



International Journal of Pharmaceutical Research and Development (IJPRD)

Platform for Pharmaceutical Researches & Ideas

www.ijprd.com

CHELATION VALUE OF SELF DEVELOPED ROOT CANAL IRRIGANTS

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ABSTRACT

The main objective of this study was to find out chelation values of self developed root canal irrigants. Chelation value determinations were performed using sodium carbonate indicator method. For this study root canal irrigants having different concentration of chelating agent such as 10%, 24% and 31% was prepared using chelating agent and suitable viscosity modifier. It has been observed that root canal irrigants having higher concentration of chelating agent shows higher chelation value. On the contrary root canal irrigant having lower concentration of chelating agent shows lower chelation value.

It has been also observed that, root canal irrigant higher chelation value removes smear layer completely than that of having lower chelation value.

KEYWORDS : Root Canal Irrigant, Chelation Value, chelating agent and smear layer etc.

INTRODUCTION

A chelating agent is a chemical reagent that can combine with metal ions to form ring shaped bonds forming water soluble complex ions¹. The function of chelating agent is to complex metal ions so that undesirable precipitate does not form. Chelating agent is nothing but ligand. Chelating agent works on the principle of chelation or sequestration. Chelation is use to describe complex formation between a chelating agent and metal ion in the form of ring shaped bond^{2,3}.

Fundamental principles in endodontic therapy are the efficient removal of the diseased pulp inside the tooth & replace it with suitable material. Thus, cleaning & shaping of the root canal dictates the success or failure of the treatment. The common obstacle one faces during the crucial part of the treatment is in the form of calcified canals, pulp stones, dentinal obstruction & sclerosed canal⁴. To overcome these problems chelating agents in the form of root canal irrigants are used by the dentist on the patients⁵.

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The chelating agents in root canal irrigant help in removal of smear layer by chelating with inorganic components of dentine⁶⁻⁷. To overcome this problem chelating agents in the form of gel is used. The effectiveness of root canal irrigant could be increased by increasing its chelation value. The poor performance or ineffectiveness may be because of less chelation value. In dentistry, these chelating agents are used in the form of gel in terms of percentage.

The chelation value represents the quantity of calcium in terms of CaCO₃ which will be chelated by known weight of chelating agent. The chelation value is evaluated by the titration of chelating gel using sodium carbonate against calcium acetate solution. During the titration, a precipitating anion (acetate) was present. The ions are chelated by the chelating agent as soon as calcium solution was added and no permanent precipitate was formed until there was a free chelating agent was present. After this point, whenever excess of calcium acetate was added in root canal irrigant i.e. chelating gel, calcium ions forms distinct permanent turbidity, which is nothing but the end point of titration.

MATERIALS AND METHODS:

Root Canal Irrigants used for this study includes 10%, 24% and 31% Self developed gel.

These gels are prepared using chelating agent and suitable gel base manufactured in India. The chemicals required for determination of chelation value was purchased from Merck chemicals. The chelation value of self developed root canal irrigant was determined by using sodium carbonate indicator method as follows.

Determination of Chelation Value:

About 3g sample of self developed dental chelating gel was weighed accurately. Distilled water [50ml] was added & dissolved it completely. 10ml of 2% Na₂CO₃ was taken into the beaker by pipette and added under stirring. Sufficient water was added to make total volume 100ml & pH adjusted up to 11.2 using 1N NaOH. And then titrated with 0.5N calcium acetate under stirring maintaining temperature at 23°C & pH 11.2 till a distinct permanent turbidity appears. Therefore, the end point of titration is appearance of white cloudy precipitate.

Similar procedure was repeated for commercially available gel. The chelation value was calculated using the formula: Chelation Value [mg of CaCO₃ / g sample] = B. R. × 25 / Wt. of Sample (g)

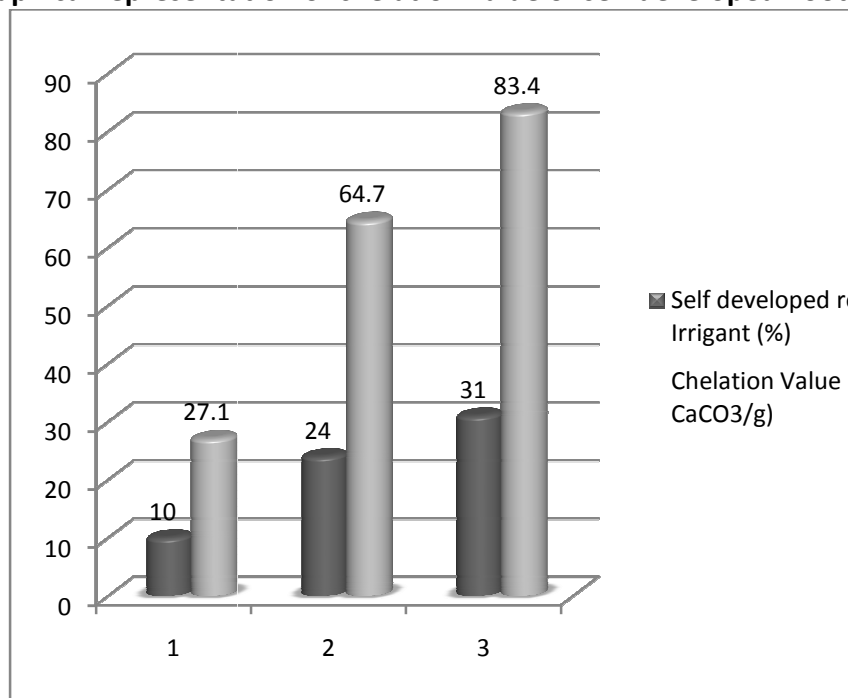
RESULTS AND DISCUSSION:

The result obtained for chelation value for self developed root canal irrigants are as follows:

Table 1: Chelation value of self developed Root Canal Irrigants

Sr. No.	Self developed root canal Irrigant (%)	Chelation Value (mg CaCO ₃ /g)
1	10	27.1
2	24	64.7
3	31	83.4

Figure 1: Graphical representation of chelation value of self developed Root



The above graph indicates that root canal irrigant having concentration 31% has higher chelation value and root canal irrigant having concentration 10% has less chelation value.

CONCLUSION:

The result of this study showed that the root canal irrigant having higher concentration of chelating agent shows higher chelation value and lower concentration of chelating agent shows lower chelation value. The result also concludes that the root canal irrigant having higher chelation value removes smear layer completely & easily when it is applied on dentin for 1 minute.

On the other hand the root canal irrigant having lower chelation value removes smear layer less when it is applied on dentin for 1 minute.

ACKNOWLEDGEMENT:

I would like to thank Principal, HOD, all teaching & non-teaching staff for providing permission me to carry out the work in Yashwantrao Mohite College of Arts, Commerce & Science, Pune.

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