Review Article

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MANAGEMENT OF POST ENDODONTIC PAIN FOLLOWING SINGLE VISIT ENDODONTICS: A REVIEW

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ABSTRACT:

The main objective of performing root canal therapy is to eliminate bacteria from the infected root canal system or to remove inflamed pulp tissue and close it with a biologically acceptable filling material. If this treatment manages well, regardless of the number of visits, it will create a favorable environment for healing. The recent advances in Endodontic technology, attracts the dental practitioners as well as the Endodontist to perform the root canal treatment in one visit. The purpose of this paper is to review some arguments regarding prevention of occurrence of post endodontic pain after single visit endodontics.

Keywords: Single Visit Endodontics, Post Endodontic Pain, Low Level Laser

INTRODUCTION:

The evolution of newer techniques, instruments, materials and better understanding of canal anatomy, has changed the face of endodontics totally. One of the latest concepts that have emerged is the single visit root canal therapy. Single-visit root canal treatment has become a common practice and offers several advantages, including a reduced flare-up rate, decreased number of operative procedures and no risk of inter-appointment leakage through temporary restorations.[1] The major consideration regarding one appointment endodontics has been the concern about post operative pain. The purpose of this paper is to review some arguments regarding prevention of occurrence of post endodontic pain after single visit endodontics that are the basis for the efficiency and reliability of single visit root canal treatment.

FACTORS INFLUENCING POST ENDODONTIC PAIN:

Postoperative pain is one of the primary problems in endodontic treatment. Although the success of endodontic treatment is highly related to the elimination or reduction of post-endodontic pain, many clinical studies have reported varying degrees of pain, ranging from 25 to 40%.[1,2,3]

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Certain factors may influence the progression of postoperative pain, such as a history of preoperative pain and the need for re-treatment[4,5]. Although microorganisms are usually regarded as the most common cause of postoperative pain, other causes include mechanical or chemical injury to pulpal or periradicular tissues. [6]

Current literature on single-visit versus multiple-visit endodontics provides conflicting opinions and recommendations, however, recent clinical reports, have shown that patients generally tolerate and prefer single-visit endodontic therapy [7,8,9]. Therefore, single-visit root canal treatment has become a common practice and offers several advantages, including a reduced flare-up rate, decreased number of operative procedures and no risk of inter-appointment leakage through temporary restorations [7]. The completion of endodontic therapy in a single appointment has been currently used [10]. Some studies found that certain preoperative characteristics lead to postoperative pain, while others found that those same characteristics have no effect on postoperative pain. *Genet* [11], found that a radiolucency of 5 mm or greater produced postoperative pain in multivisit root canal therapy, while *Fox* [12], found that a radiolucency was less likely to cause postoperative pain in one visit root canal therapy. Preoperative conditions may assist the practitioner in determining if the patient will experience postoperative pain but other factors can also produce post-endodontic pain.

Certain iatrogenic circumstances can lead to post-endodontic pain. The operator can induce post-endodontic pain by extruding debris, instruments, paper points, filling materials or disinfectant outside of the canal and into the periapical tissues [13]. Unfortunately these situations are sometimes unavoidable and result in post-endodontic pain.

SINGLE VISIT VS MULTIPLE VISIT ROOT CANAL TREATMENT:

The number of office visits required to complete root canal therapy has been continually argued. The incidence of postoperative pain between one-visit endodontics and multiple-visit endodontics has been explored. Fox et al. 1970 evaluated postoperative pain in 247 teeth following complete, one-visit endodontic treatment. Within 24 hours following treatment, 90% of the patients showed little or no spontaneous pain and 82% had little or no percussion sensitivity [12]. Mulhern et al. 1982 concluded that no difference existed in postoperative pain and the number of visits required to complete the root canal procedure [14]. Morse et al. 1987 studied 200 cases and found 98.5% of the patients showed no or slight pain after one appointment root canal therapy [15]. Fava et al. 1989 from Netherlands found no difference in the incidence of pain between one and two visit cases [8].Thorpe. 1991 reported no flare ups in one appointment cases with no apical lesions [16]. Bayram Ince. 2009 compared the incidence of postoperative pain after single-and multi-visit endodontic treatment of teeth with vital and non-vital pulp and found No

significant difference in postoperative pain between vital and non-vital teeth [17]. Su et al. 2011 compared healing rate and post operative pain of single visit versus multiple visit treatments in infected root canals [18]. Samita singh. 2012 compared the intensity of post obturation pain after single or multiple visit root canal treatment on single rooted teeth in a randomized controlled trail and concluded that the incidence and intensity of post obturation pain experience were not significantly different [19]. Sumita Bhagwat. 2013 compared the post-operative pain following single visit endodontics in vital and non-vital teeth, with and without periapical radiolucency and found no statistical difference between incidence of pain in vital and non-vital teeth without periapical radiolucency. Non-vital teeth with periapical radiolucency exhibited relatively less pain as compared with non-vital teeth without periapical radiolucency [20].

USE OF NSAIDS FOR POST ENDODONTIC PAIN:

Ideally, root canal therapy would eliminate all pain that exists in the involved tooth. Unfortunately, the physiodynamics of the inflammatory process do not allow for pain to immediately disappear once the source of the pain is removed. An acute inflammatory process causes increased hydrodynamic pressure in the periodontal ligament space, resulting in a pain response. This inflammatory process may arise from procedures completed during the root canal procedure. These include haemorrhage resulting from pulpal extirpation, cleaning and shaping of the root canal systems, irrigation, intracanal medications and/or root canal obturating materials [21]. Injury to the periradicular tissue initiates the inflammatory cascade. Inflammatory mediators; histamine, serotonin, bradykinin, prostaglandin, and leukotriene are released, causing increased vascular permeability and eventually pain [22,23].

Winter et al. 1978 compared the effectiveness of 400 mg and 800 mg of ibuprofen to 650 mg of aspirin, 65 mg of propoxyphene HCl, and a placebo in 510 patients experiencing pain subsequent to oral surgery procedures. Ibuprofen, at both doses, was shown to be more effective for both degree and duration of relief from pain[24]. Flath. 1987 concluded that prophylactic administration of flurbiprofen significantly reduced post-endodontic pain in patients who were symptomatic before treatment, compared to patients who received a placebo [25]. Torabinejad et al.1994 evaluated the effectiveness of nine different medications on postoperative pain following complete instrumentation and following root canal obturation. In the study, three factors (preoperative pain, apprehension, and types of medication) were found to be significant in determining post instrumentation pain. In patients with moderate to severe preoperative pain, ibuprofen, ketoprofen, erythromycin base, penicillin, and methylprednisolone plus penicillin were more effective in controlling postoperative pain than a placebo within the first 48 hours following complete instrumentation[6]. Dionne et al.2003 evaluated relative efficacy of selective cox-2 inhibitor compared with over the counter

ibuprofen. Both drugs significantly reduced pain compared with placebo [26]. Hakan Arslan et al.2006 evaluated effectiveness of tenoxicam and ibuprofen for pain management following endodontic therapy. Results showed that in the 6 hr period both 20 mg tenoxicam or 200 mg ibuprofen provided significantly better pain relief than placebo [27]. The ultimate goal of analgesic use is pain relief. Nonsteroidal anti-inflammatory drugs inhibit prostaglandin synthesis by decreasing the activity of the enzyme cyclooxygenase, which results in decreased formation of prostaglandin precursors. Researchers have discovered that the cyclo-oxygenase enzyme exists as two separate entities, Cox-1 and Cox-2. Cox-1 synthesizes protective prostaglandins, which preserve the integrity of the stomach lining and maintain normal renal function. Cox-2 is induced by pro-inflammatory cytokines and growth factors, which implies that Cox-2 plays a role in both inflammation and control of cell growth [28].

Ibuprofen is one of the most effective and commonly used NSAIDS for control of postoperative pain associated with root canal treatment and it has good efficacy and safety profile.

LOW-LEVEL-LASER-THERAPY (LLLT) LASERS:

Recently rapid developments in laser technology and better understanding of bio-interactions of different laser systems have broaden new horizons for clinical use of laser in contemporary endodontics. A laser consists of a lasing media in a resonating cavity, and an energy source. The supplied energy “pumps up” the lasing media to stimulate emission of radiation. Different types of lasing media have their specific wavelengths of radiation. Lasers are characterized by emitting monochromatic and coherent light.

Lasers used for LLLT are typically of class 3B, classified by an average output power range between 5-500 mW. The unit for irradiated energy per second is W, also termed the mean output power (MOP). Commonly used wavelengths in LLLT are in the red- and near-infrared band (600–1000 nm) [29], where the energy absorption in water and cutaneous melanin pigment is low [30].The unit for delivered energy in an irradiated point in LLLT is Joule (J), also called the energy dose. Another element in LLLT is the laser beam spot size (cm^2) or the cross section area. The spot size is critical for power density (mW/cm2) calculations but is hard to define as the beam power distribution is not homogeneous. In addition to the spot size, the probe lens also shapes the laser beam. Commonly used laser probe lenses are flat or convex. A flat lens does not change the shape of the beam, while a convex lens reduces the natural angle of beam divergence caused by the laser diodes.

M. B. Kreisler et al. 2004 evaluated the effect of low level laser application on postoperative pain after endodontic surgery in a double blind, randomized clinical study. The results revealed that the pain level in the laser group was lower than in the placebo group throughout the 7 day follow-up period. The differences, however, were significant only on the first postoperative day [31]. Ahmet Eralp et al.2006 evaluated the efficacy of low

power diode laser for the treatment of dentin hypersensitivity and demonstrated that the laser irradiation is efficient in the treatment of hypersensitivity [32]. Youssef M et al. 2007 evaluated the effect of low-level laser therapy during orthodontic movement. The velocity of canine movement was significantly greater in the lased group than in the control group. The pain intensity was also at lower level in the lased group than in the control group throughout the retraction period [33]. Mohammad Asnaashari et al.2011 Evaluated Pain Reduction Using Low Level Laser Irradiation in Single-Visit Endodontic Compared to the placebo group, post-endodontic pain was significantly reduced in LLLT group at 4, 8, 12, and 48 hours [34].

DISCUSSION:

The basic biologic rationale for achieving ultimate success with root canal treatment consists of eliminating microorganisms from the entire root canal system and creating an environment that is most favorable for healing [34,35,36]. Two approaches have been proposed in this regard. In one approach, residual bacteria are eliminated or prevented from repopulating the root canal system by introducing an inter appointment dressing during the root canal treatment. The second approach is aimed at eliminating the remaining bacteria or rendering them harmless by entombing them in a complete and three dimensional obturation, finishing the treatment in one visit, to deprive the microorganisms of nutrition and the space required to survive and multiply.

In recent decades, the discussion on single- or multiple-visit root canal treatment has gained attention; however, no consensus was reached [37,38,39]. This might be explained by the inconsistencies in the design, participants, intervention, and outcome measures and small sample sizes among studies. The outcomes of endodontic treatment might be influenced by several factors such as clinical approaches, experience of operators and evaluators, location and size of periapical lesion, and follow-up periods [40]. Moreover, the pre-treatment status of pulp has been suggested to have a considerable influence on the outcome of endodontic treatment [41,42].

The adoption of clinical procedures in endodontic therapy depends not merely on their efficacy or biological consequences but also on minimization of patients' discomfort. Therefore, single-visit root canal treatment has become a common practice and offers several advantages, including a reduced flare-up rate, decreased number of operative procedures, and no risk of inter-appointment leakage through temporary restorations [1]. A major concern in single visit endodontic therapy is incidence of post-operative pain and healing following the treatment. The fear that patients will develop post operative pain and that the canal has been irretrievably sealed has probably been the greatest deterrent to single visit endodontic therapy.

A lot of research has been done on various treatment options to prevent occurrence of post endodontic pain. Some authors have

suggested occlusal reduction for minimizing post endodontic pain [43]. The most common approach has been preoperative administration of NSAIDs. It has been demonstrated to reduce postoperative pain in oral surgery models and in RCT models [10,25,26,44,45].

Prophylactic oral administration of NSAIDs before RCT can block the cyclo-oxygenase pathway and by this application, the pain sensation can be blocked even before it begins [10]. In parallel with this opinion, researchers have showed that preoperative administration of NSAIDs decreased pain level at the initial hours after RCT [11,25]. By administering NSAIDs prior to root canal therapy, the cyclo-oxygenase pathway can be blocked and the pain sensation can be prevented before it even begins. Recently rapid developments in laser technology and better understanding of bio interactions of different laser systems have broaden new horizons for clinical use of laser in contemporary endodontics. Activation of microcirculation, along with cellular metabolism has been observed following LLLT [46,47,29]. Although the mechanism of pain relief subsequent to LLLT still needs to be studied, pain mediation and stimulation of endorphin production are proposed [48]. Moreover, some researchers attribute the analgesia to anti-inflammatory and neural effects of LLLT [49], including stimulation of nerve cell and lymphocyte respiration, stabilization of membrane potentials, and the release of neurotransmitters in the inflammatory tissue [50,51,52]. In addition, elongation of substance P and CGRP-rich (Calcitonin Gene-Related Peptide) neuritis was found to be reduced in vitro [53].

Currently the following analgesic effects are recognized:

1. Low-power lasers inhibit the release of mediators from injured tissues. In other words, they decrease concentration of chemical agents such as histamine, acetylcholine, serotonin, H+and K+, all of which are pain mediators.

2. Low-power lasers inhibit concentration of acetylcholine, a pain mediator, through increased acetylcholine esterase activity.

3. They cause vasodilatation and increase blood flow to tissues, accelerating excretion of secreted factors. On the other hand, better circulation leads to a decrease in tissue swelling.

4. They decrease tissue edema by increasing lymph drainage. They also remove the pressure on nerve endings, resulting in stimulation decrease.

5. These lasers decrease sensitivity of pain receptors as well as transmission of impulses.

6. They decrease cell membrane permeability for Na + and K + and cause neuronal hyperpolarization, resulting in increased pain threshold.

7. Injured tissue metabolism is increased by electromagnetic energy of laser. This is induced by ATP production and cell membrane repolarization.

8. Low-power lasers increase descending analgesic impulses at dorsal spinal horn and inhibit pain feeling at cortex level.

9. They balance the activity of adrenalin and noradrenalin system (autonomous system) as a response to pain.

10. Low-power lasers increase the urinary excretion of serotonin and glucocorticoids, increasing the production of β-endorphin [54].

CONCLUSION:

The aim of the endodontic therapy to achieve the resolution of the disease means elimination of the etiology, which means elimination of bacteria. Therefore every time we can get free microorganisms canals we can perform single visit root canal treatment. Post-operative pain associated with single-appointment root canal treatment is same as the post-operative pain associated with two-visit treatment. Prophylactic administration of NSAIDS can prevent occurrence of post endodontic pain. Recently LLLT has also shown promising results in controlling post endodontic pain.

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