



Analgesics in endodontics a short literature review

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ARTICLE INFO

Article history:

Received: 14 April 2014;

Received in revised form:

25 May 2014;

Accepted: 9 June 2014;

Keywords

Pain Control,
Analgesics.

ABSTRACT

Pain is an unpleasant sensory and emotionally associated 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.

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Introduction

In Endodontics, the terms root canal & pain often are considered synonyms. Pain from a pulpitis or apical periodontitis that produces the need for endodontic therapy may be unbearable without analgesics.(1)

In the present day, pharmacological drugs are available that work directly against anxiety without much of side effects, making endodontic treatment easier for both patient & the practitioner.

Pain Control

Detection : Peripheral nociceptors and various types of peripheral neurons are found in the trigeminal system, including heavily myelinated alpha, gamma, beta fibers associated with motor, proprioception, touch, pressure & muscle spindle stretch functions.(1)

There are two classes of pain – sensory nerve fibres or nociceptors found in the tooth pulp:

1. Smaller and unmyelinated C fibres
2. Smaller less myelinated A-delta

A delta and C fibers enter the periodontal ligament on all four sides of the root surface. The nerves enter the apical foramina and merge to form a common pulpal nerve. These nerve trunks enter the root with afferent blood vessels either as individual units or as intimately associated nerve sheaths. They proceed coronally where they divide into cuspal nerves on approaching the cell-free zone, the cuspal nerves branch repeatedly to produce an overlapping network of nerves called the plexus of Rashkaw. A few fibers enter the pre-dentin or dentin.(2) In human dental pulp C fibers are found 8-10 times more than A- delta fibres. (3-6) C fibres have a predominant role for encoding inflammatory pain arising from dental pulp & periradicular tissues. After activation C & A delta fibers transmit nociceptors signals primarily via trigeminal nerve, to the trigeminal nucleus caudalis located in medulla.(7) Once inflammation has extended to the periodontal ligament, which is well endowed with A beta discriminative touch receptors, localization of pain is more predictable with light mechanical stimuli such as percussion test.(1)

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 extirpated, 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.(7)

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 formerly 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.(8) 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.(1)

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, thereby 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 interfere 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. Anthralinic acid derivatives : mephenamic acid
4. Aryl-acetic acid derivatives : diclofenac, aceclofenac
5. Oxamic derivatives : piroxicam, tenoxicam
6. Indole derivative ; indomethacin
7. Pyrazolone derivatives : phenylbutazone, oxyphenbutazone

Preferential COX-2 inhibitors :

Nimesulide, meloxicam, nabumetone

Selective COX-2 inhibitors

Celecoxib, etoricoxib, parecoxib

Analgesic-antipyretics with poor anti-inflammatory action :

1. paraminophenol derivative : Paracetamol
2. pyrazolone derivatives : Metamizol, Propiphenazone
3. benzoxazocine 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

COX-2 levels are increased in inflamed human dental pulp,(10) & a COX-2 inhibitor (rofecoxib) is analgesic in with endodontic pain. Recently concern has arisen that the COX-2 inhibitor may cause some gastro-intestinal irritation, therefore these drugs must be used with caution.(11) The medical literature centers on the cardiovascular effects of COX-2 inhibitors. The debate started when the patients randomized to rofecoxib an increase in myocardial infarctions compared with patients randomized to naproxen(12). This led to withdrawal of the drug from the market in 2004.(13)

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 half-life(naproxen) are more likely to cause renal damage than those with shorter half-life(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 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.

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