

Coronal Discoloration Potential after Using Two Root Canal Dressings (Calcium-Hydroxide vs. Triantibiotic Dressing)

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Abstract

Background and Aim: Tooth discoloration of anterior teeth is an important esthetic problem for both the patient and dentist. One of the causative factors in this regard is placing intracanal medicaments. The aim of this study was to compare discoloration potential of calcium hydroxide vs. triantibiotic paste when being placed into the pulp chamber space.

Materials and Methods: Forty extracted upper human central incisors, with no caries or crack were selected for this study. Digital photographs were taken from the buccal aspect of all specimens under a standard situation. RGB/HSB variables were recorded, using Photoshop software. Then access cavities were prepared and canals enlarged using #1, #2, and #3 gates glidden drills and peeso reamers. The teeth were randomly divided into two experimental groups. In group A calcium hydroxide and in group B triantibiotic compound was placed in pulp chamber space. Then access cavities were sealed with a self-curing glass ionomer cement. After incubation of the samples for four months digital photographs were taken in the same standard situation and RGB/HSB variables were recorded. Pre- and post-treatment data were compared and analyzed using paired-t and independent t-tests.

Results: Both experimental groups showed a significant discoloration after four months in their labial surfaces. ($p < 0.05$) Discoloration changes in calcium hydroxide group was much more than that of triantibiotic group but the difference was not significant ($p > 0.05$).

Conclusion: Tooth discoloration was indicated following use of both calcium hydroxide and triantibiotic dressing within the pulp chamber space, but the difference between two groups was not statistically significant. ($p > 0.05$).

Key Words: Discoloration - Calcium hydroxide - Triantibiotic paste

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Introduction

Use of intracanal dressings, root canal filling materials and sealers during root canal treatment are considered among important factors causing coronal discoloration of the teeth [1]. Several investigations have focused on discoloration caused by

intracanal dressings. It has been observed that discolorations are most frequently found in midcervical areas because a decreased thickness of enamel is encountered in this part of the crown and the color of dentin is visible through this thin translucent area [2]. The amount and duration of

the color change caused by different agents is variable [3-5]. It has been depicted that intracanal dressing are capable of inducing color changes I coronal areas of the teeth. Studies revealed that use of calcium hydroxide can cause coronal discoloration in teeth the roots of which filled with gutta percha and AH26 and those that were retreated [1,2]. Van der Burgt et al evaluated the effects of dental materials on tooth color changes [2]. They found that teeth filled with calcium hydroxide and IRM had a black discoloration of their crowns after three weeks. They concluded that penetration and diffusion of the materials happen in their initial setting. Zare et al showed that eugenol-based sealers caused discoloration more that did resin-based counterparts [4]. Kerr and co-workers showed that intracanal dressings and root canal sealers are important factors causing tooth color changes. Belobrou also stated that use of white MTA for vital pulp therapy could cause tooth discoloration [6]. Tinaz and cooleagues evaluated discoloration potential of calcium hydroxide paste and monochorophenol as a medicament in pulp chamber following removal of gutta percha and AH 26 sealer. They showed that calcium hydroxide is able to cause a more pronounced discoloration in comparison with monochorophenol [7]. Parson et al showed that a mild to moderate discoloration happens following use of endodontic sealers. They showed that such discoloration is increased with time in 12 months [9]. Davis and colleagues evaluated coronal tooth color chages following use of Sealapex, Roth 801 and AH26 and found out that all sealers caused changes in tooth color within several weeks, with AH26 showing the maximal discoloration [10]. Recently, a tri-antibiotic mixture has been introced as an intracanal medicament including ciprofloxacin, metronidazole and tetracycline [11-14]. This mixture has shown promising antimicrobial results [15-17]. Incorporation of tetracyclin in this mixture may cause discoloration of the teeth after its application. The aim of this study was to evaluate tooth color changes following application of calcium hydroxide compared with tri-antibiotic mixture.

Materials and Methods

In this experimental in vitro study, 40 central incisor teeth were selected. The teeth were immersed in 2.5% sodium hypochlorite (Darugar, Iran) solution for 12 hours for disinfection. Then the teeth were rined under running water and stored in distilled water. The external surface debridement was carried out using pumice and a low-speed brush. The samples were placed on a black screen under equal and standardized light condition where standard digital photographs were made. RGB (red, green, blue) and HSB (hue, saturation, brightness) conditions were evaluated under the standardized conditions [7,14,15,18] (See fig.1)

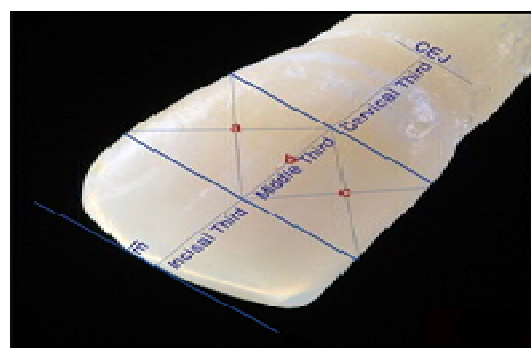


Fig 1: point selection on the samples for RGB/HSB evaluation

Photographs were transferred to a computer and evaluated using Adobe Photoshop CS8 software. In order to determine three points with equal distances on the middle one-third of the teeth, the crowns were divided into three equal cervical, middle, and incisal thirds. Then a perpendicular line was drawn parallel to the long axis of each tooth so that each sample was divided into two equal halves. Then, within the middle third, three points with equal distances were determined. RGB and HSB evaluations were carried out in these three points before placement of the intracanal medicament. After the photographs were saved in compute, the teeth were transferred to a laboratory to have their access cavities prepared using fissure and round burs (Teezkavan Co., Tehran, Iran).

Root canals were prepared and irrigated with normal saline in order to remove the pulpal tissues from the canals. Root canal orifices were enlarged using gated glidden drills (Mani, Japan). The canals were then irrigated with 2.5% sodium hypochlorite solution. Canals were completely dried using absorbent paper points and air spray. Then the orifices were sealed by a 1- to 2-millimeter-thick self-cured glass ionomer cement (ChemFill Superior, Germany). Afterwards, the samples were divided into two groups of twenty each. In group 1 calcium hydroxide paste (Merck, Germany) and in group 2 tri-antibiotic paste including metronidazole (TehranChemie Pharmaceutical Co., Iran), ciprofloxacin (Kharazmi Pharmaceutical Co., Iran) and minocycline (Iran Dau Pharmaceutical Co., Iran) was placed within the pulp chamber using a surgical curette. Then, the access cavities were sealed by self-curing glass ionomer cement. The teeth were then stored in a moist gauze before being transferred for incubation. All samples were incubated for 4 months at 37 degrees centigrade while being immersed in normal saline. The normal saline solution was changed every 3 days. The teeth were then photographed under standardized pre-operative conditions and the images were evaluated by Photoshop software. Pre-and post-operative values were statistically analyzed using t- and paired t-tests.

Results

It was shown that H value (hue) decreased in tri-antibiotic group but the changes were not statistically significant ($p=0.065$).

Evaluation of the S value (saturation) showed that the mean changes in tri-antibiotic group was decreased and teeth had a grayish discoloration following treatment. The statistical analyses showed no significant difference ($p=0.379$) (See table 1).

The mean changes in B value (brightness) indicated that there was a significant increase in tri-antibiotic group ($p=0.000$) (See table 1). The mean RGB indices in tri-antibiotic group was significantly increased ($p=0.000$). Analyses of H and S values showed that the mean hue was decreased in calci-

um hydroxide group. These changes were significant for S index ($p=0.000$) (See table 2).

As a matter of fact teeth showed a grayish discoloration post-operatively.

The mean changes in brightness was significantly increased in calcium hydroxide group ($p=0.000$) (See table 2).

Table 1: Paired t-test for comparison of the changes in HSB and RGB indices in tri-antibiotic group

Study indices	Sig	Number	Mean change
H - HH	0/118	20	-1/637
S - SS	0/522	20	0/653
B - BB	0/000	20	7/595
R - RR	0/000	20	7/526
G - GG	0/000	20	6/136
B.1 - BB.1	0/000	20	4/481

Table 2: Paired t-test for comparison of the changes in HSB and RGB in calcium hydroxide group

Study indices	Sig	Mean change	Number
H - HH	0/072	-1/907	20
S - SS	0/000	-10/741	20
B - BB	0/000	16/215	20
R - RR	0/000	16/319	20
G - GG	0/000	16/417	20
B.1 - BB.1	0/000	16/201	20

It appears that the mean for all hue, saturation and brightness indices decreased but the decrease in saturation index was significantly more in calcium hydroxide group ($p=0.000$). The mean for all three indices increased after the operation in both groups but the mean for changes in brightness (B) index was significant ($p=0.001$).

Discussion

In addition to the sealers, intracanal medicaments are also able to cause tooth color changes. The aim of this study was to compare tooth color changes following use of two different medicaments used within the pulp chamber of the teeth. Discolora

Table 3: T-test results for comparison of mean changes in HSB and RGB in both experimental groups

Group	Number	Mean change	Standard deviation	PV
Tri-antibiotic H	20	-1/1667	3/187	0/852
Calcium hydroxide H	20	-1/0000	2/344	
Tri-antibiotic S	20	0/9833	6/733	0/000
Calcium hydroxide S	20	-13/7667	5/731	
Tri-antibiotic B	20	16/8667	9/932	0/131
Calcium hydroxide B	20	20/8500	5/750	
Tri-antibiotic R	20	42/9667	25/530	
Calcium hydroxide R	20	53/0667	14/542	0/133
Tri-antibiotic G	20	30/0667	26/287	
Calcium hydroxide G	20	51/8667	14/129	0/023
Tri-antibiotic B	20	26/2000	26/148	
Calcium hydroxide B	20	52/1667	14/400	0/001

tions following use of drugs and sealers have been stated to occur two months to one year post-operatively [2,7,8,12,14]. In this study, the samples were not thermocycled because studies showed that thermocycling did not have any effect on coronal discoloration of the teeth [2,8]. The results of the current study showed that the crown of the teeth lost their translucency and hue to a grayish discoloration. It is noteworthy that the mean for these two indices was more in calcium hydroxide group. However, such increase in discoloration in calcium hydroxide was not as high as tri-antibiotic group. The mean changes for RGB index increased in both groups. The results indicate that the samples were darker postoperatively. The current results are in line with Tinaz et al who compared discoloration potential of calcium hydroxide and monochlorophenol following removal of AH26 from the root canal system. Due to the scarcity of studies focusing on tooth discoloration following use of intracanal medicaments it is not possible to compare our results with the relevant literature.

Conclusion

Under the conditions of the present study, it can be concluded that both medicaments were able to

cause coronal discoloration, but the difference between the two groups was not significant. It should be noted that the term discoloration is misnomer because changes can occur in different color indices such as HSB and RGB. Therefore using terms like hue or brightness changes can be more appropriate.

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