

The ability of 5% *Tamarindus indica* extract as cleaner of the root canal wall smear layer

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ABSTRACT

Tamarindus indica is one of traditional medicines. Pulpa tamaridorum consist of organic acid that is usually used as irrigant and to remove root canal wall smear layer. The aimed of this study was to elucidate the ability of 5% *Tamarindus indica* extract as a root canal irrigant to remove root canal wall smear layer. Eighteen tooth samples were cut on cervical line and divided into 2 then groups were prepared with K file and irrigated. Group 1 was irrigated by sterile aquabidest and group 2 was irrigated by 5% *Tamarindus indica* extract. Samples were cut longitudinally and formed $7 \times 2 \times 2$ mm specimen. Each specimen was photographed by scanning electron microscope, scored and summed. The total score obtained is used as the hygiene value of root canal wall. The collected data were statistically analyzed by using independent t test at 0.05 level. The result of the study showed there was a significant difference between 5% *Tamarindus indica* extract and sterile aquabidest ($p < 0.05$), the hygiene value of 5% *Tamarindus indica* extract was higher than sterile aquabidest. The conclusion of this investigation showed that 5% *Tamarindus indica* extract remove root canal wall smear layer.

Key words: *Tamarindus indica*, Smear layer, Root canal wall

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INTRODUCTION

Tamarindus indica has been known as traditional herbal medicine. The pulpa *Tamarindorum* has an efficacy for mouth sore, injury and fever.¹ The chemical content of pulpa *tamarindorum* consist of invert glucose, tartaric acid, citric acid, 1-malic acid, pipercolic acid, serine, beta-alanine, proline, phenylalanine, leucine.¹ Tjitrosoepomo² suggested that pulpa *tamarindorum* contains various organic acid such as tartrate, lactate, malonate acid, 12–15% citric acid, to K-bitartra, pectine, tanine, invert glucose.

In dentistry, citric acid and could be used as irrigant material.³ Tidmarsh *et al. cit.* Ingle and Bakland³ suggested that 50% citrate acid as material of root canal irrigant could only be removed by demineralization material such as citric acid, EDTA, tetracycline hydrochloride.⁴ Scelza *et al.*⁵ suggested that 10% citric acid could be used as dentinal decalcification material.

Smear layer is a layer which covers dentinal tubule and root canal wall. This layer is formed when dentine was cut by using hand instrument or rotary instrument and during root canal preparation.⁶ Smear layer consist of organic and inorganic tissue such as fragment of odontoblast, microorganism and necrotic tissue. Smear layer cleaning would decrease micro flora as well as toxin and would increase dentinal permeability. This condition might cause diffusion and action intracanal irrigation and medication so it would increase effectiveness of root canal obturation.^{5,6,7}

In performing root canal preparation is always followed by irrigation using irrigant which is capable to remove smear layer with minimal toxicity.

The function of root canal irrigant is to dissolve the content of root canal in unreachable region by an instrument.^{8,9} Complex anatomical internal dentine such as the presence of apical delta, lateral root canal and additional root canal causing root canal debridement could not be done by instrument only but requiring irrigant during root canal treatment. Preparation of root canal which could be done without irrigant cause debris are leftover inside root canal so root canal treatment would failed.^{8,9}

To achieve clean result of root canal preparation, it is necessary to choose adequate irrigant material of root canal by considering nontoxic, being able to remove smear layer, anti bacteria, easily obtained, low cost, so alternative irrigant which could fulfill the requirement is needed. On the previous study on toxicity of 5% *Tamarindus indica* extract was nontoxic against cell line BHK-21.

Based on the above explanation, it is necessary to perform a study on 5% *Tamarindus indica* extract to remove the smear layer of root canal. The aim of this study was to examined the capability of 5% *Tamarindus indica* extract as irrigant to remove smear layer of root canal wall using scanning electron microscope (SEM). The study result is expected to add scientific perception of dentistry field especially on technology development of root canal irrigant.

MATERIAL AND METHOD

The material of this study were 5% *Tamarindus indica* extract, sterile aquabidest, gold of 24 carat. Red wax, araldyte glue, extracted tooth with criteria i.e. having single root, unobstructive root canal, milipore 0.45 μm . The procedure of 5% *Tamarindus indica* extract preparation, is the shell of *Tamarindus indica* was opened, the pulpa *Tamarindorum* was weighed 5 gr added by 100 cc sterile aquabidest and mixed using magnetic stirring until the pulpa was well and homogeneously dissolved and mixed. To separate the supernatant and precipitation, it was centrifuged at 250 rpm for 15 minutes, the *Tamarindus indica* supernatant was filtered using milipore 0.45 μm . The instrument were used in this study: disposable syringe, high speed drilling with water cooler, SEM, coating tool: JOEL, fissure bur, file type K no. 15–40.

Sample was divided into 2 groups, the crown was cut on cervical line and measured according to the length of the root reduced 1 mm. Sample was fixated on metal ring, red wax and put on the balance then prepared. The preparation produce was file type K no. 15 was inserted into root canal as far as working length. File was pushed to the wall of root canal, by push and pull force to scrape the wall of root canal until it was spacious, smooth and adequate working length. Root canal was irrigated using sterile aquabidest (group I). *Tamarindus indica* extract (group II). Each irrigation used 0.5 cc, sprayed without pressure in 6 seconds then irrigant was sucked out and it was done repeatedly (four times). Until the volume of irrigant was 2 cc. The next, root canal was dried with paper point. Preparation was continued in the same way until it reached file no. 40. The total of contact period between irrigant and root canal wall for 150 seconds (2.5 minutes). In group II, every time after irrigation with test material, root canal was irrigated using sterile aquabidest with the aim to remove root canal wall from debris of irrigant.

The samples were cut longitudinally into two parts on third of the part was formed $7 \times 2 \times 2$ mm specimen. The specimen was cleaned by spraying aquadest and dried in incubator (at 30° C for 2×24 hours). The specimen was observed and attached on the holder (stub) using araldyte glue in which the surface was observed facing upward. It was left to dry for about one day, then polished by pure gold.

The specimen one was put into SEM, photograph was done on the targeted part and magnified 5000 times. To evaluate the result of hygiene value using transparent sheet divided into 10 boxes then attached on the result of SEM. Every box was scored i.e. 0 = dentinal tubule orifis invisible, the surface was completely covered by smear layer 5 = dentinal tubule orifis unequally spread, a part of the surface free from smear layer 10 = dentinal tubule orifis opens and spreads equally, the whole part free from smear layer.

To achieve the result of evaluation is to sum the score of the 10 boxes. The whole sum is the hygiene value of root

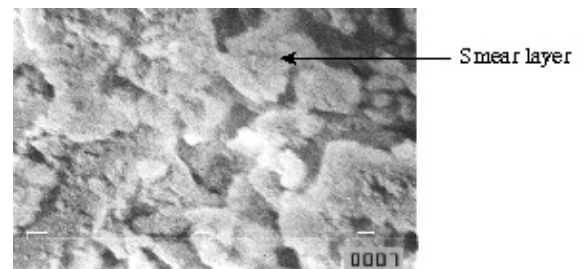


Figure 1. The observation of root canal surface using SEM after irrigation with sterile aquabidest (5000 $\times$).

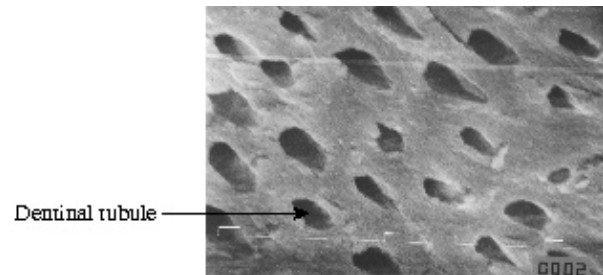


Figure 2. The observation of root canal surface with SEM after irrigation with 5%ETI (5000 $\times$).

canal wall. The higher the value means the more hygiene the root canal.

RESULT

In group irrigated with sterile aquabidest (control) the surface of root canal wall was dirty and covered completely by smear layer and dentinal tubule orifis was really invisible (Figure 1), while the groups irrigated with 5% *Tamarindus indica* extract, the surface of root canal wall was clean, dentinal tubule orifis was opened and equally spread (Figure 2) while the mean of hygiene value of root canal could be seen on table 1.

The data is achieved by performing normality test using Kolmogorov Smirnov Test and data of normal distribution is obtained so test of difference was done using parametric statistical analysis. Homogenous data was found based on homogeneity test (Levene's test) and independent t Test showed significant difference between group irrigated with sterile aquabidest and 5% *Tamarindus indica* extract on hygiene of root canal wall ($p < 0.05$) with hygiene value of root canal wall group irrigated with 5% ETI higher than group irrigated with sterile aquabidest.

DISCUSSION

On this study SEM was used to investigate the hygiene of root canal wall due to the capability showing rapid and accurate investigation result of the surface of root

Table 1. Mean, standard deviation, the significance of hygiene value control group 3% H₂O₂ and 5% *Tamarindus indica* extract with independent test

Group	N	$\bar{X}$	Significance
Control	9	0	0.001
5% ETI	9	83.33 ± 3.54	0.001

canal wall. It is more important because specimen surface could be directly observed, the sharpness of investigation appears to be more distinctive and the capability producing better analysis compared with microscope with common beam.¹⁰

Based on the present study shows that sample irrigated by 5% *Tamarindus indica* extract the root canal wall is cleaner compared with sterile aquabidest due to acid character 5% *Tamarindus indica* extract (pH = 2). A material with acid nature could contribute demineralization. Acid dissolved in water would be ionized to be carboxylate ion, and H⁺ ion, if having contact with root canal wall it would dissociate into hydroxyapatite it would release Ca₂⁺ ion and HPO₄²⁻ and demineralization occurs.

In addition, one of *Tamarindus indica* extract contents is citric acid which can dissolve hydroxyapatite. Nightingale and Sheridan *cit*. Arief¹¹ suggested that the reaction between citric acid and hydroxyapatite by releasing hydrogen ion and binding calcium (cathode). Citric ion (anode) would replace phosphate ion (anode) in hydroxyapatite structure until structure of dentine crystal demineralized.

Ingle and Bakland³ and Walton and Torabinejad¹² suggested that citric acid could solve saline mineral in dentin and it is chelating agent therefore it can remove smear layer during root canal treatment and it can vanish bacterial endotoxin.

Citric acid can decrease the number of bacteria in root canal so that the surface of root canal would be clean. Wulandari¹⁴ reported that citric acid has capability of anti bacteria against *Streptococcus viridans*. The effect of anti bacteria of citric acid is obtained from its low pH so that the high concentration of hydrogen ion can denature component on microorganism.¹⁵ Dharmayati¹⁶ reported on the efficacy of anti bacterial solution of *Tamarindus indica* extract has anti bacterial effect against root canal bacteria

Streptococcus viridans. It is concluded that 5% *Tamarindus indica* as root canal irrigant is capable to remove smear layer of root canal wall.

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