicking dental pathology (4,10,15). Periodontitis, as a common source of chronic systemic inflammation, may also contribute to the development of glaucoma (16). The relations described highlighting the importance of interdisciplinary collaboration between dental practitioners and ophthalmologists.

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Epidemiology and etiology

The prevalence of glaucoma is increased by age, rising from 1–2% in people aged 40–49 years to more than 18% in people over 80 years old (18). Major risk factors are advanced age, positive family history, diabetes mellitus, arterial hypertension, ocular trauma, and prolonged corticosteroid use (18). A higher prevalence has been reported among male patients and individuals with diabetes, suggesting a contributory role of metabolic and vascular mechanisms.

The etiology of glaucoma is multifactorial (9) Key pathogenic mechanisms are oxidative stress and mitochondrial dysfunction in trabecular meshwork and optic nerve (18). Chronic systemic inflammation, frequently observed in periodontal disease, may further exacerbate optic nerve degeneration through systemic dissemination of pro-inflammatory mediators such as C-reactive protein (CRP), interleukin-1β (IL-1β), interleukin-6 (IL-6), and tumor necrosis factor-α (TNF-α) (16,22).

Review methodology

A narrative literature review was conducted using databases, e.g., PubMed, Scopus, and Google Scholar to identify publications concerning glaucoma and its implications for dental practice. The search included combinations of the keywords “glaucoma,” “dental treatment in glaucoma patients,” “dental medicine,” “antiglaucoma medications,” “intraocular pressure,” “orofacial pain in glaucoma,” and “dental considerations in glaucoma patients,” with relevant English-language guidelines, reviews, clinical studies, and case reports published up to 05.2026 included.

Classification of glaucoma

Glaucoma is classified into four principal types based on etiology and the mechanism of intraocular pressure elevation (9).

A. Primary Open Angle Glaucoma (POAG) represents the most common form, accounting for approximately 90% of cases. Usually, it is asymptomatic until advanced stages and is defined by slow, chronic progression (9).

B. Angle Closure Glaucoma (ACG) is a less common but clinically more aggressive form of the disease. It may present acutely as an ophthalmologic emergency or chronically with gradual narrowing of the anterior chamber angle. In ACG patients experience severe ocular pain, headache, nausea, blurred vision, marked hyperemia, corneal edema, and a fixed or poorly reactive pupil (9).

C. Secondary Glaucoma develops because of ocular or systemic conditions such as trauma, inflammation, neovascularization, pigment dispersion, or prolonged corticosteroid therapy (9).

D. Congenital Glaucoma is a rare pediatric condition, typically bilateral, that requires early surgical intervention to prevent irreversible visual impairment (9).

The type of glaucoma with greatest immediate dental-treatment risk is the angle-closure glaucoma, particularly the undiagnosed narrow angle susceptible to an acute attack.

The type of glaucoma which is most likely to remain undiagnosed is the primary open-angle glaucoma, because it usually progresses without pain or obvious early symptoms.

Pharmacological management and dental aspects

The treatment of glaucoma focuses on lowering intraocular pressure, either by reducing the production of aqueous humor or by enhancing its outflow (9).

A. Treatment of patients with Prostaglandin Analogues

Because of their effectiveness and favorable systemic safety profile, prostaglandin analogues are considered first-line agents (7,9). From a dental standpoint, they are generally safe and not associated with clinically significant drug interactions.

B. Treatment of patients with Beta-blockers

Beta blockers, most commonly timolol, reduce aqueous humor production but may induce systemic adverse effects such as bradycardia, hypotension, bronchospasm, and masking of hypoglycemia in patients with diabetes mellitus (6,9). Systemic absorption via conjunctival vessels and the nasolacrimal duct necessitates careful monitoring and limitation of epinephrine dosage during dental anesthesia (9,20). Topical beta blockers may potentiate the cardiovascular effects of epinephrine in local anesthesia (6,9). In patients with controlled POAG, epinephrine in standard dental concentrations is not contraindicated.

C. Treatment of patients with Carbonic Anhydrase Inhibitors (CAI)

Carbonic anhydrase inhibitors (CAI) are used topically or systemically. Topical agents have limited dental impact, whereas systemic acetazolamide may cause metabolic and electrolyte disturbances requiring modified dental planning (9).

D. Treatment of patients with Alpha-2 agonists and management of xerostomia

Alpha-2 agonists, such as brimonidine, are frequently associated with xerostomia, fatigue, and hypotension (5,9), significantly increasing the risk of caries, periodontal disease, and peri-implant complications (9,11). Drug-induced xerostomia is a common adverse effect resulting in significant deterioration of oral homeostasis and elevated risk of caries and periodontal disease (11). The xerostomic effect is thought to result from activation of central alpha-2 adrenergic receptors, which reduces parasympathetic stimulation of the salivary glands and inhibits cholinergically mediated salivary secretion (21). Management of xerostomia may include frequent hydration, sugar-free chewing gum or lozenges, saliva substitutes, and prescription salivary stimulants in selected patients (17).

E. Treatment of patients with Combination Therapy

Combination therapy is often required and increases the risk of systemic drug interactions, requiring heightened vigilance from the dental practitioner (9). Combination therapy refers to the use of two or more antiglaucoma agents, administered either separately or as a fixed-combination preparation. Common combinations include timolol with a prostaglandin analogue, dorzolamide or brinzolamide, or brimonidine Their systemic effects may be additive: timolol may contribute to bradycardia, hypotension and bronchospasm, while brimonidine may cause fatigue, sedation and xerostomia. To be prepared for possible outcomes dentists should identify all active ingredients. (2,7,9).

F. Medications to be avoided in glaucoma

Medications causing mydriasis—including anticholinergics, first generation antihistamines, tricyclic antidepressants, phenothiazines, and benzodiazepines—may precipitate acute angle closure glaucoma and should be avoided in at risk patients (9). In dental practice, first-generation antihistamines may be used for allergic conditions and, in selected patients with oro-antral communication or fistula, for associated allergic rhinitis or sinonasal symptoms (1). Benzodiazepines, particularly midazolam, may be administered orally or intravenously for anxiolysis and conscious sedation during dental procedures (3,8)

Tricyclic antidepressants, phenothiazines, antihistamines, benzodiazepines, and anticholinergic agents may induce mydriasis or impair parasympathetic pupillary constriction and can precipitate acute angle closure in anatomically susceptible patients (1,9)

G. Nitrous oxide (N_2O).

Nitrous oxide is absolutely contraindicated in patients with intraocular gas following vitreoretinal surgery due to the risk of rapid IOP elevation and irreversible blindness (12).

H. Periodontal disease in relation to glaucoma

A growing body of evidence indicates that periodontitis may contribute to glaucoma through chronic systemic inflammation and immune-mediated mechanisms (16,22). Epidemiological studies demonstrate an independent association between periodontitis and suspected glaucoma (OR = 1.10) (16), suggesting that periodontal therapy may represent a modifiable risk factor.

Recognition of glaucoma in dental settings

AACG may present with isolated orofacial pain in the absence of intraoral pathology (4,10,15). Typical findings include severe ocular pain, blurred vision, a red eye, a fixed pupil, and markedly elevated intraocular pressure (4). If suspected, dental treatment must be discontinued immediately and urgent ophthalmologic referral arranged (9,10,15).

The following reports presented are aimed at helping dentists in recognition of glaucoma cases.

A 57-year-old woman with maxillary pain and blurred vision underwent unnecessary dental extractions before being diagnosed with acute angle-closure glaucoma and irreversible vision loss (10). A 60-year-old woman presenting with severe dental pain and visual complaints was diagnosed with AACG (IOP 66 mmHg) and promptly referred for treatment, resulting in partial visual recovery (4). Safe odontectomy was performed in a patient with well-controlled POAG using a stress-reduction protocol and careful local anesthesia (19). Bilateral AACG developed after general anesthesia for oral surgery in a patient without previous ocular disease (14).

Practical recommendations for dental practitioners

A comprehensive medical history should identify the type of glaucoma, current antiglaucoma therapy, previous acute attacks, and recent ophthalmic surgery, particularly procedures involving intraocular gas (9,10,12,15). Dental treatment should incorporate stress-reduction strategies, avoidance of prolonged supine positioning, and careful anesthetic selection (9,13).

Xerostomia associated with alpha-2 agonists requires proactive preventive care (5,11). Nitrous oxide must not be used in patients with intraocular gas (12). Unexplained orofacial pain accompanied by visual symptoms mandates immediate ophthalmologic referral (4,10,15).

Patients should continue their regularly prescribed antiglaucoma therapy, while any additional prophylactic medication should be administered only when specifically recommended by the treating ophthalmologist. Anxiety should primarily be managed through stress-reduction measures, including short morning appointments, effective pain control, clear communication, a calm clinical environment, and treatment pauses when required. (1,9).

Conclusion

Glaucoma represents a significant yet often underestimated challenge in dental practice. The systemic and oral effects of antiglaucoma therapy, together with the influence of stress and patient positioning, may affect the safety of dental treatment. Recognition of acute angle-closure glaucoma, which may mimic dental pain, is critical to prevent severe visual consequences.

Growing evidence of an association between periodontal disease and glaucoma highlights the role of dental practitioners in controlling chronic inflammation as part of a multidisciplinary approach. Increased awareness, careful treatment planning, and close collaboration with ophthalmologists are essential to ensure safe dental care and prevent irreversible visual impairment.

Additional information

Funding statement

None.

Ethical compliance

Not applicable.

Conflict of interest

The authors declare that they have no conflict of interest and no affiliations with or involvement in any organization or entity with any financial interest in the subject matter or materials discussed in this manuscript.

Author contributions

Conceptualization: AN. Investigation: ID. Supervision: AN. Writing - original draft: ID. Writing - review and editing: AN.

Acknowledgements

The authors gratefully acknowledge the support of the HEAL Erasmus+ Project (ERASMUS-EDU-2023-CBHE-STRAND 1-101129331) - Enhancement of special oral healthcare practice and lifelong learning among dental practitioners in Georgia..

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