MAR Dental Sciences & Oral Rehabilitation (2025) 5:11

Review Article

Analgesics in Dentistry: A Review.

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Received: 11 Feb 2025

Published: 27 Mar 2025

ABSTRACT

Effective pain management is essential in dentistry, where analgesics play a pivotal role in enhancing patient comfort during and after procedures. This review provides an overview of analgesics commonly utilized in dental practice, including nonsteroidal anti-inflammatory drugs (NSAIDs), acetaminophen, and opioid analgesics. It examines their mechanisms of action, indications, contraindications, potential side effects, and appropriate usage based on clinical scenarios. Additionally, the review discusses the importance of multimodal analgesia and emerging therapies that may improve pain management outcomes. The goal is to equip dental practitioners with a comprehensive understanding of analgesic options, ensuring informed decision-making to optimize patient care and reduce the risk of undertreated pain. By integrating evidence-based practices, dentists can enhance the overall patient experience while maintaining safety and efficacy in pain management.

Keywords*: Analgesic, Pain, Dentistry.*

Introduction

Pain is an inevitable aspect of dental treatment, influencing patient experiences and outcomes. Studies show that dental procedures can evoke significant anxiety and discomfort, making effective pain management essential in clinical practice. Analgesics are a key component of this management, as they alleviate pain, reduce anxiety, and enhance patient cooperation, ultimately leading to improved treatment success.[1,2]

Dental pain is primarily associated with procedures such as extractions, root canals, and periodontal treatments, often necessitating the use of analgesics before, during, and after these interventions. The orofacial region, innervated primarily by the trigeminal nerve, presents unique challenges in pain perception, where both physical and psychological factors can amplify discomfort. Thus, a comprehensive understanding of analgesics is critical for dental practitioners to tailor pain management strategies effectively.[3,4]

Various classes of analgesics are available, ranging from over-the-counter medications to prescription opioids, each with distinct mechanisms, efficacy, and safety profiles. Nonsteroidal anti-inflammatory drugs (NSAIDs) are commonly used due to their anti-inflammatory properties and effectiveness in addressing moderate pain. Acetaminophen serves as an alternative, particularly for patients with contraindications to NSAIDs. Opioids,

while effective for severe pain, carry a risk of dependence and side effects, necessitating cautious prescribing. Moreover, recent advancements in pain management emphasize multimodal analgesia—combining different classes of analgesics to maximize efficacy while minimizing adverse effects. This approach reflects a growing understanding of the complexity of pain and highlights the necessity for individualized treatment plans based on patient characteristics and clinical scenarios.[5,6]

This review aims to synthesize existing literature on the use of analgesics in dentistry, exploring their pharmacological profiles, indications, contraindications, and emerging trends in pain management. By doing so, it seeks to empower dental practitioners with the knowledge needed to optimize analgesic use, thereby enhancing patient comfort and satisfaction during dental care.

Classification of analgesic drugs in dentistry[7-11]

Analgesic drugs used in dentistry can be classified into several categories based on their mechanism of action, potency, and use in managing pain. Here is a general classification:

1. Non-Opioid Analgesics

These are commonly used for mild to moderate pain relief and are generally safe for most patients.

a. NSAIDs (Non-Steroidal Anti-Inflammatory Drugs)

These drugs work by inhibiting cyclooxygenase (COX), which reduces pain, inflammation, and fever. They are often used for dental pain caused by inflammation, such as after extractions or oral surgeries.

- **Examples:**
  - Ibuprofen
  - Naproxen
  - Diclofenac
  - Ketoprofen

b. Acetaminophen (Paracetamol)

Acetaminophen is an effective analgesic but lacks anti-inflammatory properties. It's generally used for mild dental pain and can be an alternative for patients who cannot tolerate NSAIDs.

- **Example:**
  - Acetaminophen (Tylenol)

c. Combination Analgesics

These are drugs that combine an NSAID with acetaminophen for enhanced pain relief.

- **Example:**
  - Paracetamol + Ibuprofen

2. Opioid Analgesics

Opioids are stronger pain relievers used for moderate to severe pain, typically in more invasive dental procedures (e.g., surgeries or severe infections). These medications work by binding to opioid receptors in the brain and spinal cord.

a. Mild to Moderate Opioids

- **Examples:**
  - Codeine
  - Tramadol
  - Hydrocodone

b. Strong Opioids

These are reserved for severe pain and are less commonly used in dentistry.

- **Examples:**
  - Morphine
  - Oxycodone
  - Fentanyl

3. Adjuvant Analgesics

These medications are not primarily intended for pain relief but may be used in conjunction with other analgesics to manage pain or discomfort.

a. Corticosteroids

Steroids are often used in cases of inflammation and to control swelling in post-surgical or trauma-related dental pain.

- **Example:**
  - Dexamethasone

b. Antidepressants and Anticonvulsants

These are used in managing neuropathic pain, such as in trigeminal neuralgia or post-operative nerve damage.

- **Examples:**
  - Amitriptyline (Tricyclic antidepressants)
  - Gabapentin (Anticonvulsant)

4. Topical Analgesics

These are applied directly to the painful area, offering localized relief.

a. Local Anesthetics

Used for numbing specific areas in the mouth before procedures like cleanings, fillings, or extractions.

- **Examples:**
  - Lidocaine
  - Benzocaine
  - Tetracaine

b. Counter-Irritants

These substances create a cooling or warming sensation that distracts from pain. They may not treat the underlying cause but can provide temporary relief.

- **Examples:**
  - Menthol
  - Camphor

5. Non-Pharmacological Methods

Although not strictly drugs, these methods are sometimes used alongside analgesics to manage pain in dental procedures.

a. Cold or Heat Therapy

Often used in conjunction with pain relief to reduce inflammation and swelling.

b. Physical Therapy

Sometimes suggested for patients with temporomandibular joint (TMJ) pain or muscle spasms.

The choice of analgesic depends on the type of dental procedure, the patient's pain threshold, medical history, and any potential contraindications. In general, non-opioid analgesics are preferred, but opioids may be used when necessary for severe pain.

Types of Analgesics

Non-Opioid (NSAIDs, Acetaminophen) and Opioid Analgesics

1. **Non-Opioid Analgesics** Non-opioid analgesics, including nonsteroidal anti-inflammatory drugs (NSAIDs) and acetaminophen, are commonly used in dentistry to manage mild to moderate pain and inflammation.
   - **NSAIDs**: NSAIDs, such as ibuprofen and naproxen, are widely used in dental practice for their analgesic, anti-inflammatory, and antipyretic properties. They work by inhibiting cyclooxygenase (COX) enzymes, which are responsible for the production of prostaglandins, molecules that promote inflammation and pain. By blocking these enzymes, NSAIDs help

reduce pain, swelling, and fever (Hardman et al., 2015). They are often prescribed after dental procedures like extractions or root canal treatments.

- **Indications**: NSAIDs are effective for managing pain related to mild-to-moderate inflammation, such as pain after dental surgeries (extractions, periodontal treatments) or injuries (e.g., soft tissue trauma).
- **Contraindications**: NSAIDs should be avoided in patients with a history of peptic ulcers, gastrointestinal bleeding, renal disease, or hypersensitivity to these drugs. They are also contraindicated in patients with certain cardiovascular conditions, as they can increase the risk of heart attack or stroke (Rosen, 2017).
- **Side Effects**: Common side effects include gastrointestinal irritation, bleeding, renal impairment, and, in rare cases, allergic reactions such as rashes or anaphylaxis.

- **Acetaminophen**: Acetaminophen (paracetamol) is another common non-opioid analgesic used in dentistry, particularly when NSAIDs are contraindicated or when mild pain relief is needed. Unlike NSAIDs, acetaminophen does not have anti-inflammatory properties but is effective at reducing pain and fever.
  - **Indications**: Acetaminophen is suitable for patients with mild pain, such as post-operative discomfort or mild dental pain. It is often used in combination with NSAIDs for enhanced pain relief.
  - **Contraindications**: Acetaminophen should be avoided in patients with liver disease or those who consume excessive amounts of alcohol, as it can cause hepatotoxicity at high doses (Hardman et al., 2015).
  - **Side Effects**: While generally well-tolerated, acetaminophen can cause liver damage, particularly in overdose situations, and may lead to skin reactions or allergic reactions in rare cases.

2. **Opioid Analgesics** Opioid analgesics, such as codeine, morphine, and hydrocodone, are stronger pain relievers typically used for moderate to severe pain. These medications work by binding to opioid receptors in the brain and spinal cord, which decreases the perception of pain and increases pain tolerance.
   - **Indications**: Opioids are used in dentistry for severe pain, particularly after more invasive procedures such as surgical extractions, complex dental surgeries, or trauma. They may also be prescribed when non-opioid analgesics fail to provide adequate pain relief (Berkow, 2019).
   - **Contraindications**: Opioids should be avoided in patients with a history of substance abuse,

respiratory disorders (e.g., COPD, sleep apnea), or allergies to opioid medications. Additionally, caution is necessary when prescribing opioids to elderly patients or those with liver or kidney impairments.

- **Side Effects**: Common side effects of opioids include sedation, nausea, constipation, respiratory depression, dizziness, and, in some cases, dependence or addiction. Long-term use can also lead to tolerance and withdrawal symptoms (Rosen, 2017).

Table 1: Showcases the newest breakthroughs in analgesic medications for dental use, emphasizing their mechanisms, advantages, and potential roles in managing dental pain. These innovations are designed to provide more effective and safer options compared to conventional pain management approaches, such as opioids.

Table 1: Recent Drug Developments in Analgesics for Dentistry[12-17]

Drug	Development Focus	Mechanism of Action	Potential Benefits	Current Research/Application in Dentistry
Oliceridine	Synthetic opioid alternative for moderate to severe pain.	Acts as a μ-opioid receptor agonist but with less respiratory depression.	Reduced risk of respiratory depression and addiction compared to traditional opioids.	Investigating as an alternative to morphine for post-operative dental pain management, including wisdom tooth extractions.
Liposomal Bupivacaine (Exparel)	Long-acting local anesthetic with sustained release.	Liposome-encapsulated bupivacaine, offering extended duration of pain relief.	Provides up to 72 hours of pain relief with reduced need for oral analgesics post-surgery.	Being used in dental procedures to reduce opioid consumption after major oral surgeries.
Qutenza (Capsaicin 8%)	High-concentration capsaicin patch for nerve pain.	Depletes substance P, reducing pain transmission.	Effective for nerve-related pain, offering a non-opioid pain relief option.	Used experimentally in managing neuropathic pain following dental procedures like extractions and nerve damage.
Sativex (Cannabinoid-based) Spray	Cannabinoid treatment for pain relief.	Contains THC and CBD, acting on cannabinoid	Reduced pain and inflammation without	Studied for use in managing pain in patients with chronic dental pain, including TMJ

		receptors to relieve pain.	traditional opioid risks.	disorders and post-surgical pain.
Nerve Growth Factor Inhibitors (e.g., Tanezumab)	Targeting nerve growth factor to block pain signaling.	Inhibits the activity of nerve growth factor, reducing pain sensitivity.	Potential for long-term pain management in chronic dental conditions.	Under investigation for management of chronic pain, particularly in conditions like temporomandibular joint disorders (TMJD).
Ziconotide (Prialt)	Synthetic peptide for severe pain management.	Blocks N-type calcium channels, preventing pain signal transmission.	Non-opioid alternative with powerful analgesic effects for severe pain.	Used in clinical trials for severe dental pain that does not respond to conventional analgesics.
Kybella (Deoxycholic acid)	Fat-dissolving agent with potential for pain modulation.	Works by breaking down fat cells, leading to localized tissue changes.	Innovative approach to manage pain in the peri-oral area, especially in post-surgical contouring.	Investigated for use in reducing pain and inflammation after cosmetic dental procedures like facial contouring.
Nicotinic Receptor Agonists (e.g., ABT-894)	New class of analgesics targeting nicotinic receptors for pain.	Stimulates nicotinic acetylcholine receptors, modulating pain pathways.	Potential to manage both acute and chronic pain with fewer side effects compared to opioids.	Early-stage research for use in managing post-surgical dental pain, particularly following extractions or implants.

Factor to be considered in Selection of Analgesics: When selecting an analgesic in dentistry, several factors should be considered:[18-22]

1. **Type of Pain:** Understand whether the pain is mild, moderate, or severe and select an analgesic accordingly.
2. **Duration of Action:** Consider how long the analgesic should last, whether for a short procedure or post-operative pain management.
3. **Patient's Medical History:** Evaluate any allergies, pre-existing conditions (like liver or kidney disease), or other medications that could interact with the analgesic.
4. **Age of the Patient:** Adjust dosages and types of analgesics for children and elderly patients to avoid complications.

5. **Route of Administration:** Decide whether oral, intravenous, or topical delivery is best for the patient and the type of procedure.
6. **Cost and Availability:** Consider the economic implications and availability of the analgesic.
7. **Efficacy and Side Effects:** Analyze the analgesic's effectiveness for dental pain relief and its potential side effects.
8. **Legal Regulations:** Be aware of any legal restrictions on the use of certain analgesics in specific regions.
9. **Type of Procedure:** Choose an analgesic based on the invasiveness and expected pain level of the dental procedure.
10. **Patient's Preference:** Discuss with the patient their preferences and previous experiences with analgesics.

Considering these factors will help ensure effective pain management while minimizing risks and complications.

Conclusion

In conclusion, the selection of analgesics in dentistry is critical for effective pain management and patient comfort. Dentists must carefully consider various factors, including the type and duration of pain, the patient's medical history, age, and personal preferences, as well as the efficacy and potential side effects of each analgesic. By tailoring analgesic choices to individual patient needs and the specific dental procedure, practitioners can enhance the overall treatment experience and promote better outcomes. Ongoing education about the latest analgesic options and emerging guidelines will further enable dental professionals to provide safe and effective pain relief, ultimately fostering trust and satisfaction among patients.

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