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REVIEW ARTICLE

ROLE OF PHARMACOLOGICAL AGENTS IN PAIN MANAGEMENT OF DENTAL PATIENTS

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ABSTRACT:
A number of analgesic agents are available these days that are used for the management of dental pain. They each have specific advantages, disadvantages, indications and contraindications. For the formulation of analgesic regimens properly, it is necessary to understand the basic pharmacological principles and appropriate dosage strategies for each of the available analgesic classes. This article highlights brief review of the role of these analgesics in the management of dental pain.
Key Words: Analgesics, Dental Pain, Pharmacological agents.

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INTRODUCTION

Management of dental pain can impose a significant challenge to the clinician. The key to managing pain lies in understanding whether what you do to patients will or will not create an inflammatory response, which is what activates the pain-producing mediators in tissue. Generally, procedures on hard tooth structure that do not involve the pulp create little or no inflammatory response, but, when soft tissues are traumatised, a pain response can be expected.[1] Oral medications that reduce pain, administered pre or postoperatively, improve clinical outcomes, making them an integral part of dental practice. Analgesic medications in dentistry are indicated for the relief of acute pain, postoperative pain, and chronic pain, and for controlling adjunctive intraoperative pain. In addition these medications can be given preoperatively, to mitigate both postoperative pain and reduce postoperative pain medication requirement.[2] Alleviating pain is of the utmost importance when treating dental patients, as it is prevalent and has far-reaching implications, for both the patient and the clinician.[3] The major cause of pain is thought to be the release of inflammatory mediators that activate sensory nocioceptors surrounding the tooth.[4] The resultant stimulation of both central and peripheral mechanisms is referred to as hyperalgesia and defined as an increase in perceived magnitude of a painful stimulus.[5, 6]

NON-STEROIDAL ANTI-INFLAMMATORY DRUGS (NSAIDS)

Given that the mechanisms involved are occurring at the periphery, an anti-inflammatory agent should be used to control this process. NSAIDs are among the most widely prescribed analgesics for management of post-operative pain in dental patients.[7] NSAIDs that have been approved by the US Food and Drug Administration (FDA) for OTC analgesic use can be divided into three groups: salicylates (i.e. aspirin, salycilic acid, diflunisal), proprionic acid derivatives (i.e. ibuprofen, naproxen, and ketoprofen) and the para-aminophenol derivative acetaminophen. The analgesic effect of NSAIDs is primarily the result of their inactivation of cyclo-oxygenase, an enzyme that converts arachidonic acid into eicosanoids such as prostaglandins and leukotrienes.[8-10] Two forms of cyclooxygenase have been identified: COX-1, which is constitutive and exists in the stomach, intestines, kidneys, and platelets, and COX-2, which is expressed as part of the inflammatory process.[11] Ibuprofen is a nonselective inhibitor of cyclooxygenase and is available as both a prescription and over-the-counter (OTC) product..[12] Conversely, celecoxib, introduced as a prescription drug in January 1999, selectively inhibits the COX-2 form of the enzyme.[13]

OPIOIDS

Opioid analgesics may be used to manage dental pain.[14] They should be considered if acetaminophen or an NSAID alone will not be sufficient. Analgesia

is the primary action of opioids, affecting both the pain threshold and pain reaction. Although high doses can be very effective for the relief of severe pain, opioids are most often accompanied by unacceptable side effects. All opioids induce dosedependent respiratory depression, sedation, constipation, nausea and vomiting. The nausea is characteristically exacerbated if the patient is ambulatory and can often be relieved if the patient is advised to lie down. Mood alteration may manifest as either euphoria or, alternatively, as an unpleasant reaction known as dysphoria. Chronic use may lead to tolerance or physical dependence. Addiction may occur in patients predisposed to chemical dependency. Allergy to codeine, morphine, oxycodone or hydromorphone contraindicates use of any other opioid in this structural class. If an opioid is required for patients with such allergies, the pure synthetics, meperidine or pentazocine, could be considered. Opioids can be prescribed alone if the patient already has a prescription for an NSAID or is taking acetaminophen appropriately. If an opioid is necessary, codeine should be the first to consider. Formulations combining acetaminophen or ASA with codeine are available and popular because of ease of administration. However, ease of administration may be the only advantage of these formulations as the relative doses of nonopioid to opioid are often inappropriate.[15]

ACETAMINOPHEN

Compared with NSAIDs, the mechanism of action of acetaminophen is less clear but is believed to involve an inhibition of prostaglandin synthesis within the CNS. It has little influence on peripheral prostaglandin synthesis, especially within inflamed tissues. This is a likely explanation for its lacking anti-inflammatory efficacy and sharing none of the peripheral side effects attributed to NSAIDs.[16] However, it is an ideal analgesic for patients who present any contraindications to NSAIDs. As an analgesic and antipyretic, acetaminophen is equal in potency and efficacy to aspirin29 and presumably may be somewhat inferior to ibuprofen and other NSAIDs as well. Hepatotoxicity is the most significant adverse effect of acetaminophen. It is attributed to a toxic metabolite that cannot be adequately conjugated when dosages exceed 200-250 mg/kg in a 24-hour period. The dose may be less for patients who are poorly nourished, who have liver dysfunction, or who are being treated with other hepatotoxic medications. For example, in contrast to the 4 g/d allowed healthy patients, those suspected of chronic alcoholism should limit their maximum daily intake to 2 grams.[17, 18]

PARACETAMOL AND PARACETAMOL-OPIOID COMBINATIONS

Paracetamol (also known as acetaminophen in some countries) acts primarily in the central nervous system (CNS) although neither the site nor the mechanisms of action have been clearly established.[19] It has analgesic and anti-pyretic effects, and it is a weak inhibitor of the cyclo-oxygenase sub-groups COX-1 and COX-2. Paracetamol readily crosses into the cerebrospinal fluid. Within the CNS it works by inhibiting prostaglandin synthesis in the hypothalamus, preventing release of spinal prostaglandin and inhibiting nitric oxide synthesis in macrophages. At therapeutic doses it does not inhibit prostaglandin in the peripheral tissues so there is very little, if any, anti-inflammatory action.[19, 20] Paracetamol has been used extensively in many trials that have documented its efficacy and demonstrated that higher doses are more effective than lower doses. For example, 1000mg of paracetamol taken every six hours produced analgesia comparable to ibuprofen (600mg taken every six hours) after surgical extraction of impacted third molar teeth[21] and a systematic review of randomized clinical analgesic trials (with over 1000 patients/group) indicated that paracetamol used in doses of 975-1000mg produced a 28 per cent improvement in the relative analgesic benefit when compared with lower doses (600-650mg) of paracetamol.[22] Paracetamol can be combined with codeine (an opioid – see below) for greater analgesia. Commercial preparations are available with varying amounts of codeine added to the paracetamol – typically 8mg, 9.75mg, 10mg, 15mg or 30mg combined with 500-600mg paracetamol. At least 25-30mg of codeine51 is considered to be required for effective analgesia so the efficacy of the lower dose preparations is somewhat uncertain, if at all effective, especially if a preparation containing only 8-10mg is used since typically patients take two tablets for a total of only 16-20mg of codeine. However, if the compounds containing 30mg codeine are used, very effective analgesia can be obtained with a combination of actions from the paracetamol and the codeine (especially if a double dose is taken as is usually required to have adequate paracetamol for pain relief).[23, 24] The addition of doxylamine, an antihistamine with a 'calmative' action, can further increase the effectiveness of analgesia obtained with paracetamol/codeine compounds.51 The exact mechanism of action is not clear although it is likely to be due to a combination of actions – the antihistamine helping to reduce inflammation as well as helping the patient to cope better due to its calmative action.51 Since paracetamol is metabolized

in the liver, patients with liver disease need to take care. Paracetamol can cause liver damage, even with normal therapeutic doses, but fortunately this is rare. Other patients who may have increased toxicity are those with a high alcohol intake and those taking enzyme-inducing drugs (e.g., anti-epileptics and rifampicin). Recent research suggests a relationship exists between the toxicity of chronic paracetamol (end-stage enal disease) and the history of lifetime consumption of the drug. Less is known about toxicity and dosage interval or duration of acutely administered doses although it appears more likely to be toxic if the daily dose exceeds 4000mg in adults. Despite this, it has been suggested that the use of 6000mg per day for a short period of time may have therapeutic benefit without unduly increasing risks.[25-29]

PAIN AND ANXIETY MANAGEMENT FOR PEDIATRIC DENTAL PROCEDURES

Management of child patients for various dental procedures in dental office is very challenging. The behavioral problems are commonly seen in children under the age of 6 years due to various elements such as immature reasoning, restricted coping skills and anxiety/fear causing.[30] Conscious sedation is a proven and well documented approach to assist in such a kind of situations. Conscious sedation is defined as a controlled state of low consciousness that conserves protective and unconditioned reflexes, permits continuance of a patient's airway impartially and allows the patient to communicate appropriately to physical and verbal stimuli.[31, 32] Hence, conscious sedation can be very supportive in allying anxiety, uneasiness, fear and minimizing an uncooperative child's attempt to resist treatment procedures. Procedural conscious sedation includes providing an adequate level/degree of sedation whereas decreasing pain and anxiety, maximizing amnesia, curtailing the potential for adverse drug-related events, monitoring and governing behavior, and sustaining a stable cardiovascular and respiratory status. Sedation drugs can be administered through various routes such as oral, inhalational, nasal, intramuscular, subcutaneous, and intravenous routes.[33, 34]

Ketamine and midazolam have parallel safety profiles in the emergency setting for pediatric patients. Administration of conscious sedation was ought to be directed in a suitable setting that takes into account persistent supervision of the patient via expert and trained medical staff. Ketamine causes all the more vomiting but instead still, it is the favored agent for some dental and medical practitioners. There is a lot of data in the emergency literature to show adequacy and wellbeing for both agents. Ketamine–midazolam consolidations likewise may be more viable and secure than fentanyl midazolam mixes for procedural sedation and analgesia. As the evaluated studies are little, reporting of adverse events is often limited; the literary works is not strong enough to authoritatively reason and conclude that midazolam and ketamine are superior to either agent alone or used in combination with a different agent.[35]

CONCLUSION

Although analgesics forms an important and crucial pillar in pain management, the first thing to be done in such patients is the removal of etiologic agents as quickly as possible. Therefore, a clinician must choose the analgesic very wisely and his selection should be based on the amount of pain the patient is encountering. The clinician should develop several safe and effective analgesic regimens based on estimates of anticipated pain intensity.

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