



PHARMACOLOGICAL MANAGEMENT OF CHRONIC PAIN IN DENTAL PATIENTS: A NARRATIVE REVIEW OF CURRENT PRACTICES AND INNOVATIONS

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Abstract

The management of chronic pain in dental patients poses significant challenges, requiring a nuanced understanding of pain etiology, pharmacological interventions, safety considerations, and emerging innovations. This narrative review comprehensively explores the diverse landscape of chronic pain in dental practice, encompassing dental pain, temporomandibular joint disorders (TMD), neuropathic pain, orofacial myofascial pain, and systemic conditions contributing to orofacial pain. Pharmacological agents such as nonsteroidal anti-inflammatory drugs (NSAIDs), acetaminophen, opioids, local anesthetics, antidepressants, anticonvulsants, muscle relaxants, and topical analgesics are evaluated for their efficacy, safety profiles, and indications in dental pain management.

Innovative approaches, including targeted drug delivery systems, combination therapies, non-pharmacological interventions (e.g., acupuncture, biofeedback), and emerging pharmacotherapies (e.g., cannabinoid-based treatments), are discussed for their potential to optimize pain relief and minimize adverse effects. Adverse effects, drug interactions, and the risk of addiction and dependence associated with pharmacological agents are reviewed, highlighting the importance of personalized treatment plans and multidisciplinary collaboration.

Guidelines from the American Dental Association (ADA), the World Health Organization (WHO) Pain Relief Ladder, and best practices for pharmacological pain management are synthesized to provide evidence-based recommendations for clinical practice. Future directions in pain management technology, therapeutic targets, and areas for further research are identified, emphasizing the need for ongoing advancements to improve outcomes for dental patients with chronic pain.

Keywords: chronic pain, dental patients, pharmacological management, NSAIDs, opioids, innovative approaches, guidelines, multidisciplinary, future directions.

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I. Introduction

Chronic pain in dental patients encompasses a wide spectrum of conditions that can significantly impact an individual's quality of life [1]. It is estimated that approximately 22% of adults worldwide experience chronic orofacial pain at some point in their lives, with dental pain being one of the most common complaints [2]. Dental pain can arise from various sources, including dental caries, pulpitis, periodontal disease, and postoperative discomfort following dental procedures. Additionally, patients may also experience chronic pain associated with temporomandibular joint disorders (TMD), neuropathic pain, orofacial myofascial pain, and other underlying systemic conditions [2,3].

The burden of chronic pain in dental patients extends beyond physical discomfort, often leading to psychological distress, sleep disturbances, and impaired daily functioning. This underscores the importance of effective pain management strategies tailored to the unique needs of dental patients [3,4].

Pharmacological management plays a crucial role in alleviating chronic pain in dental patients and improving their overall well-being. Unlike acute pain, which is typically short-lived and resolves with appropriate treatment, chronic pain requires a multifaceted approach that may include pharmacotherapy, non-pharmacological interventions, and lifestyle modifications [5,6]. Pharmacological agents target different pain pathways, providing relief and enhancing the patient's ability to engage in daily activities, maintain oral hygiene, and comply with dental treatment plans [7].

Moreover, effective pain management can contribute to positive treatment outcomes, enhance patient satisfaction, and reduce the risk of complications associated with untreated or undertreated chronic pain. However, it is essential to adopt evidence-based practices and consider individual patient factors when selecting pharmacological interventions to ensure safety and efficacy [8,9].

The primary objective of this narrative review is to explore current practices and innovations in the pharmacological management of chronic pain in dental patients.

II. Types and Causes of Chronic Pain in Dental Patients

A. Dental Pain

Dental pain is one of the most prevalent forms of orofacial pain encountered in dental practice. It can result from various dental conditions, including

dental caries, pulpitis (inflammation of the dental pulp), periodontal disease (infection or inflammation of the gums and supporting structures), and dental trauma [2,10]. The severity of dental pain can range from mild discomfort to excruciating pain, depending on the underlying cause and individual pain threshold [11].

B. Temporomandibular Joint Disorders (TMD)

Temporomandibular joint disorders (TMD) encompass a group of conditions that affect the temporomandibular joint, muscles of mastication, and surrounding structures [12]. Common symptoms include jaw pain, restricted jaw movement, clicking or popping sounds during jaw movement, and headaches. TMD-related pain can be exacerbated by factors such as bruxism (teeth grinding), malocclusion, stress, and trauma [2,3,13,14].

C. Neuropathic Pain

Neuropathic pain in dental patients can arise from nerve injuries, compression, or dysfunction within the trigeminal nerve or its branches. Conditions such as trigeminal neuralgia, postherpetic neuralgia (following herpes zoster infection), and nerve injuries during dental procedures can lead to debilitating neuropathic pain characterized by sharp, shooting, or burning sensations in the orofacial region [3,5,10].

D. Orofacial Myofascial Pain

Orofacial myofascial pain syndrome involves localized or referred pain originating from trigger points within the muscles of the face, head, and neck [15]. Factors contributing to myofascial pain include muscle tension, bruxism, poor posture, and repetitive strain injuries. Patients with orofacial myofascial pain may experience muscle tenderness, limited range of motion, and chronic headaches [16].

E. Other Sources of Chronic Pain

In addition to the aforementioned conditions, dental patients may experience chronic pain related to systemic disorders such as rheumatoid arthritis, fibromyalgia, and autoimmune conditions affecting the orofacial region. Dental treatments such as orthodontic procedures, implant placements, and oral surgeries can also contribute to transient or persistent pain requiring appropriate management strategies [15,17].

Understanding the diverse etiology of chronic pain in dental patients is essential for implementing tailored pharmacological interventions that address

the underlying mechanisms and improve patient outcomes [16,17].

III. Pharmacological Agents for Pain Management

A. Nonsteroidal Anti-Inflammatory Drugs (NSAIDs)

Nonsteroidal anti-inflammatory drugs (NSAIDs) are commonly used for the management of acute and chronic pain in dental patients. They exert their analgesic, anti-inflammatory, and antipyretic effects by inhibiting cyclooxygenase enzymes (COX-1 and COX-2), thereby reducing prostaglandin synthesis [18]. NSAIDs are effective in relieving pain associated with dental conditions such as dental caries, pulpitis, periodontal disease, and postoperative discomfort. Commonly prescribed NSAIDs include ibuprofen, naproxen, diclofenac, and aspirin (although aspirin is less frequently used due to its antiplatelet effects) [19,20].

The choice of NSAID and dosing regimen should consider the patient's medical history, potential drug interactions, and risk of adverse effects such as gastrointestinal ulceration, renal impairment, and cardiovascular events. Short-term use of NSAIDs at appropriate doses is generally safe and effective for managing acute dental pain, but prolonged or high-dose NSAID therapy requires careful monitoring and consideration of alternative analgesic options [18].

B. Acetaminophen

Acetaminophen, also known as paracetamol, is another widely used analgesic for pain management in dental patients. Unlike NSAIDs, acetaminophen has minimal anti-inflammatory effects and primarily acts as a centrally acting analgesic by inhibiting prostaglandin synthesis in the central nervous system. It is commonly recommended for patients who cannot tolerate NSAIDs due to gastrointestinal issues, renal impairment, or bleeding disorders [19,20].

Acetaminophen is effective in reducing mild to moderate dental pain and is often used in combination with NSAIDs for synergistic analgesic effects. However, healthcare providers must be cautious with acetaminophen dosing to avoid hepatotoxicity, especially in patients with liver disease or those taking multiple medications containing acetaminophen [21].

C. Opioids

Opioids are potent analgesic agents that are sometimes prescribed for severe or refractory pain in dental patients. Commonly used opioids include

codeine, hydrocodone, oxycodone, tramadol, and morphine. These medications exert their analgesic effects by binding to opioid receptors in the central nervous system, modulating pain perception, and producing a sense of euphoria [20,22].

However, the use of opioids for chronic pain management in dental patients is controversial due to the risk of tolerance, dependence, addiction, and opioid-related adverse effects such as respiratory depression, sedation, constipation, and nausea. Healthcare providers must carefully assess the patient's pain severity, medical history, and risk factors before considering opioid therapy [23]. Short-term opioid use may be appropriate for acute postoperative pain or severe breakthrough pain not adequately controlled by other analgesics, but long-term opioid therapy should be avoided whenever possible [22,24].

D. Local Anesthetics

Local anesthetics play a crucial role in managing acute procedural pain during dental treatments such as extractions, root canal therapy, and soft tissue procedures. Lidocaine is the most commonly used local anesthetic in dental practice, often combined with vasoconstrictors such as epinephrine to prolong its duration of action and reduce systemic absorption [18,24,25].

Local anesthetics work by blocking sodium channels in peripheral nerves, inhibiting the generation and conduction of pain signals. They provide rapid and effective pain relief, allowing dental procedures to be performed comfortably for the patient. However, healthcare providers must be mindful of potential allergic reactions, systemic toxicity, and appropriate dosing based on the patient's weight, age, and medical history [18,19,26].

E. Antidepressants

Certain antidepressant medications, particularly tricyclic antidepressants (TCAs) and selective serotonin-norepinephrine reuptake inhibitors (SNRIs), have analgesic properties that can be beneficial in managing neuropathic pain and orofacial myofascial pain in dental patients. TCAs such as amitriptyline and nortriptyline modulate pain perception by inhibiting serotonin and norepinephrine reuptake, enhancing descending inhibitory pathways, and reducing central sensitization [18,27].

SNRIs such as duloxetine and venlafaxine also inhibit serotonin and norepinephrine reuptake, leading to enhanced pain modulation and improved pain thresholds. These medications may be prescribed off-label for chronic orofacial pain

conditions that are refractory to conventional analgesics or as adjunctive therapy to enhance pain control and improve functional outcomes [20,28].

F. Anticonvulsants

Anticonvulsant medications, also known as antiepileptic drugs, have been increasingly utilized for their analgesic properties in neuropathic pain management, including trigeminal neuralgia and neuropathic pain associated with TMD. Drugs such as gabapentin and pregabalin modulate calcium channels, inhibit excitatory neurotransmitter release, and dampen neuronal hyperexcitability, leading to reduced pain transmission and improved pain tolerance [29,30].

Gabapentinoids like gabapentin and pregabalin are considered first-line options for neuropathic pain and may be prescribed in dental patients with neuropathic pain syndromes that are poorly responsive to other analgesics. However, healthcare providers should monitor for potential side effects such as sedation, dizziness, peripheral edema, and cognitive disturbances [30].

G. Muscle Relaxants

Muscle relaxants are occasionally prescribed for dental patients experiencing orofacial myofascial pain, muscle spasms, or temporomandibular joint dysfunction associated with muscular hyperactivity. These medications, such as cyclobenzaprine, baclofen, and tizanidine, act centrally to reduce muscle tone, alleviate muscle spasms, and improve jaw mobility [19,31].

Muscle relaxants are typically used as adjunctive therapy in combination with analgesics and non-pharmacological interventions to address muscle-related pain and dysfunction. However, their use should be limited to short-term management due to the risk of sedation, drowsiness, and musculoskeletal weakness, which can impact the patient's ability to perform daily activities [31,32].

H. Topical Analgesics

Topical analgesics, including lidocaine patches, gels, and creams, offer localized pain relief for dental patients with mucosal or cutaneous pain conditions such as oral mucositis, aphthous ulcers, and postoperative discomfort. These formulations provide a non-invasive and convenient alternative to systemic analgesics, targeting pain receptors at the site of application without significant systemic absorption [8,14,22].

Lidocaine-containing topical agents numb the affected area by blocking sodium channels in peripheral nerves, reducing pain signals transmitted to the central nervous system. They are

particularly useful for managing minor oral lesions, mucosal irritations, and surface pain following dental procedures. Healthcare providers should educate patients on proper application techniques, duration of use, and potential allergic reactions or skin irritation associated with topical analgesics [18,23].

IV. Innovative Approaches to Pain Management

A. Targeted Drug Delivery Systems

Innovative drug delivery systems such as transdermal patches, buccal patches, and mucoadhesive gels offer targeted and sustained release of analgesic medications, improving drug efficacy and patient compliance. Transdermal patches containing opioids or NSAIDs can provide continuous pain relief for extended periods, bypassing first-pass metabolism and minimizing systemic side effects [2,6,13].

Buccal patches and mucoadhesive gels allow for localized drug delivery to oral mucosal tissues, reducing systemic exposure and enhancing therapeutic concentrations at the site of pain. These targeted drug delivery systems are particularly beneficial for patients with localized orofacial pain, mucosal lesions, or difficulty swallowing oral medications [16,20].

B. Combination Therapies

Combination therapies involving synergistic combinations of analgesic medications, adjuvant agents, and non-pharmacological interventions can enhance pain management outcomes and reduce the reliance on single-agent therapies. For example, combining NSAIDs with acetaminophen or opioids with adjuvant medications such as muscle relaxants or antidepressants can provide comprehensive pain relief while minimizing individual drug doses and associated adverse effects [20-24].

Multimodal analgesia strategies aim to target different pain pathways simultaneously, optimize pain control, and improve patient comfort during and after dental procedures. Healthcare providers should tailor combination therapies based on the patient's pain severity, medical history, and risk factors, ensuring a balanced approach to pain management [22].

V. Future Directions and Research Needs

Future advancements in pain management technology hold promise for improving outcomes and expanding treatment options for dental patients with chronic pain. Innovations such as targeted drug delivery systems, wearable devices, neurostimulation techniques, and telemedicine

platforms offer opportunities to enhance precision, convenience, and accessibility in pain care [10-13]. Targeted drug delivery systems, including nanotechnology-based formulations and implantable devices, allow for localized drug administration, sustained release, and improved drug efficacy with reduced systemic side effects. Wearable devices such as transcutaneous electrical nerve stimulation (TENS) units, biofeedback monitors, and virtual reality systems provide non-invasive, portable options for pain relief, relaxation, and distraction therapy [17,22].

Neurostimulation modalities such as spinal cord stimulation, peripheral nerve stimulation, and transcranial magnetic stimulation offer neuromodulatory effects, pain inhibition, and functional restoration in chronic pain conditions. Telemedicine platforms enable remote consultations, monitoring, and education, enhancing access to specialized pain management services and facilitating continuity of care [4,5,27,29].

VI. Conclusion

In conclusion, the pharmacological management of chronic pain in dental patients requires a comprehensive approach that considers the diverse etiology of pain, individual patient factors, safety considerations, and evidence-based practices. Commonly used pharmacological agents such as NSAIDs, acetaminophen, opioids, local anesthetics, antidepressants, anticonvulsants, muscle relaxants, and topical analgesics offer varying mechanisms of action and efficacy profiles for different pain conditions. Innovative approaches to pain management, including targeted drug delivery systems, combination therapies, non-pharmacological interventions, and emerging pharmacotherapies, expand treatment options and improve pain relief while minimizing adverse effects and risks associated with long-term opioid use. The findings from this review have implications for clinical practice, emphasizing the importance of individualized treatment plans, evidence-based guidelines, multidisciplinary collaboration, patient education, and ongoing monitoring in optimizing pain management outcomes for dental patients. Healthcare providers should stay updated on advances in pain management technology, pharmacogenomics, and therapeutic targets to deliver personalized, effective, and safe care. Future research should focus on advancing pain management technology, identifying novel therapeutic targets, evaluating comparative effectiveness of analgesic regimens, and integrating non-pharmacological interventions

in dental pain management. Collaborative research efforts and knowledge translation initiatives are needed to address research gaps, improve treatment options, and enhance quality of life for dental patients with chronic pain conditions. By integrating evidence-based pharmacological interventions with patient-centered care, holistic approaches, and innovative therapies, healthcare providers can optimize pain relief, functional outcomes, and overall well-being for dental patients experiencing chronic pain.

VI. References

1. Kleykamp BA, Ferguson MC, McNicol E, Bixho I, Arnold LM, Edwards RR, Fillingim R, Grol-Prokopczyk H, Ohrbach R, Turk DC, Dworkin RH. The prevalence of comorbid chronic pain conditions among patients with temporomandibular disorders: a systematic review. *The Journal of the American Dental Association*. 2022 Mar 1;153(3):241-50.
2. Pau AK, Croucher R, Marcenes W. Prevalence estimates and associated factors for dental pain: a review. *Oral health & preventive dentistry*. 2003 Jun 1;1(3).
3. Fukuda KI. Diagnosis and treatment of abnormal dental pain. *Journal of dental anesthesia and pain medicine*. 2016 Mar;16(1):1.
4. Hargreaves K, Abbott PV. Drugs for pain management in dentistry. *Australian dental journal*. 2005 Dec;50:S14-22.
5. Moore PA, Ziegler KM, Lipman RD, Aminoshariae A, Carrasco-Labra A, Mariotti A. Benefits and harms associated with analgesic medications used in the management of acute dental pain: an overview of systematic reviews. *The Journal of the American Dental Association*. 2018 Apr 1;149(4):256-65.
6. Ghurye S, McMillan R. Orofacial pain—an update on diagnosis and management. *British dental journal*. 2017 Nov;223(9):639-47.
7. Gazal G, Fareed WM, Zafar MS, Al-Samadani KH. Pain and anxiety management for pediatric dental procedures using various combinations of sedative drugs: A review. *Saudi Pharmaceutical Journal*. 2016 Jul 1;24(4):379-85.
8. Lockhart PB, Tampi MP, Abt E, Aminoshariae A, Durkin MJ, Fouad AF, Gopal P, Hatten BW, Kennedy E, Lang MS, Patton LL. Evidence-based clinical practice guideline on antibiotic use for the urgent management of pulpal-and periapical-related dental pain and intraoral swelling: A report from the American Dental Association. *The Journal of the American*

- Dental Association. 2019 Nov 1;150(11):906-21.
9. Smith EA, Marshall JG, Selph SS, Barker DR, Sedgley CM. Nonsteroidal anti-inflammatory drugs for managing postoperative endodontic pain in patients who present with preoperative pain: a systematic review and meta-analysis. *Journal of endodontics*. 2017 Jan 1;43(1):7-15.
 10. Treede RD, Rief W, Barke A, Aziz Q, Bennett MI, Benoliel R, Cohen M, Evers S, Finnerup NB, First MB, Giamberardino MA. A classification of chronic pain for ICD-11. *Pain*. 2015 Jun 1;156(6):1003-7.
 11. Maixner W, Fillingim RB, Williams DA, Smith SB, Slade GD. Overlapping chronic pain conditions: implications for diagnosis and classification. *The Journal of Pain*. 2016 Sep 1;17(9):T93-107.
 12. Ahmad M, Schiffman EL. Temporomandibular joint disorders and orofacial pain. *Dental Clinics*. 2016 Jan 1;60(1):105-24.
 13. Chantaracherd P, John MT, Hodges JS, Schiffman EL. Temporomandibular joint disorders' impact on pain, function, and disability. *Journal of dental research*. 2015 Mar;94(3_suppl):79S-86S.
 14. Kleykamp BA, Ferguson MC, McNicol E, Bixho I, Arnold LM, Edwards RR, Fillingim R, Grol-Prokopczyk H, Ohrbach R, Turk DC, Dworkin RH. The prevalence of comorbid chronic pain conditions among patients with temporomandibular disorders: a systematic review. *The Journal of the American Dental Association*. 2022 Mar 1;153(3):241-50.
 15. Renton T. Chronic pain and overview or differential diagnoses of nonodontogenic orofacial pain. *Primary Dental Journal*. 2018 May;7(4):71-82.
 16. Khan J, Zusman T, Wang Q, Eliav E. Acute and chronic pain in orofacial trauma patients. *Journal of Endodontics*. 2019 Dec 1;45(12):S28-38.
 17. Crandall JA. An introduction to orofacial pain. *Dental Clinics*. 2018 Oct 1;62(4):511-23.
 18. Pergolizzi JV, Magnusson P, LeQuang JA, Gharibo C, Varrassi G. The pharmacological management of dental pain. *Expert opinion on pharmacotherapy*. 2020 Mar 23;21(5):591-601.
 19. Klingberg G, Ridell K, Brogårdh-Roth S, Vall M, Berlin H. Local analgesia in paediatric dentistry: a systematic review of techniques and pharmacologic agents. *European Archives of Paediatric Dentistry*. 2017 Oct;18:323-9.
 20. Tripathi KD. *Essentials of pharmacology for dentistry*. Jaypee Brothers Medical Publishers; 2020 Nov 23.
 21. Zehravi M, Maqbool M, Ara I. An update on pain control in conservative dentistry and endodontics: a review. *The Indian Journal of Nutrition and Dietetics*. 2022 Jan:114-25.
 22. Thornhill MH, Suda KJ, Durkin MJ, Lockhart PB. Is it time US dentistry ended its opioid dependence?. *The Journal of the American Dental Association*. 2019 Oct 1;150(10):883-9.
 23. Krasniqi S, Daci A. Analgesics use in dentistry. *Pharmacology, Toxicology and Pharmaceutical Science-Pain Relief-From Analgesics to Alternative Therapies*. 2017 May 24;24:111-39.
 24. Scrivani SJ, Keith DA, Kulich RJ, DaSilva AF, Donoff RB, Handa S, Holland N, Lerman MA, McCauley JL, Reisner L, Resnick CM. Pain management for dental medicine in 2021: opioids, coronavirus and beyond.
 25. Wehler CJ, Panchal NH, Cotchery III DL, Farooqi OA, Ferguson DK, Foran D, Hakki OW, Silva R, Smith GM, Gibson G. Alternatives to opioids for acute pain management after dental procedures: a Department of Veterans Affairs consensus paper. *The Journal of the American Dental Association*. 2021 Aug 1;152(8):641-52.
 26. Khosraviani F, Saberi-Demneh A, Asadollahifar R, Nakhostin A, Khazaei P. Post-operative pain management with meloxicam: A systematic literature review in the field of dentistry. *Oral Surgery*. 2020 May;13(2):188-96.
 27. Lino PA, Martins CC, Miranda GF, de Souza E Silva ME, de Abreu MH. Use of antidepressants in dentistry: A systematic review. *Oral Diseases*. 2018 Oct;24(7):1168-84.
 28. Ouanounou A, Ng K. Medical management, orofacial findings, and dental care for the client with major depressive disorder. *Canadian Journal of Dental Hygiene*. 2019 Oct;53(3):172.
 29. DOURADO DC, GONÇALVES EF, MELO FILHO RD, POLTRONIERI LC, DOURADO VC, FRIGO L. Treatment of chronic pain in dentistry using anticonvulsants. *RGO-Revista Gaúcha de Odontologia*. 2016 Oct;64:447-52.
 30. Schöpfer M, Ludolph AC, Fauser S. Dental care in patients with epilepsy: a survey of 82 patients and their attending dentists and neurologists in southern Germany. *International Dental Journal*. 2016 Dec 1;66(6):366-74.
 31. Hassan M, Qureshi SW, Amin G, Nawaz MS, Shahid TN, Ikram AM, Tariq A. Effect of Muscle Relaxant on Pain Perception among Patients of Temporomandibular Disorder. *Pakistan Journal of Medical & Health Sciences*. 2022 May 26;16(04):738-.
 32. ElBohy D, Ateyya H, Elkot S. Dentist & pharmacist communication awareness about

skeletal muscle relaxants; survey in Egypt.
Archives of Pharmaceutical Sciences Ain
Shams University. 2023 Oct 1;7(2):240-53.