Analgesics in endodontics: a short literature review

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ABSTRACT

Pain is an unpleasant sensory and emotional association with actual or potential tissue damage. Pain acts as a warning signal against either in the body or in the external environment of an individual. Pain control is a major issue in dental practice. There are several types of medications that are used to manage dental diseases. The medications discussed in this article have pharmacological properties that are used to treat conditions such as pain, anxiety and inflammation.

Management of endodontic pain is not very difficult but sometimes it becomes almost impossible to control pain, mostly at the first appointment. Once the pulp has been extripated, the pain comes under control. So before initiating the root canal procedure, to avoid discomfort or pain, local anaesthesia injection is needed. Numerous NSAIDS are available for the management of pain & inflammation. Analgesics can be taken either while local anaesthesia is still effective or if no anaesthesia was used, as soon as possible after treatment. The analgesic should be ingested 30-60 minutes prior to the wearing off of anaesthetic so that the drug will have sufficient opportunity to take effect.

Pain control can be achieved through:
1. Opioid drugs/Narcotic analgesics
2. Non-opioid drugs/Non-narcotic analgesic
3. Local anaesthesia (during treatment)

Opioid Analgesics

The word opiates refers to the products obtained from the opium poppy. The term opioid is used to denote all naturally occurring semi-synthetic & synthetic drugs. The word narcotic is derived from the Greek prefix ‘narco’ which means dead, numb. These drugs were formally called ‘narcotic’ analgesics because some of them induce sleep. The term ‘narcotic’ is restricted in the legal sense to drugs that are capable of producing dependence.

Opioids are potent analgesics & are often used in dentistry alone or in combination with acetaminophen, aspirin or ibuprofen. Opioids activate the mu opioid receptors which is located at several important sites in the brain. Activation of this receptor inhibits the transmission of nociceptive signals from trigeminal nucleus to higher brain regions. Opioids also activate peripheral opioid receptors.

Opioids are effective analgesics for moderate to severe pain, their use generally is limited by their adverse effects which can include nausea, emesis, dizziness, drowsiness & the potential for respiratory depression & constipation. Chronic use is associated with tolerance and dependence. Because the dose of opioids is limited by their side effects, these medications are almost always used in combination drugs to manage dental pain.
A combination formulation is preferred because it permits the use of a lower dose of the opioid, there by reducing the side effects. (1)

**Classification of opioids (9)**

**Phenanthrene derivatives:**
1. Morphine (10% of opium)
2. Codeine (0.5% of opium)
3. Thebaine (0.2% of opium)

**Benzoisoquinoline derivatives:**
1. Papaverine (1%)
2. Noscapine (6%)

**DOSES:** (7)

Codeine: 60mg Codeine = 600mg Aspirine
Morphine: 10-15mg IM or SC
Tramadol: 100mg IV

**Non-Opioid Drugs**

A major class of drugs for managing endodontic pain is the non narcotic analgesics, which include both NSAIDS (non steroidal anti-inflammatory drugs) & acetaminophen. (1) Weaker analgesics act primarily on the peripheral pain mechanism, also in CNS to raise pain threshold. Non-opioid analgesics interfere with membrane phospholipid metabolism. Mild analgesics interphere with cyclooxygenase pathway & reduce synthesis of prostaglandin elimination of pain. More frequently used non-narcotic analgesics are aspirin, acetaminophen, diclofenac sodium, naproxen & ibuprofen etc. (7)

**Classification:** (9)

**Non selective COX inhibitors:**
1. Salicylates: aspirin
2. Propionic acid derivatives: ibuprofen, naproxen, ketoprofen, flurbiprofen
3. Anthranilic acid derivatives: mefenamic acid
4. Aryl-acetic acid derivatives: diclofenac, aceclofenac
5. Oxicam derivatives: piroxicam, tenoxicam
6. Indole derivative: indomethacin
7. Pyrazolone derivatives: phenylbutazone, oxyphenbutazone

**Preferential COX-2 inhibitors:**
8. Nimesulide, meloxicam, nabumetone

**Selective COX-2 inhibitors**
9. Celecoxib, etoricoxib, parecoxib

**Analgesic-antipyretics with poor anti-inflammatory action:**
1. Paramenophen derivative: Paracetamol
2. pyrazolone derivatives: Metamizol, Propiphenazone
3. benzoazocine derivative: nefopam

**DOSES:** (8)

Aspirin: 0.3-0.6g 4-6hourly (maximum 4g/day)
Ibuprofen: 400-600mg TDS
Diclofenac Sodium: 50mg BD
Paracetamol or Acetaminophen: 500-1000 mg TDS
Piroxicam: 10-20mg OD
Nimesulides: 100mg TDS
Celecoxib: 200-400 OD or BD

**Limitations**

NSAIDS have an analgesic that limits the maximal level of analgesia & induce side effects, on the gastrointestinal system (3% to 11%) & CNS (1% to 9%) dizziness and headache. It can cause acute or chronic renal damage following repeated use. Drug with long halflife (naproxen) are more likely to cause renal damage than those with shorter halflife (ibuprofen). (8) It is contraindicated for patients with ulcers & aspirin hypersensitivity. (14, 15, 16, 17). Acetaminophen & opioid combination drugs are an alternative for patients unable to take NSAIDS. (18) In a prospective clinical study, 57% of patients reported to pain after debridement & shaping of the root canal system, 21% had slight pain, 15% had moderate pain & 7% had severe pain. (19) Postoperative pain or flare up after endodontic treatment can be attributed to inflammation or infection or both in the periradicular tissues. While shaping & debriding root canal system directly irritates the periradicular tissues & inadvertently introduces bacteria, bacterial products necrotic pulp tissue or caustic irrigating solution through the apical foramen. In response to this irritation, inflammatory mediators (prostaglandins, leukotrienes, bradykinins, platelet activating factor, substance p & others) are released into the tissues surrounding the apical area of the tooth. As a result pain fibers are directly stimulated or sensitized and increase in vascular dilation & permeability. It causes edema and increased interstitial tissue pressure. (1)

Glucocorticoids are known to reduce the acute inflammatory response by suppressing vasodilation, migration of polymorphonuclear (PMN) leukocytes and phagocytosis & by initiating the formation of arachidonic acid from neutrophil & macrophage cell membrane phospholipids, thus blocking the cyclooxygenase & lipoxygenase pathways & respective synthesis of prostaglandins & leukotrienes. Therefore corticosteroids (administered via either or systemic routes) is used in the prevention or control of postoperative endodontic or flare-up. (20)

**Conclusion:**

Correct diagnosis, appropriate treatment and suitable medication are factors that lead to proper management of Endodontic disease and that allow adequate control of dental pain.

**References:**