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An invo comparative evaluation of the anti-inflammatory potential of two final rinse irrigants during single visit endodontic therapy in patients suffering from acute irreversible pulpitis

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Abstract

Aim: The aim of this study was to evaluate and compare the anti-inflammatory potential of two final rinse irrigants viz green tea and dexamethasone during single visit endodontic therapy in patients suffering from acute irreversible pulpitis.

Materials and Methods: 75 patients who visited the Department of Conservative Dentistry and Endodontics , Faculty Of Dental Sciences, SGT University ,Gurgaon, Haryana with a chief complaint of spontaneous pain or pain on lying down in the single rooted teeth were randomly divided into three groups of 30 ,30 and 15 patients. Group 1: Green tea (Organic India), Group 2: Dexamethasone (Cadila Pharmaceuticals), Group3: Saline (Placebo). A questionnaire containing VAS was given and explained to each patient to record the intensity of pain felt preoperatively and at 6, 12, 24,72 hours and 1week postoperatively. The data was accumulated and statistically analyzed.

Result and Conclusion: In accordance to this study, Dexamethasone showed statistically significant reduction in post-operative pain followed by Green tea and Normal Saline.

Keywords: Dexamethasone, Green tea, Final rinse irrigant, single visit endodontic therapy

Introduction

Pain is defined as the unpleasant sensory and emotional experience associated with actual or potential tissue damage or described in terms of such damage.[1] Pain has both the physiological and psychological component and endodontic post-treatment pain is a matter of concern to both the endodontist and the patient.[2] Although presence

of post-treatment endodontic pain is not an indicator of failure but its management is a strong component for clinical excellence.[3] Endodontic treatment by itself can trigger the release of inflammatory mediators into the surrounding periapical tissues as a result of which pain fibers gets stimulated. Presence of post-treatment endodontic pain is a multifactorial phenomenon and no single reason can be attributed to its cause and these factors can lead to pulpal or peri-radicular injury which are induced or exacerbated during the root canal treatment.[4] It is due to peri-radicular inflammation, edema forms and leads to increased interstitial tissue response leading to pain.

Control of factors that lead to peri-radicular injury can decrease the incidence of post-treatment endodontic pain. Considering the role of inflammatory mediators like prostaglandins and leukotrienes; a possible strategy for reduction of post-operative pain could be the local use of anti-inflammatory agent adjacent to inflamed tooth to decrease the production of inflammatory mediators.[5] Steroids like dexamethasone, prednisolone and triamcinolone acetonide are used as an endodontic anodyne for their anti-inflammatory properties.[6] Due to potential harmful reactions, safety concerns and ineffectiveness of allopathic forms, utilization of preparations from therapeutic plants has expanded in the course of the last few decades.[7-9] Green tea is a conventional drink of Japan and China and is derived from the shrubs of tea plant Camellia Sinesis.[10,11] The health benefits of green tea are mainly due to its polyphenol content particularly flavanols which comprises of 30% of fresh leaf dry weight.[12] Green tea polyphenols have anti-inflammatory properties.

The present In vivo study was designed and conducted to evaluate and compare the anti- inflammatory potential of green tea and dexamethasone as a final rinse irrigant used during single visit endodontic therapy on post- operative pain experience, in patients suffering from acute irreversible pulpitis.

Materials and methods

The present In-vivo study was conducted in the Department of Conservative Dentistry and Endodontics, SGT Dental College and Research Institute. Approval was obtained from the institutional ethical committee. Seventy-five patients with acute irreversible pulpitis were selected for the study. Inclusion criteria were single rooted teeth, age between 18-50 years of age with no systemic disease, women who are not pregnant, no history of taking analgesics in the previous 12hrs, radiographically a sound periodontal apparatus, no history of trauma to the tooth involved, no peri-apical radiolucency related to the involved tooth, no para functional habit, no pus or inflammatory exudate draining through the canal were selected for this study. These patients were randomly divided into three groups. Seventy-five chits with the name of final rinse irrigant were placed in a jar and the patient was asked to pick a chit. Depending on which group was selected, treatment was performed and the chit was discarded.

Before beginning of the treatment, informed consent was obtained from each patient.

After explanation of the treatment procedures, the tooth was anaesthetized, access cavity was prepared, working length was confirmed and cleaning and shaping was done using Protaper rotary file system (Dentsply Mallifer). During each instrumentation copious amount irrigation was done using 4% sodium hypochlorite (Emplura) and file patency was confirmed. Final rinse was done with Saline and 17% EDTA (3ml) with 1-minute contact.

Just prior to obturation, experimental irrigating solutions were used.

The patients were divided into three groups:

	Group I (n=30)	Group II (n=30)	Group III (n=15)
Final rinse Irrigant	Green Tea	Dexamethasone	Saline (Placebo) Control Group

The canals were dried with absorbent paper point and obturated using AH Plus sealer and warm thermoplasticized gutta percha technique. The cavity was sealed using Cavit temporary restorative material.

Along with the Post-operative instructions an "Escape Medication" (Ibuprofen - 400 mg) was given to each patient. The patient was explained to take this escape medication only if needed and to record the time it was taken in the pain survey.

The intensity of the preoperative pain was measured by instructing the patient to complete a Visual Analogue Scale (VAS). The scale was devoid of any marking and patient was explained as that extreme left marking on scale corresponds to no pain and extreme right to maximum pain. The patients were asked to mark on the scale depending on intensity of pain experienced preoperatively and 6, 12 , 24 and 72 hours and 1 week postoperatively . Once forms were submitted, scoring criteria was marked as follows: none (score 0), mild (scores 1–33), moderate (scores 34–66) or severe (scores 67–100). At the second appointment, the questionnaire was collected back from the patient and the patient was subjected to further treatment of the tooth.

Results

	Normal Saline	Dexamethasone	Green Tea	p value
PREOP TO 6 HOURS MEAN	35.67	73.47	46.50	< 0.001*
PREOP TO 12 HOURS MEAN (p value < 0.001*)	39.53	82.27	59.47	
PREOP TO 24 HOURS MEAN (p value < 0.001*)	46.33	83.93	64.57	
PREOP TO 72 HOURS MEAN (p value < 0.001*	57.20	83.93	68.67	
PREOP TO 1 WEEK MEAN (p value < 0.001*)	64.13	83.93	71.80	

Table 1: Comparison of mean pain reduction score from preoperative to 6, 12 , 24, 72 hours and 1 week postoperatively between Normal Saline, Dexamethasone and Green Tea using One-way Anova test. (*-significant)

Mean reduction in pain score (from preop pain)	Normal saline & dexamethasone	Normal saline & green tea	Dexamethasone and green tea
6 hours (Mean difference / p value)	-10.33/0.002*	-3.17/0.811	7.17/0.009*
12 hours (Mean difference / p value)	-42.73/< 0.001*	-19.93/< 0.001*	22.80/< 0.001*
24 hours (Mean difference / p value)	-37.60/< 0.001*	-18.23/< 0.001*	19.37/< 0.001*
72 hours (Mean difference / p value)	-26.73/< 0.001*	-11.47/0.018*	15.27/< 0.001*
1 week (Mean difference / p value)	-19.80/< 0.001*	-7.67/0.039*	12.13/< 0.001*

Table 2: The inter-group comparison of mean reduction in pain score between Normal Saline, Dexamethasone and Green Tea using Post-hoc Bonferroni test. (*-significant)

The mean reduction in pain score from pre-operatively to 6, 12, 24, 72 hours and 1 week post-operatively was significantly more among Dexamethasone in comparison to Normal Saline and Green Tea. Green Tea which was

significantly more effective than Normal Saline at 12, 24, 72 hours and 1 week post-operatively in reduction of pain. (TABLE 1 & 2)

Discussion

One of the main goals during and after the root canal treatment is the relief from pain as its occurrence after the treatment is undesirable. Endodontic pain reflects the pulpal or periapical inflammation[13.] It is the pulpal irritants that initiate cellular, humoral and neurovascular responses in pulp tissue thereby causing pain.[14] Pulpal irritants can be broadly classified under three categories namely microbial, chemical and mechanical. Microbial causes lead to imbalance in host-bacteria relationship during intracanal procedures that causes pain. There are certain situations that facilitate microorganisms to cause pain like apical extrusion of debris, incomplete instrumentation leading to changes in endodontic microbiota or secondary intraradicular infections. Non-microbial causes include mechanical and chemical. Mechanical causes can be like over instrumentation that damages the periapical tissue resulting in inflammatory response which may result in extrusion of debris peri-apically. Another mechanical cause for inflammation is over extended obturation that compresses the periapical tissue that can induce pain. Chemical irritation includes apical extrusion of irrigant or intracanal medications and these can be cytotoxic to host tissue leading to pain.[15]

The insult to pulpal or periapical tissue from any of the above-mentioned factors can lead to the release of inflammatory mediators.[16] Inflammatory mediators include prostaglandins, leukotrienes, histamine, bradykinin, serotonin and substance P.[17,18] Prostaglandins are derived from arachidonic acid through cyclooxygenase pathway. Arachidonic acid is a major component of mammalian cell membrane phospholipid and derived from phospholipid A. It gets metabolized by either cyclooxygenase pathway or lipoxygenase pathway. Cyclooxygenase pathway will produce prostaglandins while lipoxygenase pathway will result in the formation of leukotreines.[17] As these inflammatory mediators gets released in the periapical area, pain fibers get stimulated directly. Moreover, there is increase in vascular dilation and permeability that results in increase in oedema and increased interstitial tissue pressure.[18,5] As the fluid accumulates in the extravascular tissue, the pressure on surrounding nerve endings increases thereby causing pain.[19] It has been seen that level of arachidonic acid is high in cases of inflamed pulp that leads to pain.[13,17] Bradykinin possesses four main pro-inflammatory actions including vasodilation, increased vascular permeability, leukocyte chemoattraction and nociceptor activation. Bradykinin activates the sensory nociceptors and elicit the release of substance P, neurokinin A and calcitonin-related gene peptide via receptor B1 and B2. The pain of acute inflammation is mediated by B1 and chronic is by B2. Therefore, reduction in bradykinin level will lead to an anti-inflammatory effect.[5]

Considering the role of inflammatory mediators in endodontic pain, a possible way for reduction of pain can be achieved through the use of a potent anti-inflammatory agent. However, till date no definitive anti-inflammatory protocol to prevent and control the occurrence of post-endodontic pain has been established.[20]

In the present study we have used dexamethasone, green tea as post-instrumentation, pre-obturation final rinse irrigant for management of post-operative pain. Dexamethasone is an adrenocorticosteroid that has greater anti-inflammatory action than other steroids like it is 25 times more potent than hydrocortisone, 6 times more potent than prednisolone and 5 times more potent than triamcinolone. It has been used as an intra-canal

medicament and irrigant and orally in combination with antibiotics in management of inter-appointment pain.[19]

Herbal products with their less toxic properties have also been used since ancient times in the field of medicine to cure many diseases.[8] Green tea is one such herbal drink popular worldwide and has also been used in dentistry for its varied properties. The health promising effect of green tea are due to the presence of polyphenols in it. Green tea has polyphenols that produces flavanols, flavandiols and phenolic acid and accounts for 30% of dry weight of green tea. Most of the green tea polyphenols are flavanols, known as catechins.[12]

They both inhibit the production of arachiodonic acid metabolites such as prostaglandins, leukotrienes and thromboxanes while NSAIDs are only cyclo-oxygenase inhibitors and prevent the formation of prostaglandins and thromboxanes while there is continual formation of leukotrienes.[7]

In the current study pre-operative pain was recorded for all the patients and following treatment with experimental groups, post-operative pain was recorded 6, 12 , 24, 72 hours and 1 week post-operatively using Visual Analog Scale.

In accordance to this study, Dexamethasone showed statistically significant reduction in post-operative pain followed by Green tea and Normal Saline.

Conclusion

This study concluded that:

1. Dexamethasone was more effective in reducing pain as compared to Green Tea in patients who experienced moderate to severe pain before the treatment and the results were statistically significant.
2. Green tea was effective in reducing post-treatment endodontic pain as compared to placebo and the results were statistically significant.
3. Normal Saline was not as effective as dexamethasone and green tea in reduction of post-operative pain. The reduction in pain was due to the removal of irritants from pulp space and not because of normal saline when used as final rinse irrigant.

Although Post-operative pain is a multifactorial phenomenon, pain management is an important part of the treatment and also the importance of diagnosis, treatment planning, procedural disciplines and operator's skills cannot be neglected.

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