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Treatment Regimen to Prevent Endodonticflare- Ups- A Review

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I. Introduction

Flare-up is one complication of endodontic treatment, defined as acute exacerbation of asymptomatic pulp or periradicularpathosis after the initiation or continuation of root canal treatment (1).

The development of postoperative pain after RCT is usually due to acute inflammatory response in the periradicular tissues. It commences within few hours or days after endodontic treatment. It is a poor indicator of pathosis and unreliable predictor of long term success (2–3).

The current accepted hypotheses describe flare-up as a polyetiologic phenomenon, whereas mechanical factors (preparation beyond apical terminus, over instrumentation,pushing dentin chips and the remainder of the infected pulp tissue into the periapical area, overextension of root canal filling), chemical factors (irrigants, intracanal dressings, and sealers) and microbiologic factors contribute to its appearance(4).

The development of moderate to severe inter-appointment pain, with or without swelling, is an infrequent but challenging problem. The reported incidence of inter-appointment emergencies ranges from 1 to 24% of the time (5).

The presence of more number of endotoxins was found in the periapical areas of painful teeth than in those of asymptomatic teeth (6).Infection is considered as the most significant factor in flare-up pathogenesis.Pushing an infected organic substance into the periapical region during root canal preparation might cause exacerbation. Another hypothesis is selective growth of certain bacterial species inside the root canal as a result of ecologic changes during endodontic therapy.Knowledge about the causes of postoperative pain and adoption of appropriate preventive measures can significantly reduce the incidence of this highly distressing and undesirable clinical phenomenon (7)

Regimen to Prevent Flare Up

II. Relief Of Occlusion

Occlusal relief prior to endodontics has been advocated by Cohen (8) for the prevention of postoperative endodontic pain. Other endodontists (9-10) have recommended occlusal relief in teeth with painful periapical symptoms.Rosenberg et al (11) reported that pulpitis, the absence of periapical radiolucency, the presence of preoperative pain, and tenderness to percussion all had significant influences on postoperative pain after root canal treatment. In addition, presence of pretreatment pain and periapical allodynia are significant predictors for pain after root canal treatment.

In a recent study, the effect of occlusal reduction on pain after root canal treatment was evaluated in patients with no or mild spontaneous preoperative pain but with mild tenderness to percussion. No significant differences were found between the 2 groups (12). These findings suggest that preoperative pain may have more effect than mild tenderness to percussion on the efficacy of occlusal reduction. In addition, other studies (11-13)have reported a significant influence of preoperative pain. It is considered acceptable to reduce the occlusal surface of a tooth when 1 or more walls of the cavity have undermined enamel. It is also acceptable when the dentist has ensured that the patient can afford and is willing to continue treatment by having full coverage over the occlusal surface. It has been recommended to use full coverage over occlusal surfaces of posterior teeth after root canal treatment (14-16). However, if the patient does not proceed with full-coverage restoration of the tooth after root canal treatment and the dentist had reduced the occlusal surface to prevent possible postoperative pain, the tooth would then have no function.Occlusal reduction when performed in appropriate cases is a highly predictable, simple strategy for the prevention of postoperative flareup.

1. Systemic Drugs

Antibiotics

Antibiotic treatment is generally not recommended for healthy patients with localized endodontic infections.The use of the most popular antibiotic, penicillin, is based on the predominance of penicillin-sensitive microorganisms reportedly found in infected root canals. Although most strains of bacteria found in endodontic infections are susceptible to penicillin, some, such as the anaerobic peptostreptococci, Bacteroidesfragilisare resistant (17-19). Resistance is transferred from organism to organism by packages of genes, called plasmids (20).Many of the genes specifying antibiotic resistance are found on movable elements of DNA called

transposons (21). The increasing resistance to the number of anaerobic dental infections(22-23). In such cases, some antibiotics, such as clindamycin or tinidazole, may be effective, but the organisms may be resistant to erythromycin,demeclocycline, or doxycycline(24).

Antibiotics should be considered if there is spreading infection that indicates failure of local host responses to control bacterial irritants or the patient has medical condition that compromises defense mechanisms and could expose the patient to higher systemic risks.(25)

Tryptophan & Phenylalanine

Ingestion of L-tryptophan and phenylalanine has been found to increase pain tolerance in patients with chronic pain, to reduce maxillofacial pain effectively(26).Tryptophan is an essential amino acid. When ingested, a small amount is carried past the blood-brain barrier into the brain There it is utilized by certain brain neurons for conversion into serotonin (5-hydroxytryptamine). Centrally, serotonin plays a role in various behavioral responses, including elevation of pain threshold. Shpeen et al. (27), in a controlled study, reported that when 3 g of tryptophan were given daily to 25 patients, there was a significant reduction in postendodontic treatment pain after 24 h, compared with a control group.

The analgesic action of phenylalanine has been attributed to its inhibitory effect on enzymes that degrade **enkephalins**.Enkephalins have the pharmacological properties of morphine and are part of the body's endogenous pain control system(28).

Analgesics

III. Non-Narcotic Analgesics

Non-steroidal anti-inflammatory drugs(NSAIDs)

The recent studies suggest that this important class of analgesics has other actions including inhibition of free radical formation, cytokine synthesis or major cellular signaling pathways mediating inflammatory responses(29). Prostaglandins play a key role in the development of inflammation and pain. Therefore it is predictable that the NSAIDs have clinical efficacy for reducing acute dental pain and inflammation. In support of this point, numerous double-blind placebo-controlled clinical trials have demonstrated that the NSAIDs are effective for reducing pain due to surgical,periodontal and endodonticprocedures.(30)

Many NSAIDs – including ibuprofen, aspirin, diflunisal, etodolac, mefanamic acid, ketoprofen,ketorolac and flurbiprofen– have been shown to produce significant reductions in dental pain. The most popular NSAIDs ibuprofen is commonly used for treatment of acute dental pain. Ibuprofenwill produce a dose-related analgesia over the range of 200-800mg, as shown in Fig 1.

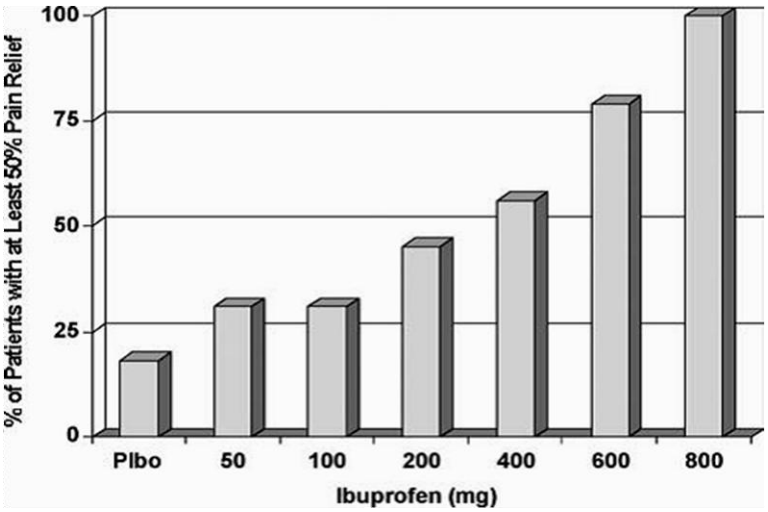

Fig 1. Dose-related analgesic effect of ibuprofen for treating acuteinflammatory pain. Data are taken from the The Oxford League Table of Analgesic Efficacy (31) and represent a meta-analysis ofrandomized clinical trials where post-operative patients were treated with either placebo (Placebo) or with ibuprofen (50-800mg) and the results are plotted as the percentage of treated patients who reportat least 50 per cent relief from their pain (N = 76 – 4700 patients/group).

Ibuprofen should be considered the drug of first choice for management of acute inflammatory pain in patients who can tolerate this class of drug. Conventional oral formulations are very effective over a dose range of 200-800mg (not to exceed a total daily dose of 3200mg).

Paracetamol and paracetamol-opioid combinations

Paracetamol (also known as acetaminophen in some countries) acts primarily in the central nervous system. 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.

Menhinick et al (32) compared 600 mg of ibuprofen with 600 mg ibuprofen/1000 mg acetaminophen combination and with a placebo in 57 patients with moderate to severe endodontic pain. They found the ibuprofen/acetaminophen combination to be the most successful when looking at an 8-hour postoperative period. Two of the 57 patients required a rescue medication (300 mg acetaminophen/30 mg codeine).

The usual recommended adult dose of paracetamol is 500-1000mg every four to six hours (up to a maximum of 4000mg per day).Acetaminophen with the combinations of acetaminophen/ibuprofen and acetaminophen/ codeine is more effective for postoperative pain.

The opioids (narcotics)

Narcotic analgesics are most commonly prescribed for relief of severe pain.The opioids produce analgesia by activation ofopioid receptors. Three major families of opioid receptors have been cloned: the mu, kappa and delta opioid receptors.33The most important opioids used in acute pain management include morphine, oxycodone, fentanyl, nalbuphine, buprenorphine and tramadol. Simon has theorized that the binding of opiates to receptors causes the release of sodium, which then enhances analgesia. Also, the endorphins may inhibit the production of cyclic AMP, which might counteract the pain-enhancing properties of the PG's 34. Opioid analgesia occurs by activation of opioid receptors expressed on neurons in supraspinal sites, spinal sites and in peripheral tissue. Opioids are highly effective analgesics but they also have a concomitant high incidence of side effects. Itincludes nausea, emesis and respiratory depression. In the clinical setting of treating ambulatory acute dental pain, opioids are used in low dosages that provide relatively minor adverse effects at the cost of reduced analgesia.Opioids are frequently combined with paracetamol or more recently with ibuprofen in treating acute dental pain. The combination of 600-650mg of paracetamol with 60mg of codeine produces very effective analgesia in post-operative pain patients(35).

Placebos

It has been known for about forty years that a remarkably constant proportion (about 1/3) of all patients obtain significant relief from severe pain by taking sugar pills or other inert substances, known to the medical profession as "placebos".

They act by alleviating anxiety and are fairly effective in a high percentage of cases. As analgesics, they mimic the action of active drugs.Placebos are 10 times more effective in relieving pain of pathological origin than they are in relieving contrived pain (36). Their greater effectiveness is based on their ability to control the anxiety present in a diseased state, which is more intense than the anxiety in an experimental situation. Researchers at U.C.S.F. hypothesized that the physiological mechanism behind placebo analgesia is the release of endorphins.The therapist himself exerts a potent placebo effect.A sympatheticand professional attitude on the part of thedentist can provide a most important therapeutic benefit.

Long Acting Local anesthetics

Bupivacaine, a long-acting amide local anesthetic, is a chemical analogue of mepivacaine with high lipid-solubility and protein-binding characteristics. These properties contribute to bupivacaine's greater potency and anesthetic duration as compared to other local anesthetics used in dentistry. The prolonged anesthesia it produces has been shown to limit postoperative pain following third molar extractions and endodontic procedures. Bupivacaine 0.5% with 1:200,000 Epinephrine provides a safe and valuable alternative to the anesthetic agents presently available in dentistry.

Establishment of Drainage

In the presence of suppuration,drainage of exudate is the most effective methodfor reducing pain and swelling.Drainage, upon access to the pulp cavity, releases purulent or hemorrhagic exudate from the periapical tissues & may reduce periapical pressure in symptomatic teeth with radiolucent areas (37).

Drainage is most simply accomplished by removing the temporary dressing from the root canalor by removing the temporary filling in the access opening. In some instances passing a root canal instrument, such as a file orreamer, through the in the canal may help to establish the flow of exudate. In exceptional cases, theexudate is either absent or cannot be evacuated through the root canal. Surgical intervention is then necessary. The removal of the alveolar bone over the apex of the tooth root (creation of an artificial sinus tract),

or a soft tissue incision when swelling has occurred (38) usually affords relief, which is termed as trephination.After the exudation is reduced, the access opening to the root canal can be temporarily closed again. Many endodontistsprefer to leave the root canal open until symptoms have subsided.

Intracranial Medicaments

Intracanal medicament should be non-antigenic, nontoxic, and non-carcinogenic to tissues surrounding the tooth. In addition, it should have no adverse effects on the physical properties of exposed dentin or the sealing ability of filling materials. Ineffectiveness of saline as a root canal irrigant(39)have resulted in the use of antiseptic intracanalirrigants and medications. Sodium hypochlorite (NaOcl) is currently the most commonly used root canal irrigant. Advantages of this popular irrigant include its ability to dissolve organic substances present in the root canal system, its antimicrobial activity and its low cost. The major disadvantages of NaOCl are: (a) significant toxicity when injected into periradicular tissues, (b) disagreeable smell and taste, (c) risk of bleaching clothes, and (d) corrosion of metal objects (40).

No irrigation solution has been found capable of demineralizing the smear layer and dissolving organic tissue simultaneously (41). Therefore, the adjunctive use of chelating agents such as EDTA or citric acid (CA) is suggested in order to remove and prevent the formation of the smear layer associated with root canal instrumentation (42). EDTA is a polyprotic acid whose sodium salts are non-colloidal organic agents that can form nonionic chelates with metallic ions (42, 43). A recently published outcome investigation indicated that 2.5% to 5% NaOCl followed by 17% EDTA had a profoundly beneficial effect on secondary nonsurgical root canal treatment success while having a marginal effect on the original treatment (44).

Chlorhexidine (CHX), a bisguanide, is stable as a salt although it dissociates in water at a physiologic pH, releasing the CHX component. It is frequently used at concentrations between 0.2% and 2%and exhibits an optimal antimicrobial activity at a pH of 5.5 to 7.0 depending on the buffering agent used and the organism studied (45). The most common preparation is CHX gluconate. It has been recommended that CHX be used as either an alternative or an adjunct root canal irrigant because of its antimicrobial qualities.Some investigations suggest that NaOCl is more effective as an antimicrobial agent compared with CHX. One in vivo study showed 2.5% NaOCl was a more effective antimicrobial agent compared with 0.2% CHX (46).However, an in vitro study (47) using a bovine root model showed that CHX had a similar antimicrobial effect as NaOCl, whereas another investigation into bovine dentinal tubule disinfection comparing NaOCl and CHX 0.2% to 2% found no difference in antimicrobial efficacy between either solution at these concentrations (48).

Torabinejad and associates recently investigated the ability of a mixture of citric acid, doxycycline, and Tween 80 (MTAD) to remove the smear layer and disinfect contaminated root canals. Their results show that MTAD is effective as a final rinse in removing the smear layer (49) and is also capable of eradicating bacteria from infected root canals (50). In addition, they have shown that MTAD is a biocompatible material (51) and has minimal effects on the physical properties of the tooth (52).In an in vitro investigation, the cytotoxicity of MTAD was compared to that of some of the commonly used irrigants and medications. Based on the results of that study, MTAD has less cytotoxicity than Eugenol, 3% H2O2, Ca(OH)2 paste, 5.25% NaOCl, Chlorhexidine as well as EDTA (51).

Acupuncture

Acupuncture is used an alternative therapy for relieving dental pain, In the Geneva WHO 2003 report, pain in dentistry, including dental pain, facial, and postoperative pain, were listed among the conditions for which acupuncture appears to be an effective treatment [53,54]. However, in a systematic literature review [55], according to data analysis, acupuncture can be effective in relieving dental pain, either during surgical procedures or after surgery.Acupuncture wasreported to be effective (at the 90%+ level) for the relief of "tooth-related pain." In this group were an unspecified number of patients who complained of intense

Postoperative endodontic pain; their pain was reduced to tolerable levels within 15 to 20 min. This relief lasted indefinitely in almost 50% of the cases(56).

Acupuncture involves inserting thin needles in some points on the surface of the body, known as acupuncture points, in order to obtain a therapeutic response, with the aim of treatment and prevention of disease [56]. When a needle is inserted into the acupoint, a specific feeling called **De qi** is felt, which can present as pain, numbness, heat, weight, or distention around the area where the needle was inserted, and this feeling can radiate along the path of the meridian that belongs to the point stimulated. It is a desired and necessary effect for acupuncture to be effective (57,58). The exact mechanism of action of acupuncture has not yet been established [58 acupuncture analgesia could be a technical adjunct to pain control in patients with acute dental pain, contributing to the restoration of health with social benefit. However, further studies are needed to increase the understanding of its effects.

IV. Discussion

The main factors contributing to postoperative pain and discomfort can be classified as (a) flora of infected root canals, (b) host factors, and (c) operative factors. A number of antibacterial and chelating substances have been recommended for cleaning and shaping of root canals. Significantlyfewer flare-ups occurred in patients taking analgesics and antibiotics as contrasted to patients not taking these medications, but there were significantly fewer flare-ups in patients taking analgesics than those patients taking only antibiotics.In flare-up cases, if infection is not dealt with by the use of antibiotics, dangerous cellulitis and serious life-threatening incidences can occur. These include osteomyelitis, septicemia, Ludwig's angina, cavernous sinus thrombosis, orbital cellulitis, and intracranial abscess .New endodontic technology and materials have been incorporated into the clinical practice for the endodontic management of flare up

V. Conclusion

The ability to effectively manage pain represents a critical skill of the prudent practitioner.A number of factors responsible for pain and swelling during and after endodontic therapy have been presented. In addition, the currently available treatment modalities for such flare-ups have been discussed.

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