



Comparative Study of Physico-Chemical Properties of 17% Root Canal Lubricant: Self Developed vs. Commercially Available

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ABSTRACT

This paper describes the comparative study of Physico - chemical properties of self developed with commercially available root canal lubricant gel. Self developed gel was prepared in house. On the contrary, commercially available gel like File – Rite was purchased from the market. It was found that, there is no significant difference in the above mentioned physico-chemical properties of self developed dental chelating gel as compared to the commercially available gel. The major aim of this study is to see whether self developed and commercially available root canal lubricant show similar physical properties or not and to see its impact on performance during root canal. However chelating efficiency, cleaning & shaping of root canal by using both the formulation was same. Efficiency of Lubrication was also found to be comparable for both the formulation.

Keywords: Chelating efficiency, Comparative Study, Dental Chelating gels, Economy, Physico - chemical properties, Root Canal.

INTRODUCTION

Comparative study of physico-chemical properties of self developed as well as commercially available gel was determined in order to Judge the suitability of formulation during root canal. Self Developed root canal lubricant was prepared using chelating agents and suitable gel base manufactured in India^{1,2}. The Physico-chemical properties of self developed as well as commercially available gel includes physical appearance, active content, water content, Viscosity, 10% aqueous solution pH³, 10% aqueous solution stability and solubility in water. The idea of comparative study of physico-chemical properties arises from surface tension, Chelation value and pH study^{4,7}. The commercially available lubricant File-Rite was purchased from pulpdent in exhibition held at Mumbai. The basic aim of this study is to found out whether self developed formulation is at par with commercially available formulation or not in handling characteristics and also in physico-chemical properties. Various chelating agents are used in dentistry but among these EDTA is the most popular and suitable chelating agent. Chelating agents are employed by the dentist for the removal of smear layer & debris from inside the root canal. Chelating agents acts as irrigant and helps in cleaning, shaping & widening of the canal. These applications of Root canal lubricant depend on the special physico-chemical properties.

MATERIALS AND METHODS

Materials

All the Chemicals required for determination of water content and other testing was purchased from S. D. Fine Chem. Pvt. Ltd. Distilled water necessary for analysis was made in laboratory using Equitron make distilled water unit. The Commercially available root canal lubricant gel was purchased from Pulpdent Corporation.

Methods

Appearance of the gel observed physically by eyes. Active content was determined by heating the gels at around 110°C in an electrical oven for 2 – 3 hours. Water content was determined using Karl Fischer apparatus. Viscosity was determined at 25°C using B. F. Viscometer. 10 % aqueous solution was prepared & its pH is determined using pH meter. The 10% aqueous solution stability is tested in cylinder.

RESULTS AND DISCUSSION

1. Physical Appearance

Physical appearance of both the formulations i.e. self developed as well as commercially available gel was seen, whether the formulation is solid or liquid or semisolid. It has been found that the formulation is in the form of gel which is highly transparent & the clarity of the formulation is very high. Physical appearance of gel was also compared such as colour. Both the formulation have sunset yellow colour.

2. Active content

Active Content of gel is nothing but active ingredients or components present in the formulation. Active content of the formulation can be easily found out by heating the formulation at 110°C in an oven for 2 – 3 hours. Constant weight loss is found out and then from the constant weight loss, percentage active content was determined using the following formula.

$$\% \text{ Active Content} = \frac{\text{Loss in weight} \times 100}{\text{Initial weight of the Sample}}$$

The result obtained for active content for both the formulation was enlisted in the Table 1 and Figure 1.



3. Water Content

Water content of self developed as well as commercially available gel was determined using pyridine free Karl Fischer's reagent & Karl Fischer's apparatus. For determination of water content only 0.2g of sample was weighed accurately and percentage water content was determined which was shown in Table 1 and Figure 2.

4. Viscosity

Viscosity of 17% self developed as well as commercially available gel (File – Rite) was measured using Brook Field Viscometer made up of Brook Field Company. Viscosity is expressed in terms of centipoises. Viscosity measurement were performed at 25°C and using spindle no. 04 by rotating the gel sample at different speed such as 60rpm and 30rpm and also recording the dial reading. The B. F. viscosity of the sample was then calculated using the following formula.

B. F. Viscosity = Dial Reading × Multiplying factor at the respective speed at which reading was taken.

The results obtained for B. F. Viscosity are as shown in the Table 1 and Figure 3.

5. 10% Aqueous Solution pH

10% aqueous solution was prepared by weighing 10 g sample of self developed as well as commercially

available (File-Rite) root canal lubricant and then dissolving in 50 ml distilled water & then diluting final volume to 100 ml using volumetric flask. pH was measured using pH meter made up of Lab-line Technologies Pvt. Ltd. having Model no. CL – 280. The pH measurements of each formulation was performed five times and then mean value was taken into account and that was reported in Table 1 and Figure 4.

6. 10% aqueous solution stability

Exactly 10 g sample of self developed root canal lubricant gel was weighed and dissolved in about 50 ml distilled water and then finally diluted to 100 ml and kept in graduated cylinder for 48 hours. No oily or other separation was observed. Similar procedure was repeated for File – Rite i.e. commercially available root canal lubricant.

7. Solubility in Water

10 g sample of self developed root canal lubricant was dissolved in 70 ml distilled water and finally diluted to 100 ml and time taken to dissolve the was recorded using stop watch. The similar procedure was carried out for commercially available File-Rite sample. It has been observed that File – Rite took less time to dissolve in water as compared to self developed root canal lubricant.

Table 1: Comparative study of physico-chemical properties of 17% self developed as well as commercially available root canal lubricant.

Properties	Self Developed	File – Rite
Appearance	Clear Transparent Sunset yellow coloured gel.	Clear Transparent Sunset yellow coloured gel.
Active Content [110°C, 2-3 hrs]	20.12 %	18.18%
Water Content	79.61%	81%
Viscosity (cP)	3500	3300
10% aqueous solution pH	8.4	10.3
10% aqueous solution stability	Stable for 48 hours at R. T.	Stable for 48 hours with oily separation
Solubility in water	Soluble	Easily soluble

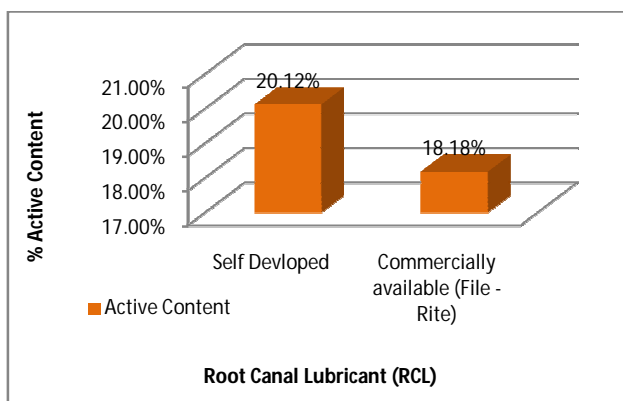


Figure 1: Comparative study of Active Content of 17% self developed as well as commercially available root canal lubricant.

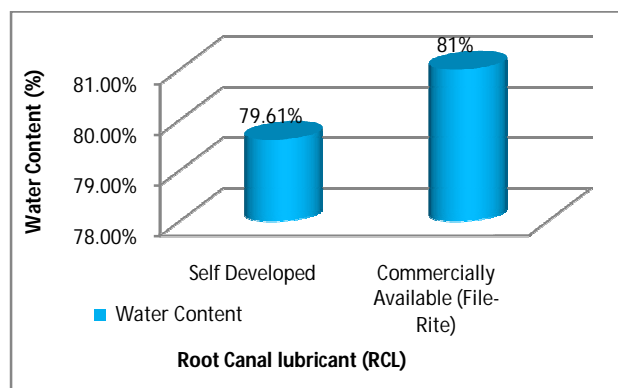


Figure 2: Comparative study of Water Content of 17% self developed as well as commercially available root canal lubricant

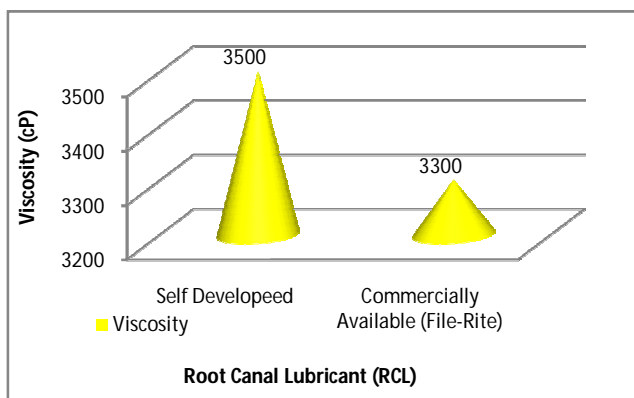


Figure 3: Comparative study of Viscosity of 17% self developed as well as commercially available root canal lubricant

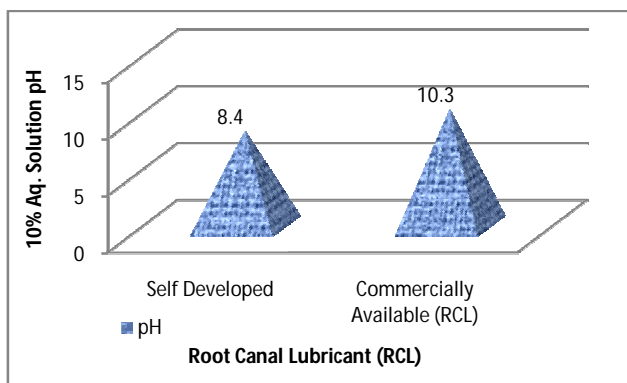


Figure 4: Comparative study of 10% aqueous solution pH of 17% self developed as well as commercially available root canal lubricant.

CONCLUSION

No significant difference found in comparison of the two gels with reference to their appearance. Active content and viscosity of self developed root canal lubricant is

more as compared to File-Rite as commercially available product. Water Content and 10% aqueous solution pH of self developed formulation is less as compare to File - Rite. It is concluded that there is no significant difference was found out in physic-chemical properties amongst the self developed and commercially available root canal lubricant.

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