

Condutas farmacológicas e não-farmacológicas para o manejo de dor em odontopediatria

Pharmacological and non-pharmacological techniques for pain management in pediatric dentistry

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RESUMO

Na Odontopediatria, a utilização dos meios farmacológicos e não-farmacológicos para manejo da dor é importante para uma abordagem completa e efetiva do fenômeno doloroso, sem que o mesmo represente um evento traumático para a criança, pois o estresse vivenciado pelo paciente amplia o seu medo e a sua percepção da dor, diminuindo a sua capacidade de colaborar com o tratamento. Nesse contexto, é imprescindível que o cirurgião-dentista utilize, de forma consistente, todos os recursos disponíveis para controle da dor infantil. Portanto, o objetivo desta revisão é enfatizar as condutas farmacológicas e não farmacológicas utilizadas para o controle de dor em crianças na Odontologia, através de uma revisão da literatura científica. O controle da dor de uma criança é o fator-chave imprescindível na conduta do profissional pediatra, visto que o tratamento adequado da dor, da ansiedade e do medo, gerados pela situação desconfortável dos sinais e sintomas, proporcionam maior probabilidade de sucesso nos procedimentos, em especial quando há necessidade de procedimentos invasivos. Dessa forma, o conhecimento da farmacologia das diversas categorias de drogas sedativas e analgésicas é obrigatório para qualquer pediatra e, da mesma forma, as condutas psicológicas infantis se constituem elementos primordiais para o sucesso em todos os procedimentos adotados.

Palavras-chave: Comportamento; Conduta farmacológica; Conduta não-farmacológica; Dor; Odontopediatria

ABSTRACT

In pediatric dentistry, a complete and effective approach to avoid trauma in children involves the use of pharmacologic and nonpharmacologic techniques for pain management. The stress experienced by the patient increases the fear and perception of pain, diminishing his ability to cooperate with treatment. In this regard, the dentist must use all available resources for pain control. The goal of this review is to emphasize pharmacological and non-pharmacological procedures used in dentistry for

pain control in children via a review of scientific literature. Pain control is a key factor in the work of a pediatric professional, given that adequate treatment of pain, anxiety and fear generated by uncomfortable situations leads to greater probability of success in procedures. This is especially true for invasive procedures. Thus, pharmacology knowledge of sedative and analgesic drugs is obligatory for every pediatric dentist; similarly, psychological care for children is a fundamental element for success in all procedures.

Keywords: Behavior; Pharmacological care; Non-pharmacological care; Pain; Pediatric dentistry

INTRODUCTION

Pain is defined by the International Association for the Study of Pain as “*an unpleasant sensory and emotional experience associated with tissue damage or described in terms of such damage*”¹. This is a complete definition because it acknowledges the subjectivity of the experience and the perception of the painful sensation. Perception of pain is a process that involves many subjective aspects; thus, being aware of situational, psychological and social factors is essential to avoiding impaired treatment². Such factors may influence perception of and reaction to pain and may produce negative emotional reactions and behavioral changes (frustration, fear, anxiety, rage and sadness) during dental treatment.

Appropriate communication with the child, in addition to pharmacological and behavioral techniques, assures a complete and rewarding dental treatment provided by the pediatric dentist without representing a traumatic event for the child; the stress experienced by the patient increases his fear and perception of pain and diminishes his ability to cooperate with the treatment^{3,4}.

However, awareness of pain perception in pediatric dentistry is not an easy task. In fact, the verbal description of the child's sensation is quite complex as well as the interpretation of psychological manifestations of the child by professionals⁵. Furthermore, it is important to realize that the measurement and “quantification” of the pain reported by the patient, both equally subjective conditions, require an intellectual ability to understand and express pain,

which often constitutes a limiting factor for such evaluation in pediatric patients.

OBJECTIVE

To review the scientific literature on pharmacological and non-pharmacological techniques used for pain control in pediatric dentistry.

METHODOLOGY

Research of Brazilian and other international articles indexed in the following health databases: Proquest, Pubmed, Medline and Scielo. The following descriptors were used: analgesia; sedation; pain control; pediatrics; pain in pediatric dentistry.

REVIEW OF THE LITERATURE

Neurophysiology of acute inflammatory pain

Acute inflammatory pain represents the majority of pain cases that are of dental origin⁶. This is equivalent to nociceptive pain, which is defined as the result of direct activation of nociceptors in response to tissue damage through the release of inflammatory mediators. Pain is a subtype of somatic sensation, the principal function to alert of present or potential damage⁷.

When tissue is damaged, the damaged tissue releases chemical mediators, such as bradykinin, prostaglandin, leukotriene, nitric oxide and substance P, that are responsible for the activation of free nerve endings and the induction of hyperesthesia. The nociceptive stimuli are carried by nerve fibers types A and C and converge at the posterior horn of the spinal cord, from which point the nerves connect to higher centers of processing and interpret the nociceptive information. The understanding of this process is important for the appropriate drug action, which prevents or mitigates pain triggering⁷.

The importance of social-cultural factors and their effects on the perception of pain have been increasingly recognized. Cognitive factors, such as knowledge, expectations and preparation for the experience of pain have a recognized influence on the process of pain perception. Swafford and Allen (1968) stated, "pediatric patients rarely need medication to relieve pain, and tolerate discomfort well"¹. This erroneous thinking has been reflected in professional techniques that underestimate the pain of pediatric dental patients, leading to undertreatment in most areas.

It is known that, once gestation is complete, the central and peripheral nerves involved in pain perception are mature and that children, even in the neonatal period, possess the ability to feel and remember painful sensations. Considering that children older than three, if adequately instructed, are already able to understand the concept of pain and discern different degrees of pain, the use of visual analogue scales can be a good tool to measure pain¹.

Techniques for pain management in pediatric dentistry include non-pharmacological resources (psychological methods, acupuncture, hypnosis and suggestion) and pharmacological resources (local anesthesia, sedation, general anesthesia, and the use of analgesic and anti-inflammatory drugs). Precisely because of the emotional impact on children who face an event that may lead to pain, there must be great clarity when addressing this topic, and information must be reviewed as an ethical necessity of professional conduct in pediatric dentistry.

Pain in children: non- Pharmacological techniques

According to certain authors^{2,8,9}, non-pharmacological techniques for pain control in pediatric dentistry are the following:

- **Tell-show-do:** This technique seeks to familiarize the child with elements of the dental office and create positive associations. Thus, the professional should introduce the team and all the objects in the office along with their functions. It is important to highlight that these explanations should be age-appropriate for the patient. The same process should be applied to treatment by carrying out previous explanations of the procedures.
- **Desensitization:** The intention of this method is to produce a state of relaxation by gradually exposing the child to dental procedures. Using suggestion, the patient is made to feel comfortable and calm, reducing his anxiety.
- **Distraction:** Based on the professional's awareness of the interests of the child, distraction with films, cartoons, and pleasing conversation can be used to reduce tension in the child. It must be emphasized, however, that the use of this technique before an invasive procedure is not advised because the child may come to see distraction as an omen of a traumatic procedure. There is evidence that children with difficult behavior show an improved level of collaboration after the use of this technique.
- **Voice control:** This consists of a communication resource through which change in the volume and tone of the voice is used to obtain the attention and cooperation of the child. It can draw the child's attention away from himself and demonstrate the authority of the professional or externalize disapproval in the face of unacceptable behavior.
- **Body language:** The facial expression of the professional, through visual contact, can be an important resource for demonstrating satisfaction with good behavior to the child or the opposite, especially in younger children. Physical contact with the child should be gradual, seeking at first to welcome him with affectionate gestures such as touching shoulders and hands.
- **Positive reinforcement or reward:** Verbal expressions, praise, and gestures, such as a hug, are used to reward the child. Positive reinforcement should be a pleasant surprise at the end

of the dental procedure and should not be used prior to this point, so that the child does not associate it with a bad experience.

- **Modeling:** Observation of treatment of another child who cooperates presents appropriate behavior to the child with respect to dental procedures to reduce fear and anxiety.
- **Hand over the mouth:** Communication by the professional with agitated children by muffling sounds is the goal of this technique. This technique is not used very often anymore and should only be used as a last resort and never in special needs patients. The professional should be experienced and calm to avoid having this technique produce fear on the part of the child.
- **Physical restraint:** One can make use of physical restraint in special cases with the intent of protecting the child because materials used by the dentist may cause injury. This is especially the case when rapid and unexpected movements on the part of the fearful child are involved.

Chemical restraint provides control of pain and anxiety and prevents these from being exacerbated by the use of physical restraint¹⁰. However, Fúccio et al., in appraising the acceptance by parents of behavior control in pediatric dentistry, concluded that pharmacological and restrictive techniques (active restraint, passive restraint and hand over the mouth) were less accepted than were nonrestrictive techniques (say-show-do, voice control, modeling and positive reinforcement)⁸.

In some circumstances, preanesthetic and postoperative drug alternatives can be important or imperative tools by preventing or treating certain specific symptoms that are characterized by stress, swelling and pain⁶.

Pain in children: Pharmacological techniques

Prescribing drugs in pediatric dentistry requires special care. The form of the drug should be appropriate to the needs of the child. Priority should be given to those that are easy to swallow (liquid, with a pleasing taste).

Andrade⁶ highlights the importance of the ability of dentists to choose medications appropriate for use by children, including the knowledge of appropriate dosages that are normally calculated as a function of the child's weight. In this respect, one can note the

adoption of various methods for establishing the correct pediatric dose. Among these options, it is known that health professionals adopt a rule of one drop/kg of weight; however, Carmo et al.¹¹ emphasize that the current method that is considered to be the most adequate takes into account the surface area of the body of the child and not just his weight, as follows:

$$\text{Surface area} = \frac{(\text{Weight} \times 4) + 7}{\text{Weight} + 90}$$

$$\text{Pediatric Dose} = \frac{\text{Adult dose} \times \text{body surface of the child}}{\text{Body surface of the adult (1.73 m}^2\text{)}}$$

All of these factors work toward producing quality care and aid in the development of a therapeutic plan, which is highly effective and has a low level of adverse reactions for the patient. Additionally, it is important to highlight the need for contact with the pediatric doctor, especially when working with children who have chronic illnesses.

Concerning the discussion on pain control, some concepts are important for proper understanding of the procedure and correct use of available pharmacological resources. This being the case, we understand *analgesia* to be the reduction or elimination of the sensation of pain in a conscious patient¹². *Anesthesia* is defined as a reversible blockage of nerve conduction in which there is a loss of sensitivity without change in the level of conscience producing progressive elimination of autonomic and sensory-motor functions¹³. *Sedation* involves the control of fear, anxiety and the response to pain through the systemic use of drugs without inducing loss of consciousness in the majority of cases¹².

Sedation may be conscious or profound. The chief difference between the two is that profound sedation implies an alternation of states of consciousness with partial or complete loss of reflexes and an inability to respond to physical stimuli and verbal commands; this does not take place in conscious sedation¹².

The importance of proper sedation and analgesia in children is correlated to a reduction of postoperative complications and better recuperation when blocking physiopathological reactions responsible for adverse events¹. In contrast to the control of postoperative pain in dentistry, which is a commonly accepted practice, one does not frequently see the use of medication for the management of pain in the preoperative phase.

To write a prescription, the dentist should know the pharmacokinetic and pharmacodynamic aspects of the chemical substances that he prescribes. The drugs used in clinical dentistry play important roles in the treatment and relief of symptoms. The rational use of pharmaceuticals should be based on solid knowledge and precise information with respect to mechanisms of action, indications, contraindications, dosage and undesirable effects with the intention of obtaining the maximum therapeutic result with minimal adverse reactions for the patient¹¹.

The therapeutic pharmacological arsenal available in pediatric dentistry involves the use of drugs in the preoperative period (sedatives and anesthetics) and postoperative period (analgesics and non-steroid anti-inflammatory drugs). An exception is nitrous oxide, which can be used peri-operatively in a procedure known as conscious sedation. In this study, we address the characteristics of each medication and the variables related to their use in pediatric dentistry.

Pharmacological control of pain in the preoperative stage

Local anesthesia consists of the reversible blockage of nerve conduction resulting in the loss of sensory-motor and autonomic functions without producing an alteration in the level of consciousness¹³. The use of topical anesthetics allows for a less traumatic puncture by the needle during administration of local anesthesia. Especially in pediatric dentistry, this type of anesthetic facilitates the link between patient and professional because it reduces fear and anxiety related to anesthesia.

The application of the anesthetic should be done after drying the mucosa with a jet of air to avoid dilution of the drug by saliva. After being applied, the anesthetic should remain in contact with the mucosa for at least three minutes. Maximum topical anesthesia is reached in two to five minutes when lidocaine is used or in up to eight minutes with tetracaine. The duration of the anesthesia is also longer with the use of tetracaine (about sixty minutes); lidocaine produces anesthesia for thirty to forty-five minutes. The gel or cream is preferable to the aerosol form because the latter reaches a larger contact area and produces anesthesia in places where it is not necessary resulting in a disagreeable sensation, especially for children¹².

In invasive procedures, local anesthesia is fundamental for the control of pain in children and should be used judiciously to avoid the effects of overdose and drug toxicity, such as convulsions and cardiovascular depression. The characteristics of an effective anesthetic include low systemic toxicity and a low degree of tissue irritability as well as not producing irreversible nerve damage. Furthermore, the anesthetic effect, after the application, should begin as quickly as possible and should be sufficient in duration for carrying out the surgical procedure. Preferred local anesthetics in dentistry are the tertiary amines with hydrophilic and lipophilic properties because they are a group characterized by lower toxicity, greater potency and lower immunogenicity, compared with the ester group¹³.

Among the local anesthetic solutions available for pediatric dentistry, the ones that stand out are the following: lidocaine without vasoconstrictor, which is classified as a short duration local anesthetic; 2% lidocaine with adrenalin or prilocaine with octapressin 0.03 UI, which are intermediary duration anesthetics; and finally, bupivacaine 0.5% with adrenalin, classified as a long duration anesthetic. Of these, the drugs whose effect is intermediary are most commonly used because they produce effective anesthesia for a time sufficient for dental procedures to be completed¹².

Carmo et al.¹¹ confirmed that intermediate-duration anesthetics are the best option for pediatric dentistry, especially when considering the anesthetic of choice is 2% lidocaine with epinephrine at a dose of 4.4 mg/kg of weight; however, 3% prilocaine with felypressin 0.03 UI/ml may be used except in the case of patients with methemoglobinemia. In cases where the use of vasoconstrictors is contraindicated, one may use 3% mepivacaine without vasoconstrictor, the profile of which is similar to lidocaine. The duration of action is somewhat longer. It is also used in procedures that do not require pulpal anesthesia of long duration or with great depth.

Anesthetic techniques used in pediatric dentistry possess some peculiarities if compared to techniques used in adult patients due to the lower bone density of the mandible and maxilla in children, which allows for more rapid and complete diffusion of the anesthetic solution. In addition, due to the fact that the child is smaller than an adult patient, standard techniques of injection can be performed with penetration of the needle to a lesser depth¹⁴.

It is important to realize that, in children, due to the lower circulating plasmatic volume, the probability of toxic effects is more relevant than for adults¹¹. Adverse reactions in pediatric dentistry are usually related to inadequate reduction of the dosage, which should be calculated according to the weight of the child. Even so, in very obese patients, one calculates the dose according to the ideal weight, rather than the real weight of the child¹⁵.

Local anesthetics are considered to be extremely safe medications, but there is a risk of adverse side effects. Complications can be divided into psychogenic and non-psychogenic complications. The former, represented by fainting and hyperventilation, are independent of the anesthetic and have to do with the stress experienced by the patient¹³.

Nonpsychogenic complications are rare and are related to improper technique of administration, overdose, or an allergic reaction to the anesthetic. Such manifestations principally touch on the nervous system and stem from the liposolubility of these drugs, which confers on them a high capacity of crossing the blood-brain barrier and causing depression of the central nervous system. Peripheral symptoms include paresthesias and hypotension, and concurrent use with opioids or sedatives may lead to severe respiratory depression¹⁶.

The use of pre-anesthetic medication with sedative properties can be an interesting resource for children who present with behavior problems and who appear extremely anxious and fearful with regard to treatment⁶. One should consider, however, that any drug used cannot substitute for a psychological approach, and both resources should be used as complementary methods.

The use of sedatives is indicated for cases in which the child is in need of odontological interventions and is unable to cooperate due to mental or physical deficiency or because he suffers from systemic illnesses¹⁷. Procedures with sedative components have been increasingly performed by various groups of professionals outside the Surgical Center. The American Academy of Pediatrics and the American Academy of Pediatric Dentistry¹⁸ emphasize the importance of training professionals on proper management of sedative procedures and their potential complications, e.g., respiratory depression.

The Federal Council of Odontology¹⁹, in its Resolution CFO 51/04, regulated norms for the

application of relative analgesia or conscious sedation with nitrous oxide and indicated that dentists may apply analgesia as long as he is properly qualified and when its use is an effective means of treatment. The Council also judged, finally, that there is no difference between relative analgesia and conscious sedation because both refer to the use of a mixture of nitrous oxide and oxygen in dental practice.

The inhalation method is considered quite safe because it allows for analgesia without loss of consciousness and maintains the ability of the patient to collaborate with treatment¹². Intravenous conscious sedation using midazolam has been considered effective in dental procedures because there have not been any documented cases of hemodynamic instability, fall in saturated oxygen level or disinhibition attributable to the process of sedation^{20,21}. However, there is a need for greater attention on the subject to be able to apply this technique in pediatric practice.

Sedative and analgesic drugs may be divided into first generation drugs (such as chloral hydrate, pentobarbital, thiopental, diazepam, morphine and meperidine); those of the second generation (such as midazolam, fentanyl, ketamine and nitrous oxide); and those of the third generation (particularly propofol and etomidate)²².

The drugs most often used in Brazil for the purposes of sedation in pediatric dentistry are chloral hydrate and the benzodiazepines. Chloral hydrate is a hypnotic sedative agent without analgesic properties that is commonly used in pediatrics¹. At therapeutic doses, it produces a reversible depression of the central nervous system inducing a state of sleep similar to physiological sleep and without significant respiratory and hemodynamic alterations⁶. Administered by mouth, the suggested dosage is from 25 to 100 mg/Kg; however, it can cause respiratory depression at doses of 75 – 100 mg/Kg²². The average time to reach peak sedation ranges from 20 to 60 minutes with a duration of up to 120 minutes^{22,23}. Doyle and Colletti²⁴ consider chloral hydrate a viable option for sedation in painful procedures, but they emphasize that this therapeutic resource may also be used in non-painful procedures that require only motor control.

With regard to benzodiazepines, represented mainly by diazepam, midazolam and triazolam, it has been considered that they are effective medications and superior to chloral hydrate⁶. In general,

benzodiazepines are considered to be extremely safe for clinical use due to the fact that there is a considerable margin between therapeutic and toxic doses²⁵. They have anxiolytic, amnesic, sedative-hypnotic, muscle relaxant and anticonvulsant properties. They do not possess analgesic properties and are commonly associated with analgesic opioids in therapeutic schemes for sedation and analgesia in children. This association, however, requires care due to a higher risk of hypoxia and apnea because they have synergistic effects²².

Although Andrade⁶ considered diazepam to be the agent of choice for sedation in children, Krauss and Green²² emphasize that midazolam is preferred due to its shorter period of action and various possibilities for administration. Its safety profile is considered to be excellent; however, side effects such as uncontrollable crying, disorientation and agitation have been reported. The risk of respiratory depression exists independent of the dose, especially if it is combined with other drugs that depress the central nervous system such as the opioids.

Triazolam has a relatively rapid onset, short half-life until elimination and minimal respiratory and cardiovascular effects, which make it preferable to other sedatives whose pharmacokinetic and pharmacodynamic properties are not so favorable. In addition, the profile of side effects, according to the author, represented 0.3% of the cases with reports of drops in the arterial saturation of oxygen, elevation of systolic arterial pressure, hypotension, tachycardia and bradycardia²⁵.

Barbiturates, in turn, exert depressive effects on the central nervous system and produce profound sedation, hypnosis, and amnesia without having analgesic properties. Hemodynamic repercussions include reduced cardiac output and hypotension, and respiratory effects include, most importantly, the possibility of apnea. It is important to emphasize that cardiorespiratory effects depend on the dose. In pediatric practice, the most frequently used barbiturates are secobarbital and thiopental. This class of drugs is being gradually replaced by the benzodiazepines for sedative purposes¹.

Etomidate is a non-barbiturate hypnotic agent with ultra-short action and high potency, which can be used for induction of general anesthesia or for sedation and analgesia depending on the dose. It does not possess analgesic properties, produce sedation, have an anxiolytic effect, induce amnesia, or have fewer hemodynamic repercussions than

barbiturates in general. The patient's recovery is rapid and may be accompanied by nausea, vomiting and myoclonus. In addition, there is transitory adrenal suppression with inhibition of steroidogenesis; however, this is not clinically significant with only one dose²².

Propofol is another ultra-short acting agent, and it also may be used both for sedation and analgesia and for general anesthesia depending on the dose²². It reduces systemic arterial pressure by inducing peripheral vasodilatation and causes potent respiratory depression. It is associated with higher rates of satisfaction by patients due to its euphoric properties and anti-emetic action. Recovery is rapid after administration, and it is characterized by minimal postoperative mental confusion.

Ketamine is used to induce dissociative anesthesia, the name of which comes from the sensation of dissociation from the environment experienced by the individual using this drug. The state of dissociative sedation is characterized by profound sedation, amnesia and immobilization. Recovery is longer than that observed with etomidate and propofol and frequently may be accompanied by disagreeable dreams and hallucinations; however, these psychological manifestations rarely occur in the pediatric population. It is contraindicated for children younger than three months due to the high risk of respiratory complications²².

General anesthesia is indicated for the following patients who are incapable of cooperating with dental treatment under the effects of local anesthesia: children with special needs; patients with severe physical and mental limitations; those suffering from serious heart disease with intolerance to excitatory stimuli during treatment; those undergoing extensive surgical procedures that involve craniofacial pathologies and anomalies, those who have experienced traumas due to accidents; very small children and those with behavioral disorders involving intense psychic alterations¹⁰. It may be considered in non-cooperative patients, but prior to this, one should evaluate the possibility of using other techniques of conditioning, restraints, or pre-anesthetic medications.

In a study comparing general anesthesia and sedation by inhalation, it was shown that, although both are associated with high success rates in treatment, sedation by inhalation is intrinsically related to fewer chances of side effects and shorter dura-

tion of treatment; sedation by inhalation is considered a good alternative to general anesthesia²⁶.

Control of postoperative pain

Analgesics, antipyretics and NSAIDS are among the groups of medications most frequently consumed by adults and children, and they are considered to be relatively safe drugs. Many of these drugs are made available commercially without a need for prescription from health professionals.

Because tissue damage, independent of etiology, triggers the synthesis of inflammatory mediators (Figure 1), drugs with peripheral action are recommended for combating pain in pediatric dentistry due to their action on the synthesis of prostaglandins and inflammatory mediators and on inhibition of synthesis of type 2 cyclooxygenase enzyme (COX 2).

Analgesic and anti-inflammatory drugs are indicated in cases of pain and inflammation stemming from surgical procedures, such as tooth extractions, after dental trauma, soft-tissue pain and tooth pain of pulpal origin. Toxicity and limited experience in the use of many of these drugs restricts choices to only a few medications for treatment of painful procedures in children.

Side effects of analgesics, antipyretics and NSAIDS affect the cardiovascular, renal, gastrointestinal and respiratory systems^{27,28,29,30}. Among the risk factors that stand out in the development of side effects, one finds young infants with chronic illness, individuals who already use other drugs, hypovolemia, dehydration, arterial hypertension, disorders of the kidney, liver, or heart and clotting disorders^{28,29}.

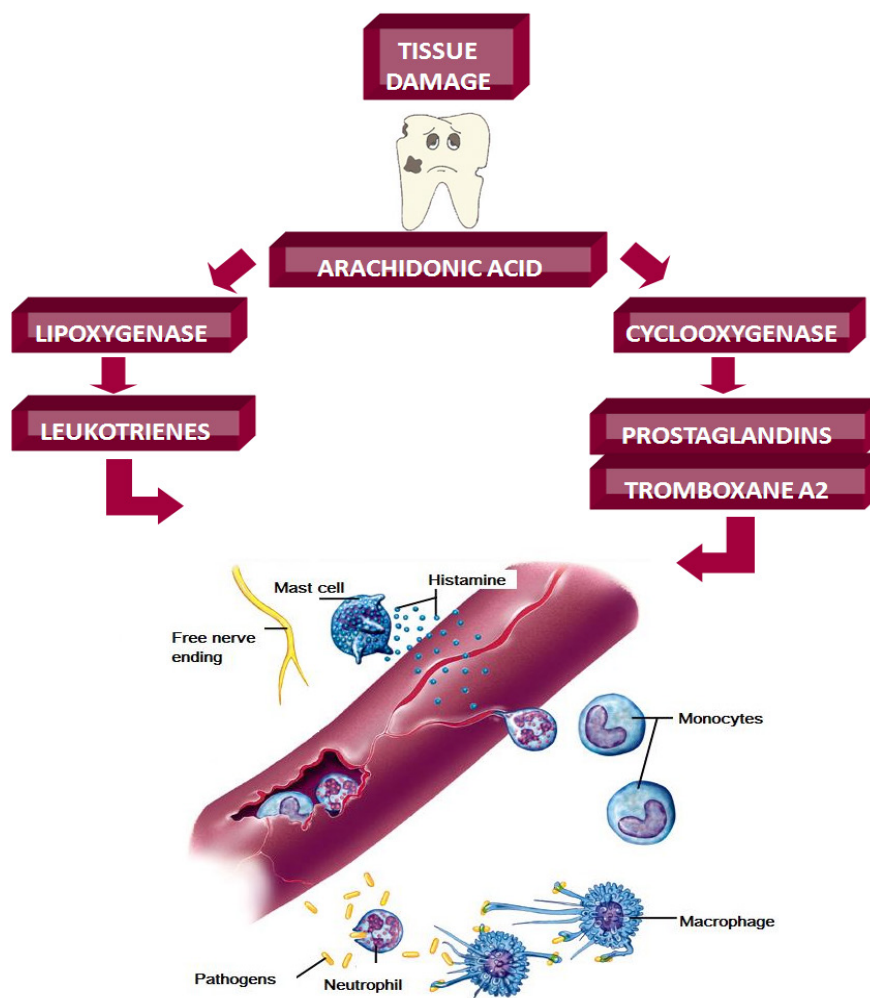


Figure 1
 Inflammatory cascade set off by tissue damage. The end product causes the migration of leukocytes to source of inflammation, vasodilation, increase in vascular permeability, formation of edema and pain (Adapted from Andrade⁶).

Undesirable effects of analgesics and anti-inflammatory drugs occur through immunologic (allergic) and non-immunologic mechanisms, with the latter corresponding to the majority of cases due to the non-selective inhibition of the cyclooxygenase enzyme (COX). This enzyme is found in two forms: 1) COX 1 - widely distributed in the organism. Its inhibition is intimately related to gastrointestinal bleeding and ulceration as well as interference in platelet aggregation; 2) COX 2 - enzyme related to inflammation. The inhibition of this enzyme is responsible for the anti-inflammatory effect desired with the use of NSAIDs^{28,29,31}. Paracetamol (acetaminophen) and dipyrrone are two possible choices because both have analgesic and anti-inflammatory effects¹². In pediatric dentistry, paracetamol (acetaminophen) is the first choice of analgesic because it creates potent inhibition of prostaglandins and analgesic and antipyretic effects¹¹. Whenever possible, paracetamol should be preferred to dipyrrone because it is considered to be free of side effects when given in therapeutic doses²⁸. A study comparing the effectiveness of paracetamol and ibuprofen in the control of pain after orthodontic movement found paracetamol to be preferable because it interfered less in the physiology of tooth movement³².

Paracetamol is considered to be a rather safe drug because it does not produce cardiovascular nor respiratory effects. It does not produce irritation, erosion or gastric bleeding and does not have platelet effects, thus not interfering in bleeding time. With respect to the prevention of liver injury, one must emphasize the need to verify whether the child is receiving medical treatment, which involves the inhibition of cytochrome P450 such as the use of anticonvulsants and anti-TB drugs^{28,29}.

The use of dipyrrone, although very common in Brazil, is considered problematic as it is associated with hematopoietic side effects, mainly agranulocytosis and aplastic anemia; this is the reason this drug was banished from the therapeutic arsenal in the United States. Many authors, however, affirm that dipyrrone is a safe drug, and it represents an important alternative for the control of pain and fever in children^{6,33}.

Although it is still very commonly used in Brazil, acetylsalicylic acid is being used less and less in other countries due to its toxicity for the gastrointestinal tract. This property stems from its inhibition of the COX1 enzyme, whose action involves the protection of the gastric mucosa and whose inhibition is related to gastric ulceration and bleed-

ing. Furthermore, it has been associated with Reye's syndrome in children, particularly if used in conjunction with viral infections, such as chicken pox and influenza, which may produce serious brain and liver damage even when used in low doses such as 15 mg/kg/day^{28,29}. Also, due to its less selective action on COX-2, acetylsalicylic acid may cause edema, urticaria, rhinitis, bronchospasm, and in severe cases, shock and death. Thus, it should not be recommended on a routine basis for pediatric patients¹¹. Acetylsalicylic acid is not recommended in dentistry, particularly in cases of surgery, because it interferes with platelet aggregation¹², as already described above.

Among the other non-hormonal anti-inflammatories, ibuprofen has been considered a good option for children due to its ample margin of safety. However, if possible, administration of paracetamol is preferred. The potential advantages of ibuprofen include the long period of action and cost similar to that of paracetamol. Various NSAIDs are widely used in adults, but they still have not been approved for use in children due to the potential toxicity of this group of drugs¹¹.

FINAL CONSIDERATIONS

Concern is imperative on the part of the professional to assess the presence of pain and anxiety in the pediatric patient, and resources need to be available to measure these emotional parameters so that pharmacological and non-pharmacological techniques are appropriate for each patient. We must highlight the importance of not underestimating the amount of pain expressed, approaching it in an effective and objective way, and understanding that each child is a unique individual who overcomes difficulties to the degree that he progresses in his psychological maturation. It is important to understand the child in a dynamic way and in accordance with the phase of development and with how he is able to react to external stimuli and adapt to them. A proper pharmacotherapeutic technique, working on pain and altered behavior, can favor success in invasive dental procedures. However, the use of these medications does not obviate the necessity for a non-pharmacologic approach because childhood experiences are responsible for future psychological repercussions.

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