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Effect of different impregnated gutta-percha points on post operative discomfort

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Abstract

The purpose of this study was to compare levels of post operative discomfort after cleaning and shaping of root canals using intracanal medicaments. Two hundreds forty teeth requiring root canal treatment were included. At random, canals were cleaned and shaped with crown-down technique and then dried and one of the following medicaments was used. Group I: medicated with chlorhexidine containing gutta-percha points (Activ points). Group II: medicated with calcium hydroxide containing gutta-percha points and finally group III: with no medicaments. Access cavities were closed with a sterile cotton pellet and cavit. The patients recorded degree of discomfort of various time intervals after cleaning and shaping on a visual analogue scale for 72hr. A significant statistical difference was found in the degree of discomfort between the three groups.

Key wards: Intracanal medicaments, Activ point, Calcium hydroxide points, Pain.

Introduction

Post operative pain after endodontic procedures are an undesirable occurrence for both patients and clinicians [(1)]. Certain factors may predispose to the development of post operative pain, such as preoperative pain and retreatment [(2)]. The causes of post operative pain include mechanical, chemical, and/or microbial injury to the pulpal or periradicular tissue. In fact, it has been suggested that microbial injury is probably the major and the most common cause of post operative pain and some Gram-negative anaerobic bacteria may play an important role in the development of symptoms [(3)].

Acute periradicular inflammation is the most common cause of post operative pain. It can develop as a result of any type of insult from the root canal system. In reality, regardless of the type of injury (mechanical, chemical, and/or microbial injury), the intensity of the periradicular inflammatory response is directly proportional to the intensity of the tissue injury. When periradicular tissues are injured, a myriad of chemical substances are released or activated, which will mediate the events of inflammation, such as vaso dilation, increase in vascular permeability and chemotaxis to inflammatory cells [(1)]. Most of these mediators have been detected in periradicular lesion [(4)]. Although some mediators can cause pain by directs effects on sensory nerve fibers, the major inflammatory event responsible for periradicular pain is the increase in vascular permeability and the

consequent edema, which lead to the compression of nerve fibers [4]. The occurrence of mild pain is relatively common even when the treatment has followed the highest standards and should be expected and anticipated by patients [1].

Proper cleaning, shaping, and irrigation have been shown to significantly reduce and sometime eliminate bacteria from canals [5].

The use of intracanal medications to disinfect the root canal medications to disinfect the root canal system has been advocated [6]. Reasons for the use of intracanal medications are: (a) to eliminate bacteria in the root canal; (b) to prevent bacterial proliferation between appointments; and (c) to act as a physiochemical barrier, preventing root canal reinfection and nutrient supply to the remaining bacteria [7].

From a pathogenic view point, it is unclear whether the infections start with the presence of single or multiple specific species. It also remains to be determined whether the progression of the disease can be associated with a single species within the polymicrobial biofilm in the infected root canal. Based on the frequency of detection and the number of identified virulence factors, *fusobacterium nucleatum*, *peptostreptococcus micros*, *porphyromonas gingivalis*, and *streptococcus intermedius* are among the 10 most important species associated with endodontic infections [8].

A variety of substances have been tested and used for intracanal medication. Among these substances, calcium hydroxide [$Ca(OH)_2$] stands out because of its frequent use and consistent antibacterial activity [9]. Also other intracanal medications, such as chlorhexidine (CHX) and camphor-phenol compounds, demonstrate bactericidal activity. Calcium hydroxide has been the intracanal medication of choice [10]. Calcium hydroxide has been demonstrated to improve dissolution of the pulp tissue by sodium hypochlorite (NaOCl) and provide antimicrobial activity [11]. However, the antimicrobial activity of calcium hydroxide seems dependent upon direct contact with bacteria [10]. Haapasalo and Ørstavik [12] have demonstrated that it's not effective in eliminating bacteria from dentinal tubules. CHX is a broad-spectrum antimicrobial agent that has been advocated as an effective medication in endodontic therapy [13]. As a root canal irrigant and intracanal medication, CHX has an antibacterial efficacy comparable with that of sodium hypochlorite [14] and is effective against strains resistant to calcium hydroxide. CHX may also result in residual antimicrobial activity of the root canal to CHX [15].

To facilitate its application, calcium hydroxide containing gutta-percha points and CHX containing gutta-percha points has been introduced, allowing easy insertion into root canal [16]. A new formulation of a CHX impregnated gutta-percha point, "Activ point" (Roeko, Langenau, Germany), has been marketed. According to the manufacturer, Activ point contain gutta-percha matrix embedded with 5% chlorhexidine diacetate. This innovation allows ease of introduction and retrieval from the root canal [17].

Because of the microbial etiology of the periradicular disease, endodontic therapy should be based on antimicrobial strategies [1]. In addition, if micro organisms are the commonest causative factors of post operative pain, a lower incidence of pain might be expected after the accomplishment of intracanal procedures of this prospective study was to evaluate the incidence of post operative pain after

intracanal procedures based on an antimicrobial strategy.

Materials and methods

Data were examined from 240 teeth from 232 patients that had been referred for root canal treatment to the consultant clinic, college of dentistry, Al-Mustansisia University, Baghdad, Iraq, over a 3-years period. The selected teeth had a necrotic pulp or acute periapical periodontitis. Information was obtained for each patient treated with regard to the presence of preoperative pain. Occurrence of periradicular bone destruction radiographically detected was also recorded, patient age ranged from 18-60 years. Patients were assigned to the medicament group randomly using a random number table; they were not aware of the medicament being used; and all clinical procedures were performed by one endodontist who was not aware which medicament was to be used until the debridement / instrumentation had been completed, when he was informed by the dental assistant which drug was to be used.

Pregnant patients and patients with a history of allergy to any medication used in the study were excluded. Also excluded were patients who required root canal retreatment. Patients who were unable or unwilling to participate in this study were also excluded from this investigation. None of the root canal treatments were completed in one visit. Each patient was anaesthetized with local anesthetic solutions. The rubber dam was placed, the operative field decontaminated with 2.5% NaOCl, and conventional straight-line access preparations were performed. Chemomechanical preparation was completed using the same technique for all teeth, the alternative rotation motion technique. The coronal two-third of the root canals were enlarged with Gates-Glidden burs (sizes varying depending on the root anatomy). In curved canals, initial passive step-back instrumentation was performed to facilitate the use of Gates-Glidden burs as well as to direct their cutting action to the anti curvature dentinal walls. Working length was established 1mm short of the root apex. Apical preparation was completed to the working length with nickel-titanium files, always using a back and forth rotation motion. Master apical files ranged from # 35 to # 60, depending on both root anatomy and initial diameter of the root canal. Preparation was completed using step-back of 1mm increments. Irregation was always performed using 2.5% NaOCl solution. At the conclusion of treatment, the canals were dried and medicated with one of the following medicaments:

Group I (n=80): CHX containing gutta-percha points (Activ Points, Roeko, Germany) were introduced into the root canal. Sterile saline (0.01 ml) was added to wet gutta-percha and avoid dehydration [16].

Group II (n=80): Calcium hydroxide containing gutta-percha points (Conventional points, Roeko, Germany) were introduced into the root canal. Sterile saline (0.01 ml) was added to wet gutta-percha and avoid dehydration [16].

Group III (n=80): No dressing.

Cavities were sealed with a cavit. At the conclusion of each appointment, each patient was given an evaluation sheet and the visual-analogue pain scale was explained (table I). The pain score for the previous night was recorded. The patient was then requested to record the level of pain 4h, 24h, 48h, and 72h after the completion of treatment. The four pain categories were as follows:

0 = No pain

1= Mild pain, which is recognizable, but not discomforting.

2= Moderate pain, which is discomforting, but bearable.

3= Severe, discomfort which is difficult to bear.

Approximately 1wk later, the patients returned the complete questionnaires to their endodontist. The patients who had severe pain or discomfort, swelling or other side effects after their instrumentation appointment could contact us to receive advice or medications. The over all incidence of post operative discomfort was recorded and expressed as a percentage of total number of teeth evaluated. Incidence of post operative pain was also calculated for each studied variable. Data were statistically analyzed using the Chi-square test.

Results

The incidence of post operative pain is presented in table (II). Post operative pain was non-significantly associated with previously symptomatic teeth. No other correlations were detected between the occurrence of post operative discomfort and other clinical conditions.

The over all incidence of sever pain occurred in 3.3% of all cases. There was no significant difference regarding the occurrence of sever pain when comparing symptomatic cases with asymptomatic cases.

Statistical analysis of the percentage of post operative pain (4h to 72h) between the three groups using chi-square showed significant differences ($p<0.05$) between the three groups.

A significant decrease in pain score was observed over the time intervals in all groups (Fig-I).

Discussion

This study can be categorized as a single blind trial from the point of view of the patient. With respect to the operator, it can be regarded as partial blind as he was not a war of the drug to be used until the mechanical preparation of the canal had been completed.

An acute inflammatory response develops in the periradicular tissue as a result of additional results from root canal system, which can be of mechanical, chemical or microbial origin [(1)]. Microbial injury to the periradicular tissues is probably the commonest cause of flare-ups. Although microbial insult can be coupled with iatrogenic factors, it can sometimes occur even when the root canal procedures have been judicious and careful. Apical extension of contaminated debris to the periradicular tissues is one of the principle causes of post operative pain. Forcing microorganisms and their products into the periradicular tissues can generate an acute inflammatory response, whose intensity will depend on the number and the virulence of extruded microorganism [(1)]. Theoretically, the presence of some bacteria commonly associated with clinical symptoms, such as *Porphyromonas Spp.*, *Prevotella Spp.*, *and Fusobacterium nucleatum* in a symptomatic tooth may predispose to post operative pain provided they are apically extruded or allowed to overgrow [(3)].

In complete instrumentation may disrupt the equilibrium of the endodontics microbiota, favoring the overgrowth of some microbial species, which can cause exacerbations. In addition, introduction of new microorganisms in to the root canal

system during treatment, as a result of breakage of the aseptic chain, may be another cause of post operative pain of microbial origin [1].

The main factors contributing to post operative pain and discomfort can be classified as (a) flora of infected root canals, (b) host factors, and (c) operative factors [18]. All instrumentation techniques are reported to cause apical extrusion of debris, even when the file action is maintained short of the apical terminus [19-20]. The difference is that some techniques extrude more debris than other do. Crown- down technique, have been demonstrated to extrude a lesser amount of debris [19-20]. Because the amount of extruded debris may influence the response of the periradicular tissues, crown down instrumentation has theoretically less probability to reduce flare-ups.

The incidence of postoperative pain was associated with treatment of previously symptomatic teeth without periradicular lesions. Studies have shown that the presence of preoperative pain can significantly increase the probability of postoperative pain [21]. Higher incidence of post operative pain in teeth without periradicular lesions might be attributed to a lake of space for pressure release when periradicular bone resorption is absent.

The antimicrobial action materials containing Calcium hydroxide depends on Calcium hydroxide ionization and on the release of hydroxyl ions that promote an increase in the medium PH and its maintenance. Hydroxyl ions have some action on bacterial cells through the destruction of unsaturated fatty acids or phospholipids of the bacterial citoplasmatic membrane [22]. Evaluations after antimicrobial activity of materials containing calcium hydroxide in solid media present some difficulties. The possible buffering of calcium hydroxide PH in this medium can harm its action. The antimicrobial effect of calcium hydroxide is directly related to its capacity of diffusion and alcalinization in the culture medium which can be decreased by the low solubility of the calcium hydroxide contained in the point [16]. This fact could explain the results obtained in this study that shows that the gutta-percha points containing calcium hydroxide showed the least favorable results. Drstler and Ptschelt [17] demonstrated in a vitro study that the major amount of calcium hydroxide was released within the first 24h from the gutta-percha points. To achieve a PH rise within the entire root, calcium hydroxide has to be administered for at least 1week as shown by Nerwich et al [23]. The failure of the gutta-percha points used here may be due to the short- term release of the calcium hydroxide from the points. The amount of calcium hydroxide released may not sufficient to over come the strong buffer capacity of the dentin [24]. In consequence, PH levels may not have been high enough to result in elimination of bacteria. The CHX compound is well established as a single substance for intra oral disinfection with a broad antibacterial activity against gram-negative and positive bacteria and for short-term irrigation of the root canal during an appointment. Contrary to Camphor and Phenolic compounds used for the same purpose, it exhibits considerably less cytotoxic activity. It can be expected to be useful for long-term medication, because it was demonstrated to exert remnant antibacterial activity in the course of impregnating exposed dentine layers [25]. Because of its cationic properties, CHX can be bind to the hydroxyl apatite of dentine [26] and gradual release of this bound. CHX may protect the canal against

microbial colonization beyond the actual medication period [15].

The use of an antimicrobial intracanal dressing is a valuable tool to control endodontics infection. The use of an antimicrobial strategy during the endodontics therapy can significantly remove microorganisms from the root canal and prevent post operative pain.

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Table I. Data collection form and visual-analogue pain scale

Name:---------- Sex: M------- F---------
Age :-----<20----- 21-39 ---------- 40-59 ----------> 65

A- Systemic disease? ----Yes -----No If yes, What? ----------

B- Allergies? ----Yes ----No If yes, What are you allergic to?----------

C- Are you taking any medications? ----Yes ----No If yes, What?----------

D- Do you bleed excessively or bruise easily? ----Yes ----No
E- Do you consider yourself nervous? ----Yes ----No
F- Has your tooth been hurting? ----Yes ----No

Time intervals		None	Mild	Moderate
Severe				
Previous	0	1	2	3
4h	0	1	2	3
24h	0	1	2	3
48h	0	1	2	3
72h	0	1	2	3

Fig. I: Significant decrease in pain score

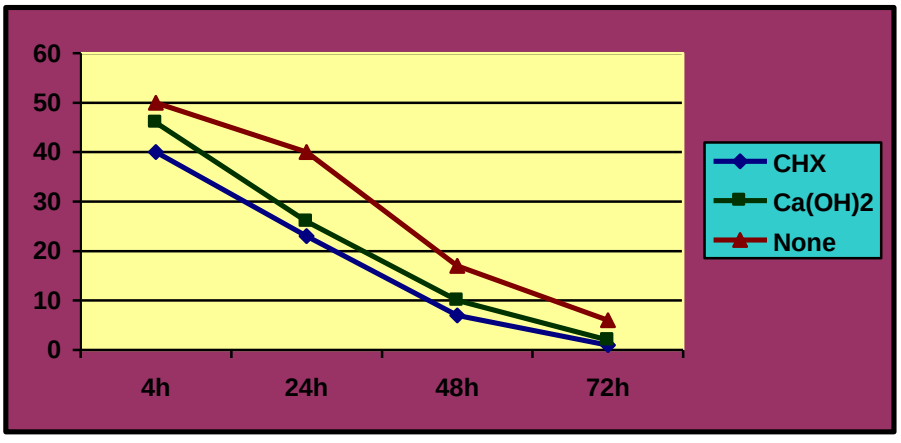

Table II: The incidence of post operative pain

4hr.									
Gr.	n.	None		Mild		Moderate		Severe	
CHX	80	40	50%	22	27.5%	16	20%	2	2.5%
$Ca(OH)_2$	80	34	42.5%	23	28.8%	20	25%	3	3.7%
No dres.	80	30	37.5%	25	31.3%	22	27.5%	3	3.7%
χ^2 = 4hr.	2.877 p-value = 0.0432 * Sig.								

24hr.									
Gr.	n.	None		Mild		Moderate		Severe	
CHX	80	57	71.3%	15	18.7%	8	10%	-	-
$Ca(OH)_2$	80	54	67.5%	16	20%	9	11.2%	1	1.3%
No dres.	80	40	50%	20	25%	19	23.7%	1	1.3%
χ^2 = 24hr.	10.266 p-value = 0.0001 * H.Sig.								

48hr.									
Gr.	n.	None		Mild		Moderate		Severe	
CHX	80	73	91.2%	6	7.5%	1	1.3%	-	-
$Ca(OH)_2$	80	70	87.5%	8	10%	2	2.5%	-	-
No dres.	80	63	78.8%	12	15%	5	6.2%	-	-
χ^2 = 48hr.	13.911 p-value = 0.0001 * H.Sig.								

72hr.									
Gr.	n.	None		Mild		Moderate		Severe	
CHX	80	79	98.7%	1	1.3%	-	-	-	-
$Ca(OH)_2$	80	78	97.5%	2	2.5%	-	-	-	-
No dres.	80	74	92.5%	4	5%	2	2.5%	-	-
χ^2 = 72hr.	6.182 p-value = 0.0001 * H.Sig.								