15th FDI - IDA PROCEEDING BOOK

15th FDI-IDA Continuing Dental Education

Alila Hotel Solo Indonesia
15 - 16 November 2019

Proceeding of The 15th FDI-IDA Continuing Dental Education Programme

"Updates in Current Scientific and Technological Innovations in Dentistry"

Alila Hotel, Solo November 15-16, 2019

online version available at
https://bit.ly/2SMMWQ4

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editor :

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Lasmi Dewi Nurnaini
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LSKI Lembaga Studi Kesehatan Indonesia
Bandung 2020

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First published by Lembaga Studi Kesehatan Indonesia (LSKI) Bandung 2020
for 15th FDI-IDA Continuing Dental Education Programme Committee

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Faizah Ariani Tams
Widia Susanti

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Preprinted Agus Sono

ISBN 978-602-60959-6-1

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FOREWORD

Science and technology in the field of dentistry are developing rapidly with the passage of time. These developments require practitioners in dentistry to be constantly up to date with the newest trends. One of the ways in which dentists can improve their knowledge and skills in maintaining the quality of services for society is to attend scientific conferences. In light of this, the FDI World Dental Federation together with the Indonesian Dental Association (PDGI) organize an international scientific conference and exhibition on the latest and most advanced medications, tools and materials in the practice of dentistry, taking place in different cities in Indonesia every year.

This year, the Solo Regional Branch of the Indonesian Dental Association has been honored to receivethe opportunity to organize the 15th FDI-IDA Continuing Dental Education Programme 2019, 15-16 November, in Alila Hotel Solo. Through this forum, themed *"Updates in Current Scientific and Technological Innovations in Dentistry"*, we are trying to provide space for a very comprehensive and excellent exchange of knowledge and experience by organizingmain and short lectures, full paper and e-poster presentations, oral presentations and competition, Pepsodent FDI Award, as well as a dental equipment exhibition. The presented papers are compiled in this proceeding in the form of research papers, case reports, and literature reviews.

This year's seminar also brings something new to the experience since various organizations from different disciplines have joined us to enrich and broaden our discussion. These renowned organizations are the Military Dentistry, International Military Dental Forum (IMDF), International College of Dentists (ICD Region 38), Indonesian Conservative Dentistry Society / ICDS (IKORGI) and Indonesian Society of Periodontology (IPERI).

I would like to extend my heartfelt thanks and gratitude to these esteemed organizations, reputable invited speakers, notable dental suppliers, sponsors, as well as all participants for the strong support and enthusiasm in making this event a success. Most importantly, I would like to extend my deepest gratitude towards the team of reviewers who have meticulously chosen the selected papers and made the publication of this proceeding a success. I would also like to express my gratitude to the steering and organizing committee for their tireless effort and commitment.

Sincerely yours,
SherlyIndratno, drg., Sp. Ort
Chairperson of the Organizing

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Irrigation Effect of Mangosteen Pericarp Extract in Wistar Rat Root Canal on Macrophage Activities Periapical Tissue

Berliana Calpika Febriyanti[1], Sri Lestari[2], Sulistiyani[3]

[1]Student, Faculty of Dentistry, Universitas Jember
[2]Part of Dental Conservation, Faculty of Dentistry, Universitas Jember
[3]Part of Pedodontic, Faculty of Dentistry, Universitas Jember

e-mail : berlianacf@gmail.com

ABSTRACT

Root canal irrigation is an important step in supporting the success of root canal treatment. The commonly used root canal irrigation solution is NaOCl. The disadvantage is that it is irritative and can cause pain if it enters the periapical tissue. Alternative irrigation material is needed which does not cause harm, namely mangosteen pericarp extract. Mangosteen pericarp extract contains xanthones and flavonoids which can prevent the occurrence of tissue inflammation, characterized by the small number of inflammatory macrophage cells. Macrophage cells are the dominant chronic inflammatory cells. The purpose of this study was to determine the effect on periapical tissue which was irrigated with mangosteen pericarp extract. The research method used an experimental laboratory study with the post-test only control group design. The irrigation material used was 2.5% NaOCl, 80% and 100% mangosteen pericarp extract. The material was irrigated in the root canals of wistar first molar teeth which had been prepared with conventional techniques. The data analysis used is the Two Way ANOVA test. The results of the study showed that the number of mangosteen cells extracted from mangosteen pericarp extract was 80% smaller than 100% extract and NaOCl. The number of cells increased on the 3rd day and decreased on the 7th day. The conclusion of the study obtained 80% administration of mangosteen pericarp extract irrigation material has the potential not to cause inflammation compared to MPE100 and NaOCl.

Keywords : Macrophage, Root canal irrigation, Mangosteen pericarp extract, Periapical tissue

INTRODUCTION

Root canal treatment is the treatment that aims to reduce pain and control infection of the pulp and surrounding periapical tissue as well as restore the condition of toothache to be accepted by the surrounding tissue. The success of root canal treatment is influenced by several factors, namely root canal preparation, irrigation and root canal (*triad endodontic*)[1].

One of the chemical irrigation materials commonly used is Sodium Hypochlorite (NaOCl). This irrigation material is commonly used in dental practice from the concentration of 0.5% up to 5.25%. NaOCl is an option in irrigating root canal because of its effective antimicrobial mechanism in reducing the number of bacteria in the root canal. NaOCl has toxic deficiencies in the vital tissue if it is used in the concentration as high as 5,25%[2]. NaOCl concentration which is commonly used in dentistry is 2,5%[3]. Penetration of NaOCl solution toward periapical tissue can cause pain, ulceration, hemolysis, edema, and swelling[2]. Also NaOCl has toxic deficiencies and can cause pain when entering periapical tissue[4].

The entry of NaOCl to the periapical tissue is one of the causal factors of periapical inflammation. Inflammation is defined as a local tissue reaction towards infection or injury and involves more mediators than immune response. Inflammation is a physiological response towards various stimulations such as infection and tissue injury. Inflammation can be local, systemic, acute and chronic which cause pathological abnormalities[5].

Because of toxic effects from some material that has been used, therefore this research was conducted by using alternative irrigation material, one of which was mangosteen pericarp extract to

find out the toxic effects in the periapical tissue. The previous research said that 100% concentration of mangosteen pericarp extract eliminated smear layer on crown dentin[6] and in the root canal wall[7]. Cytotoxicity test was carried out to determine mangosteen pericarp extract qualified to be acceptable in the tissue by testing on cell culture and fibroblast cells used for cytotoxicity tests to be compared with 2.5% NaOCl and 3% H_2O_2, so mangosteen peel extract was biocompatible and could be used as a biocompatible cell alternative root canal irrigation[8]. Clinical antibacterial test in mangosteen pericarp extract had antibacterial ability toward the growth of mixed bacterial colonies in the teeth of infected rats[9].

The role of xanthone content in the natural irrigation ingredients of mangosteen pericarp extract in inhibiting the inflammatory process is by inhibiting the enzyme cyclooxygenase while flavonoids play a role in inhibiting the release of arachidonic acid[10]. With the inhibition of these two enzymes, it is expected that there will be a decrease in the inflammatory process which is marked by a decrease in the sensation of pain, fever, inflammatory reactions and a decrease in inflammatory cells[11]. The researcher was interested in doing laboratory testing to find out the irrigation response of mangosteen *(Garcinia mangostana L.)* pericarp extract on root canal of wistar rats to the number of macrophage cells periapical tissue.

RESEARCH METHOD

This type of research was an experimental laboratory research with a research design by using *post-test only control group design*.

The sample groups were divided into 4 groups, as follows: Group I negative control: aquadest, Group II positive control : NaOCl 2.5%, Group III treatment 1 : MPE 80%, Group IV treatment 2 : MPE 100%

The making of mangosteen pericarp extract (*Garcinia mangostana L.*) was done using maceration technique. Mangosteen pericarp powder was weighed as much as 100 grams using a weight balance then macerated in a 96% of ethanol solution as much as 1000 ml for three days. The solution was moved in a closed container. The maceration results were then filtered using a funnel coated with filter paper and then evaporated using a rotary evaporator at 40°C for 3 hours, so that the mangosteen pericarp extract was obtained at a concentration of 100%. The extract was stored in a closed glass container. To get 80% concentration, the extract was diluted by adding distilled water with an 8:2 extract ratio, the solvent was then homogenized using a vortex device.

The researchers prepared 48 male wistar rats weighing 200-250mg adapted to the environment of the cage and given the standard Turbo food and drinking water every day in *ad libtium* way for one week before being treated.

Four wistar rats that were not used were decapitated, from the right lower jaw of each rat, first molar was taken and extracted with an excavator and half-circle sonde. After extraction, measurements of the actual tooth length were then averaged. The average length of the tooth of a wistar rat was 3mm. The mean exceeded ±2mm to reach the periapical network if the irrigation material was exposed.

Rats were fixed on their stomach on the table. Anaesthesi of rat feet intramuscularly with anesthetic drugs in the form of Ketamine HCL as much as 0.04-0.08ml/200-250gBB. Next, the rats were positioned on the dental rat chair, the cheeks of the rats were retracted with a burnisher and then the asepsis of the work area. Made an opening access on the occlusal of right first molar tooth lower jaw using a round bur to pulp perforation, then pulp extirpation with a purple extirpation needle. Furthermore, it was prepared and irrigated with materials according to the sample distribution group.

Treatment for Sample Group I

Rats were prepared according to the working length of 3mm (depth exceeded ± 2mm) using File no.06, 08, 10, 15 then irrigated with 0.25ml distilled water using a disposable syringe for 10 seconds. Irrigation was done every change of file size. After being prepared the cavity was dried with cotton pellets and paper points and then in *caviton* filling material. Rats were released depend on the group of decapitated time (first, third, seventh day).

Treatment for Sample Group II

Rats were prepared according to the working length of 3mm (depth exceeded ± 2mm) using File no.06, 08, 10, 15 then irrigated with 2.5% NaOCl using a disposable syringe for 10 seconds, then rinsed with 0.25ml distilled water. Irrigation was done every change of file size. After being prepared the cavity was dried with cotton pellets and paper points and then in *caviton* filling material. Rats were released depend on the group of *decapitated* time (first, third, seventh day).

The Treatment on Sample Group III

The mice were prepared according to the working length of 3mm (the depth exceeded about ± 2mm) through File no. 06, 08, 10, 15, then they were irrigated with MPE 80% by using a disposable syringe for 10 seconds, then 0.25 ml of aquadest was used to rinse them. Irrigation was done on every change of file's size. After being prepared, the cavity was dried with a cotton pellet and paper point and in *caviton* filling material. The release of the mice relied on the group of *decapitated* time (on the first, third, seventh day).

The Treatment on Sample Group IV

The mice were prepared according to the working length of 3mm (the depth exceedsed about ± 2mm) through File no. 06, 08, 10, 15; then they were also irrigated with MPE 100% by using a disposable syringe in 10 seconds, then they were rinsed with 0.25ml of aquadest. Irrigation was done on every change of file's size. After being prepared, the cavity was dried out with a cotton pellet and paper point and were then in *caviton* filling material. The release of the mice depended on the group of *decapitated* time (on the first, third, seventh day).

The Observation and Calculation on the Number of Cells

After *decapitation* carried out based on the time group, tissue preparation and staining were then done through Hemaktosilin-eosin. After that, we observed and calculated the number of cells according to the area of the periapical tissue by using 400x magnification objective lens. The observation on the number of macrophages was conducted afterwards.

RESULTS

An increase was found on periapical tissue response and a decrease was also occurred on the number of macrophages in periapical tissue under the apical foramen of male wistar rats which were investigated with mangosteen pericarp extract of 80% and 100%. The calculation results of macrophage cell calculation are drawn in Table 1:

Group	Day-1	Day-3	Day-7
Aquadest	1,38	1,80	1,48
NaOCl 2,5%	1,70	1,90	1,52
MPE 80%	1,30	1,55	1,15
MPE 100%	1,46	1,76	1,36

Table 1. The Mean of Macrophage Cell on Periapical Tissue of Wistar Rats

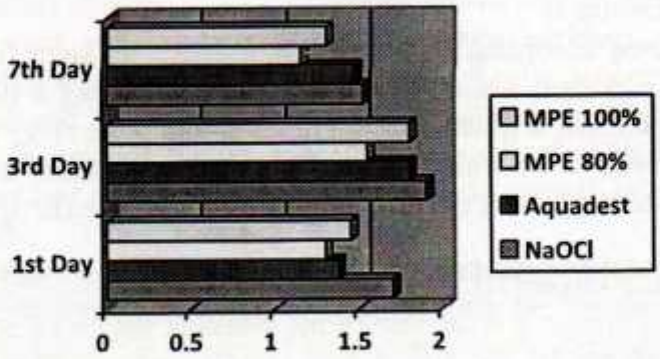

Figure 1. The Diagram of average number of macrophage cells in wistar rats

Based on table 1 and figure 1, it can be seen that macrophage cells began to appear 24-48 hours after the occurrence of lesion and peak on the third day. The decrease in the number of macrophages happened on the fifth day to the seventh day [4].

Data analysis was performed by using the normality test with Kolmogorov-Smirnov test and homogeneity test through Levene test. The test results showed that the data were normally distributed and homogeneous ($p > 0.05$). Then, Two Way Anova parametric statistical showed the data results were significantly different ($p < 0.05$). LSD test showed the significance value of $p < 0.05$ and there was a group with significance value of $p > 0.05$ but statistically showed a decrease on the number of macrophage cells in the periapical tissue of Wistar rats.

DISCUSSION

Macrophage cells became the dominant cells in chronic inflammation and tissue cells that originated from circulating blood monocytes and then exited the bloodstream. The half-life of monocytes in circulation was about 1 day, monocytes started migrating to the site of injury within the first 24-48 hours after the onset of acute inflammation and peak on day 3. The decrease on the number of macrophages occurring from day 5 to day 7 indicated that the inflammatory process had been greatly reduced [4]. The process of repairing this injury was accelerated by administering the ingredients of mangosteen pericarp extract irrigation. This research was intended to know the effectiveness of mangosteen pericarp extract as the alternative irrigation material toward the number of macrophage cells in the periapical tissue of male wistar rats.

The results of the research were NaOCl, MPE100, MPE80 from the order in which macrophage cells appear on the day 1. On day 3, the number of macrophage cells increased in the following order NaOCl, MPE100, MPE80. On day 7, the number of macrophage decreased in the following order NaOCl, MPE100, MPE80.

The results of the research in Figure 1, the number of macrophage in control and experimental groups increased on the 3th day and decreased in the 7th day. The increment of the number of macrophage cells of the control group on the 3rd day occurred because of the perforation of apical foramen that causes irritation and triggered the emersion of macrophage cells marked by the increase of the number of macrophage cells and also in the positive control was caused by the content of irrigation material of NaOCl, hypochlorous acid (HOCL-) and hypochlorite ion (OCL-) that reached periapical tissue. Moreover, in the experimental group, there was an increase because of the irritation reached the periapical part under apical foramen. It was due to the presence of irrigation material exposure of mangosteen pericarp extract that reduced the number of macrophage cells compared to the control group and caused irritation was not quite big.

The group of NaOCl and MPE80 had a significantly different numbers of macrophage cells, where the NaOCl group had more macrophage cells than MPE80. This was due to the content of irritating NaOCl material which entered periapical tissue caused more macrophages present compared to mangosteen pericarp extract.

The group of MPE100 had more anti-inflammation process compared to NaO[illegible] the mangosteen pericarp extract had xanthone and flavonoid contents. Inflammatory acti[illegible] inhibited in an important phase, where the content of the mangosteen peel extract namely xanthone inhibits the cyclooxygenase enzyme and the content of flavonoid inhibits the lipooksigenase enzyme which will convert to arachidonic acid and prevent the release of prostaglandin synthesis, which in turn decreases the number of inflammatory cells including macrophage cells.

The results of this research showed that there was an influence of irrigation material of mangosteen (*Garcinia mangostana L.*) pericarp extract toward the number of macrophage in periapical tissue of male wistar rats' teeth. The exposure of irrigation material of mangosteen pericarp extract 80% and 100% reduced the number of macrophage which was the effect of synergism of active compounds contained in the irrigation material of mangosteen pericarp extract. The contents played a role as anti-inflammation, anti-bacterial, and anti-oxidant. The decrease of the number of macrophage showed that the possibility of normal tissue damage caused by macrophage was decrease so that the healing process run better.

CONCLUSION

Based on the results of the research, it can be concluded that the mangosteen pericarp extract reduced the number of macrophage cells in periapical tissue of male wistar rats' teeth. The effective concentration to reduce the number of macrophage cells in this research was extract 80% and 100% compared to NaOCl 2.5%.

GRATITUDE

The researcher thanks drg. Sri Lestari, M.Kes and drg. Sulistiyani, M. Kes who have guided the researcher in completing the journal.

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Yang termuat dalam : Proceeding of The 15th FDI-IDA Continuing Dental Education Programme, Vol.-, No.-

Tempat dan Waktu : Surakarta, Indonesia, 15 November 2019

Tema : Updates in Current Scientific and Technological Innovations in Dentistry

Dengan Judul : Irrigation Effect of Mangosteen Pericarp Extract in Wistar Rat Root Canal on Macrophage Activities Periapical Tissue

ISSN/ISBN : -/978-602-60959-6-1

e-ISSN : -

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