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Judul Artikel : Level Density Of Root Canal Filling Using Ca (OH)2 Plus Nano Chitosan Sealer With Lateral Condensation Techniques and Thermoplastic (Scanning Elektron Microscopy test/SEM Test)

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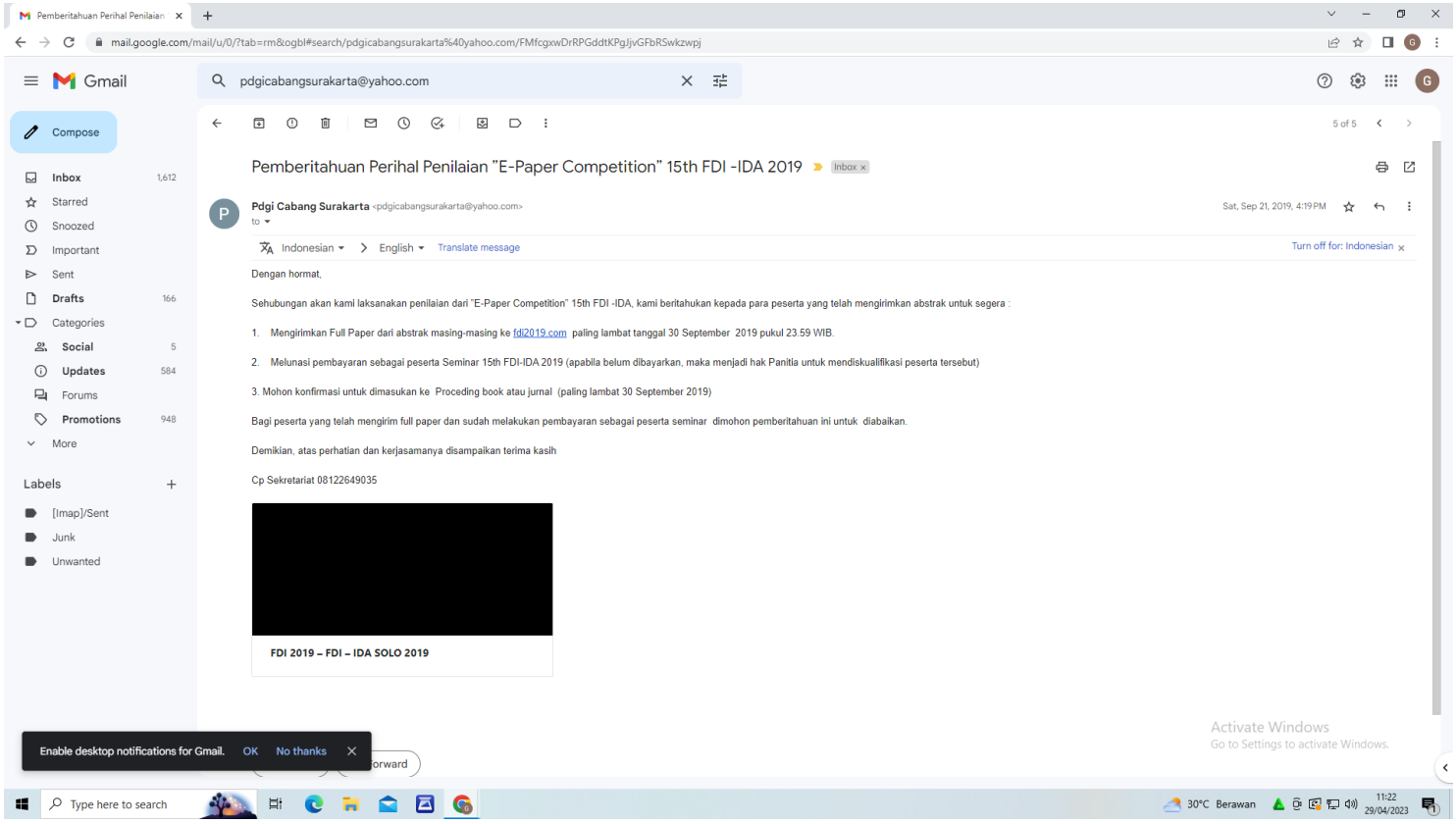

Level Density of Root Canal Filling Using Ca (OH) 2 plus Nano Chitosan Sealer with Lateral Condensation Techniques and Thermoplastic (Scanning Electron Microscopy test / SEM Test)

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ABSTRACT

The aim of Endodontic treatment is to clean the pulp or microorganisms in the root canal system so that root canal filling can be carried out properly and periapical repair occurs. The purpose of root canal filling is to create perfect density along the root canal system from the orifice to the end of the apex. Many techniques are used for root canal filling. One of them is the lateral condensation technique. Another technique is thermoplasticised gutta percha technique which is made by heating gutta perca. Ca (OH) 2 can adapt well to the dentine and guttap point so that it can reduce leakage of the apical foramen and can stimulate hard tissue formation. Nano chitosan can react with any material (Smart material), is bioactive, biocompatible, quickly adapt to the environment, and has good stability. The aim of this study to determine the difference in the density of root canal filling using a Ca (OH) 2 plus Nano Chitosan sealer with lateral and thermoplastic condensation techniques. The research design used experimental laboratory. The sample used 16 pieces of maxillary incisors according to predetermined sample criteria. Sample testing was carried out using Scanning Electron Microscopy (SEM). The results of statistical analysis using the independent t-test showed that $p < 0.05$. This shows that there is a difference in the density between the lateral and thermoplasticised condensation techniques. Root canal filling with thermoplastic techniques has much better density than the lateral condensation technique, especially in the apical third area.

Key Words : Thermoplasticised , Lateral Condensation , Sealer Ca(OH)2, *Nano Chitosan*, SEM, Density

INTRODUCTION

A Root Canal Treatment are one of endodontic treatment which aim to clean up the pulp tissue or microorganism inside of root canal, so a perfectly root canal fillings will improve periapical tissue. The aim of a root canal fillings are to create a perfect density along of root canal from orifice to apex. The results of root canal obturation are need to be sealed, solidify, and attached to the wall of root canal which obtained from preparation, sterilisation, fillings, and material of root canal obturation[3].

The material of root canal obturation that currently used is gutta percha that in it application have to combine with root canal sealer[4]. Calcium Hydroxide ($Ca(OH)_2$) has long

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been used in dentistry specially on endodontic treatment. Calcium Hydroxide had an antimicrobial effects and ability to neutralize the toxin also bacterial products, so it is very effective to used as a root canal sterilization material[5].

The problems encountered in Indonesian dentistry is the material that use for the treatment are imported and expensive. Especially in endodontic, a lot of study to find substitute material by using a nature products example, chitosan. Chitosan are a biomaterial which continues to be developed because it has many medical benefits and it is safe. There are a study that shows the use of chitosan with high moleculs can stimulated dentin reparative formation and release of fluorine ions[6]. Chitosan have a potential and easily found especially from white shrimp shells ((Litopenaeus vannamel)[7]. Sholihatunnisa et al think that chitosan have an antimicrobial, that can inhibit pathogenic bacteria and rot microorganisme, also fungus, gram – positive bacteria, gram – negative bacteria, and also pathogenic microorganisme inside of mouth. Chitosan are useful if it combine with another ingredients. Chitosan non particle can use for carrier of drug delivery causes of good stability, low toxic, simple preparation method, and can follow the route of drug administration[8]. Nano chitosan are a natural biopolimer that biocompatible, can dissolve in water, can deliver a drug by a macromolecul, had molecular weight varies so that can easily chemically modified, helps absorpstion between the substrate and cell membrane, and also the size of nano particle had more better effectivity. Nano chitosan used is nano chitosan white shrimp shells (Litopenaeus vannamel).

Lateral condensation technique with gutta percha for obturation material can use for many situations except to a bent root canal, abnormal and there is an internal resorption. This technique are not difficult, the adaptation to the root canal wall are good and have a nice obturation results[9]. Lateral condensation technique are standart to compare between another root canal obturation technique causes easily to do and have a high level of success. Fillings with lateral condensation technique are the one of root canal fillings with main gutta percha inside of th cavity and had another accesories around it with lateral pressure by spreader. Fillings with thermoplastic technique are one of root canal fillings with a special gutta percha that heated then injected inside of the root canal that have done of preparation and flow apically with minimal pressure[10]. Thermoplastic technique use a lot of heat to increase the plasticity of gutta percha and enable the operator to fillings the root canal with a little bit pressure. This method are can fillings the root canal with full. Thermoplastic technique can prevent the formation of empty space. A good root canal fillings can produce a good

prognosis. Therefore need to research about the density of root canal fillings with Calcium Hydroxide sealer plus nano chitosan with lateral condensation and thermoplastic technique and give a replica more better for root canal surface[11]. And also to see is there any different density of root canal fillings between sealer $Ca(OH)_2$ plus nano chitosan with lateral condensation and thermoplastic technique.

MATERIAL AND METHODS

Type of research that used are laboratorium experimental. The sample consisted of 16 maxillary incisors, no intact caries, no root canal treatment before, straight and perfectly formed roots. Subsequently divided randomly into two groups: the first group with lateral condensation filling techniques and the second group with thermoplastic filling techniques. The minimum number of samples is calculated by the Federer [12]. Sampling is done by selective random sampling technique, where teeth that meet the criteria are used as samples.

The material used in this study are Nano Chitosan, Gutta percha point, gutta percha thermoplastis, sealer Ca(OH)2, EDTA, and the instrument used in this study are calipers, cement spatel, glass lab, round bur, fissure bur, mini endo block, root canal spreader, miller needle, extirpation needle, k-file needle, lentulo needle, plastic filling, carborundum disc, pinset, Handpiece contra angel, straight handpiece, Needle Syringe, HerofillTM Oven, Scanning Electron Microscopy (SEM).

RESEARCH PROCEDURE

This research was carried out with the following work procedures:

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1. Prepared the maxillary incisors to be sampled, respectively tooth samples were measured for dental length first using calipers and record the measurement results in the form that is already available, then work length is determined by subtracting 2 mm from the length of the sample teeth, after which the dental implant is implanted with cast block.
2. The sample was divided into 2 groups, each group consisting of 8 samples. Group I is the lateral condensation filling of the root canal using Ca (OH) 2 sealer plus Nano Chitosan. Group II is the filling of the root canal thermoplastic technique using Ca (OH) 2 sealer plus Nano Chitosan. Samples were planted on a soft cast beam with a length of 13 cm, width 14 cm and height 3 cm. Marked the working length of each sample on the cast block.
3. Draw the outline of cavity entrance in the cingulum of the incisor teeth.

4. Do cavity entrence preparation according to the outline image on the cingulum of the incisors, using handpiece angle and round bur and fissure bur.
5. After finding the orifice, insert the miller's needle to check the work length.
6. Using an extirpation needle, remove the necrotic tissue from the inside the root canal in a clockwise circular motion is then pulled out of the root canal.
7. Make preparations using conventional techniques.
8. Perform root canal filling with the following steps:
   The first group is using lateral condensation filling techniques using sealers $Ca(OH)_2$ plus Nano Chitosan.
   a. The root canal wall was modulated with a Ca (OH) 2 sealer plus Nano Chitosan 2: 1 ratio using a lentulo needle.
   b. The main cone to be used is smeared with a Ca (OH) 2 sealer plus Nano Chitosan, then put into the root canal according to the working length.
   c. Insert the spreader between the guttap point and the root canal wall slowly.
   d. Turn the root canal spreader around 180^o so that the guttap point is pushed laterally.
   e. Empty rooms are given additional percha and are suppressed by the root canal spreader. This is done until the spreader can only enter 2 to 3 mm into the orifice.
   f. The excess gutta percha is cut with a heated excavator and the surface of the root canal is cleaned with cotton wool.
   g. Cavity is filled with small cotton and then temporarily capped with cavit.

   The second group used a thermoplastic filling technique using Sealer $Ca(OH)_2$ plus Nano Chitosan.
   a. The root canal wall was modulated with a Ca (OH) 2 sealer plus Nano Chitosan 2: 1 ratio using a lentulo needle.
   b. Gutta percha thermofill is marked according to the working length and is heated in an oven (HerofillTM Over) with a temperature of 1100 C to 1300 C.
   c. Gutta percha thermofill that has been heated ± 52 seconds is inserted slowly - slowly towards the apical to full according to the length of work.
   d. The stems on the obturator are mounted on the root canal orifice using an excavator.
   e. Cavity is filled with small cotton and then temporarily capped with cavit.

9. The next stage the samples that have been filled are then cut transversely in the apical third by using a Carborundum disc.

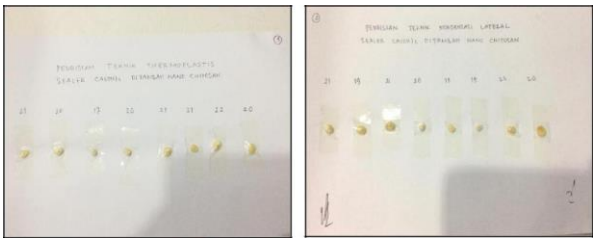


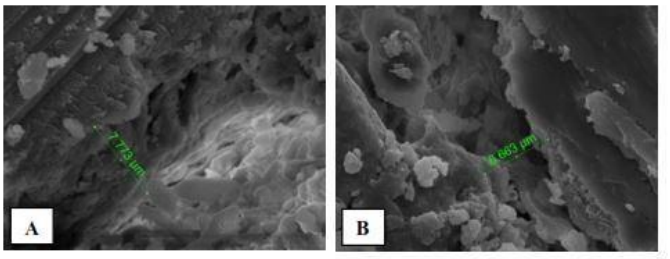
Figure of cross section on 1/3 of the root

10. After that the sample is tested by SEM (Scanning Electron Microscopy) technique to determine the level of density that occurs.

RESULTS

The study was carried out experimentally by a laboratory of 16 samples that met the criteria using lateral and thermoplastic condensation filling techniques. Samples were divided into 2 groups. The first group was using lateral condensation filling technique using Sealer Ca (OH) 2 plus Nano Chitosan and the second group was using thermoplastic filling technique using Sealer Ca (OH) 2 plus Nano Chitosan.

From observations using Scanning Electron Microscopy (SEM), the results of the two groups were obtained.



The 3000x Scanning Electron Microscopy (SEM) test results.
Note: A. Lateral condensation filling technique, B. Thermoplastic filling techni

Tabel 5.1 The measurement results of root canal density with SEM test

No.	Lateral Condensation (m)	Thermoplastic (m)
1.	7.77	6.90
2.	9.71	2.34
3.	10.95	6.66
4.	8.16	2.18
5.	7.95	3.56
6.	9.43	3.30
7.	8.82	1.43
8.	12.24	4.72

Result Analysis

From the results of the t-test statistical test, the average result of root canal density in the two treatment groups was lateral condensation 9.3788 µm with a standard deviation of 1.56729, while the thermoplastic filling technique was 3.8863 µm with a standard deviation of 2.04440. The difference is statistically t = -6,031, with a P value of 0.03.

Tabel 5.2 Independent t-test results of lateral and thermoplastic condensation filling technique

Group	N	X (µm)	SD	t	P
I	8	9.3788	1.56729	-6.031	0,03
II	8	3.8863	2.04440	-6.031	0,03

From the results of the statistical tests above, it can be seen that the t-gain calculation of the root canal density of lateral condensation and thermoplastic filling techniques is -6.031 with propability of 0.03. Propability results show <0.05 then H_0 is rejected, which means that there are significant differences between lateral condensation techniques and thermoplastic using a $Ca(OH)_2$ sealer plus Nano Chitosan. This shows that the thermoplastic technique has a denser root canal filling density than the lateral condensation technique, especially in the apical third region.

DISCUSSION

This study uses a calcium hydroxide $(Ca(OH))_2$ sealer plus Nano Chitosan. Calcium hydroxide has the advantage of being bactresidal, helping healing and tissue repair, acidic pH, stopping internal resorption, inexpensive and easy to use (Athanassiadis, 2007). While Chitosan has the physical characteristics that are easily formed into sponges, solutions, gels, pastes, membranes, and fibers that are very useful in its application[2].

Nano chitosan can be used as a root canal filling material because of its advantages that can react with any material (Smart material). The special properties possessed by nano chitosan include good biocompability, biodegradable, non-toxic does not cause immunological reactions, does not cause cancer so modification Chitosan with other ingredients can be used for clinical applications as a biomaterial (Irawan, 2005) and can accelerate the wound healing process by its nature which is able to increase fibroblast proliferation[13]. Chitosan can also inhibit the growth of pathogenic microorganisms in the mouth (Sulistyani, 2015). Because of the special nature of this chitosan which causes non-toxic cells in the addition of calcium hydroxide.

One of the methods used in sample testing to get accurate results is to use Scanning Electron Microscopy (SEM). The sample to be analyzed is placed in a ± 10mm holder. For non-conductive samples (such as organic samples, polymers) it is necessary to be coated (coated) using Au-Pd (this aims to make the sample more conductive). The stages are as follows: power on SEM and computer, insert the sample into the SEM chamber, then pump, beam on for about 5 minutes. The final result is data that can be seen on the computer.

The density of root canal filling is also determined by the use of root canal paste that accompanies the use of gutta percha. In accordance with research thermoplastic filling techniques can prevent the presence of empty space on the inner surface of the roots. Root canal filling with thermoplastic techniques can increase the homogeneity and surface

adaptation of gutta percha (Kandaswamy et al., 2009). Replication of the thermoplastic technique is better than the lateral condensation method (Grossman, 1995). According to Silvia et al (2013) the ability of thermoplastic techniques is more recommended for filling the root canal because of its ability to balance between the root canal wall, sealer and gutta percha. This is in accordance with the research that has been done, in which the results are obtained that the density of the root canal filling is denser on the use of thermoplastic techniques.

This is because the advantage of this technique is that when gutta percha has been heated, the root canal can be obturated in a relatively short time. Continuous wase of condensation is said to be able to fill the root canal better and increase the density of gutta percha which is theoretically capable of creating apical seals thereby reducing the risk of apical microleakage. The advantage of this technique is that it produces homogeneous gutta percha, which adapts well to the root canal wall [14].

Meanwhile, according to Eguchi et al (1985) that lateral condensation filling techniques can control the placement of gutta percha, but the results of obturation are not homogeneous but in the form of a collection of gutta-percha that are fused because of the presence of sealers and the use of excessive sealers can cause loss of density, and a decrease in the quality of obturation of the channel root and effect on density. In addition, space can be formed between gutta percha and the root canal wall due to inadequate lateral condensation obturation techniques. In addition, the obturation result is not a homogeneous mass and it is difficult to fill the lateral root canal.

Devcic (2005) and Hwang (2002) examine density in several different obturation techniques. They also concluded that all obutation techniques undergo microleakage. These results provide the view that the density of root canal filling is influenced by many anatomic parameters and clinical considerations such as root morphology, anatomical shape of the root canal, female operator and obturation techniques.

In this study it was found that the treatment group of thermoplastic techniques had a mean density of 3.8863 µm smaller than the lateral condensation treatment group of 9.3788 µm. These results are the same as previous research conducted by Putu (2016) which shows the level of density of the root canal filling that occurs in the thermoplastic technique is closer than the lateral condensation technique. This happens because of the influence of pressure when inserting gutta percha on the root canal which is not good, not only due to the

preparation and filling techniques, but also due to the quality of the root canal filling material [15]. The need to consider in choosing the root canal filling and filling material so as not the occurrence of a fairly large number of differences from the research results obtained.

CONCLUSION

The conclusion of this research is that there is a difference in the level of density between the lateral condensation and thermoplastic techniques. Filling the root canal with the thermoplastic technique has a much better density than the lateral condensation technique.

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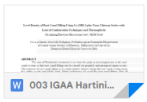

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