

Evaluation of Natural Chelating Agents in Smear layer removal

Running Title: Natural chelating agents in removal smear layer

Type of article – Research

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Aim

To study the comparative evaluation of natural agents on effective removal of smear layers.

Objective

To find out the effect of chelating agents in removal of the smear layer in root canal treatment.

Background

Chelating agents were introduced into endodontics as an aid for the preparation of narrow and calcified root canals. Nowadays, chelating agents are used on a routine basis in endodontics for the removal of smear layers. EDTA (ethylenediaminetetraacetic acid) is the most commonly used chelating agent. Many natural chelating agents have been tried like citrus fruits and amino acids but nothing has been proved as effective as EDTA. This study has been undertaken to compare the effectiveness of natural chelating agents with recurrent gold standard EDTA.

Keywords: Chelating agents, Smear layer, EDTA and natural agents.

Introduction

Root canal cleaning means removing all potential irritants such as bacteria and their by products, organic/inorganic debris, vital and necrotic pulp tissues, as well as blood (Haznedaroğlu 2003). In endodontics smear layer results directly from instrumentation while preparing the canal wall. Because the tooth structure is cut, instead of being uniformly sheared, the mineralised matrix shatters and forms a smear layer, which is scattered over the dentinal surface. The smear layer can be removed with various substances but the most commonly used are based on different concentrations of EDTA. However, there are various concerns regarding the use of EDTA as it may cause damage to the periapical tissues and root canal dentin erosion is the most common damage depending on its concentration and application time. It is also considered an irritant, as it is not naturally derived. (Loel 1975)

There are some natural agents which are used for the removal of the smear layer, citric acid, a weak organic acid that has been tried previously on root canal surfaces and has shown favourable results.

Noni, with the botanical name *Morinda citrifolia* is a traditional folk medicinal plant that has been used for over 2000 years by polynesians. Its juice has a broad range of therapeutic effects including antibacterial, anti-fungal, analgesic, hypotensive, anti-inflammatory and immune enhancing effects (Marques et al. 2018). It has gained popularity as a good irrigant in endodontics.

Carbonic acid is prepared by melting the raw materials, such as sodium carbonate, lime, dolomite, silicon dioxide, aluminium oxide, and small quantities of fining agents (EG:- sodium sulfate, sodium chloride).

So, this study briefly explains the effects of citric juice, Noni juice and carbonic acid on removal of the smear layer.

Materials and Methods

In this study, 40 teeth samples were taken, access opening was done for all those teeth samples, canal patency was checked using a 10 size k file, cleaning and shaping was done using the stepback technique. Apical preparations were done up to size 40 k file.

The teeth were divided into 4 groups ;

Group 1 : Control group (10 samples)

Group 2 : Citrus juice (10 samples)

Group 3 : Noni juice (10 samples)

Group 4 : Carbonic acid (10 samples)

The longitudinal section of the samples were done and they are exposed to the above mentioned test solution.

Then, each specimen was mounted on aluminium stub and coated with 25 nm of gold-palladium and examined under a scanning electron microscope.

The magnification utilised in this study are 1000x,2000x and 3000x and all the specimens were observed and examined in coronal,middle and apical parts of their root canal walls.

Results

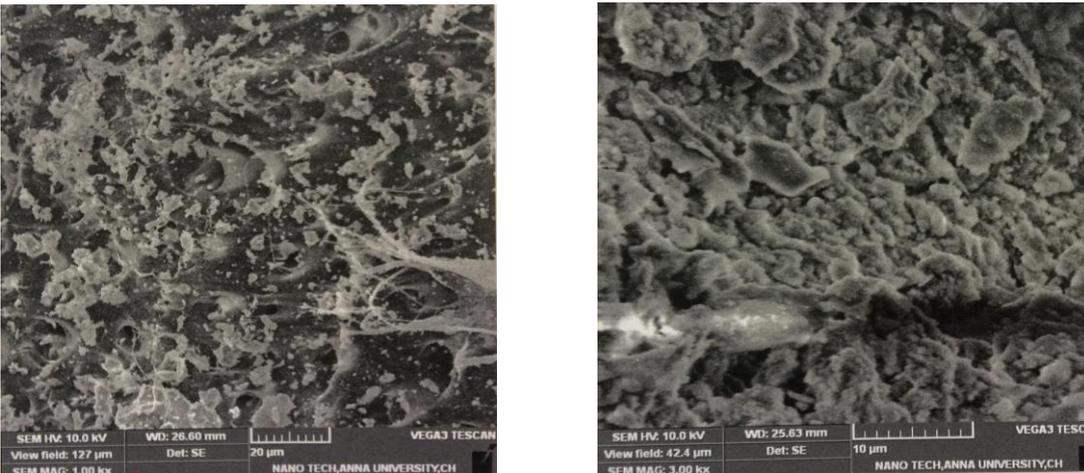


Figure 1. Effect of controlled sample(magnification 1000x and 2000x)

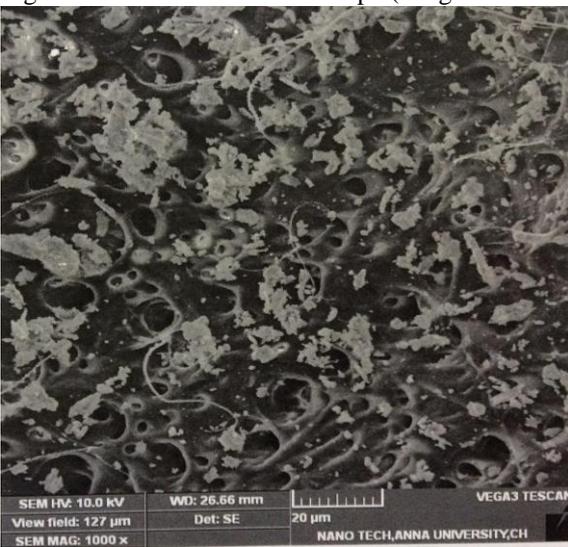


Figure 2. Effects of citrus juice (magnification 1000x)

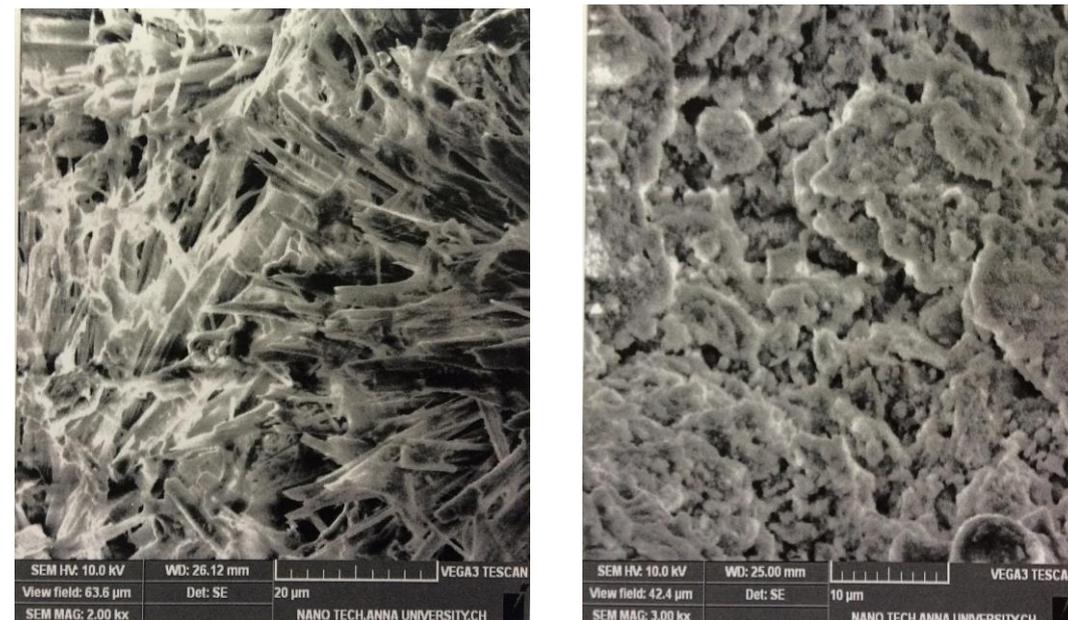


Figure 3. Effects of carbonic acid (magnification 2000x and 3000x)

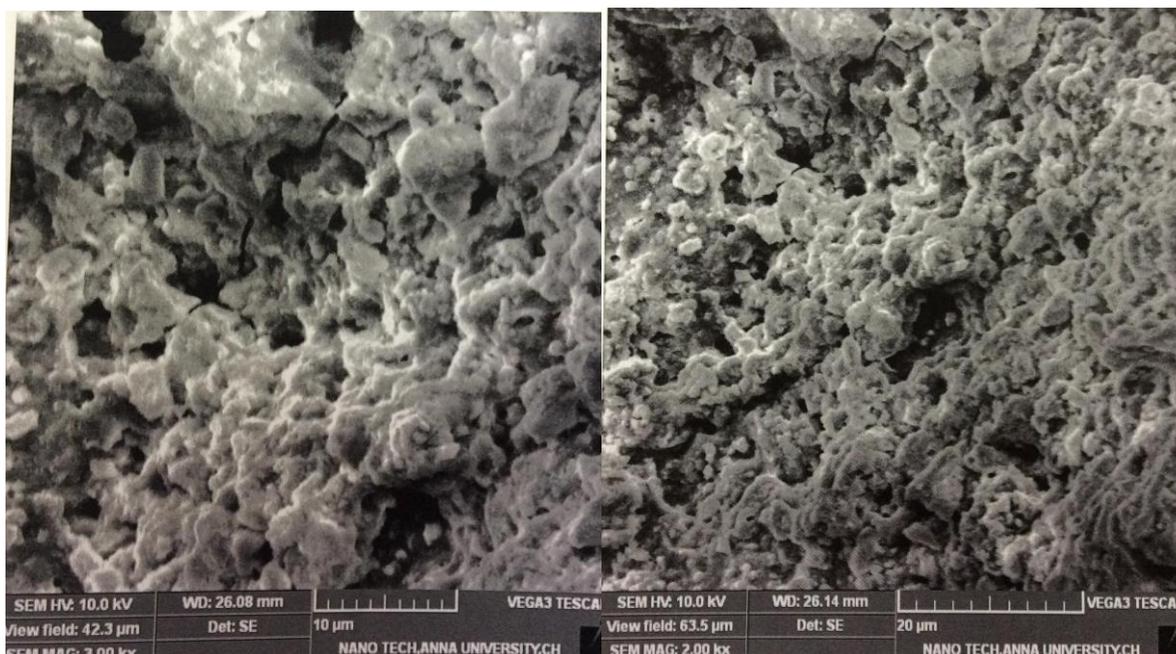


Figure 4. Effects of noni juice (magnification 3000x and 2000x)

Discussion

The smear layer is formed during root canal instrumentation consisting of dentin, bacteria, odontoblastic processes, necrotic and vital pulp tissues. The smear layer can compromise coronal and apical micro leakage, as well as the long term success of endodontics treatment (Desai and Himel 2009)

We chose citrus juice, noni juice and carbonic acid. Specimens were irrigated for 30 minutes for maximum antimicrobial effect. Citric acid compared to EDTA is a good chelating agent. The probable reasons for this could be as it forms a complex with calcium of tooth which is greater than that of EDTA. It is biocompatible to the tissues, helps in cementum formation and periodontal tissue regeneration (Takeda et al. 1999; Torabinejad et al. 2002)

Noni is one of the products which is gaining off natural remedies nowadays. This study demonstrated that noni juice has removed the smear layer better than the control group. Noni also contains organic acids like caproic acid, unsolicited acid and caprylic acids. The smear layer removal property of noni could be due to the presence of these organic acids (Khademi, Yazdizadeh, and Feizian Ford 2006)

But In this study, citrus juice, noni juice and carbonic acid were tested. In this three test solutions, carbonic acid had shown to be more effective in the removal of the smear layer.

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