

The Effect of Bismuth as A Local Hemostatic Material Post Extraction of Permanent Mandibular First Molars Teeth

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ABSTRACT

Background: Bleeding is a post-extraction complication that is often found in dentistry. Normally post-extraction bleeding stops 12-24 hours after surgery, but it is often found for more than 24 hours. The post-extraction bleeding usually stops by pressing the area with sterile gauze but there is an obstacle due of the large volume of blood. **Objective:** to evaluate the bismuth subgallate as an effective local hemostatic agent. **Methods:** This study conducted on patients who came to the Oral Surgery Clinic, Nala Husada Hospital Surabaya, population aged 18-60 years, with permanent mandibular first molars diagnosed with chronic apical periodontitis et causa pulp gangrene or radix gangrene without systemic disorder and planned for extraction teeth with close method. It was divided into 2 groups by simple random sampling group design; the control group and the treatment group. After tooth extraction with the close method, a local hemostatic agent will be applied at the socket. The control group used a paste containing vaseline, while the treatment group used a paste containing bismuth subgallate. This paste contains 2.25% bismuth subgallate mixed with Peruvian balsam. After the application of local hemostatic agents, both the control group and the treatment group will be calculated the bleeding time, bleeding volume, and whether or not the secondary bleeding occurs. **Conclusion:** of this study is that bismuth subgallate has an effect as a local hemostatic agent after extraction of the mandibular first permanent molars.

Keywords: Bismuth subgallate, Bleeding, Local hemostatic agent, Post extraction.

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INTRODUCTION

Bleeding is a post-extraction complication that is often encountered in dentistry.¹ Normally post-extraction bleeding in healthy patients stops after 12-24 hours after surgery, however post-extraction bleeding is often found for more than 24 hours, so the patient has to come back to the dentist or to the emergency department because they are disturbed by the blood that keeps coming out of the socket.^{1,2}

Doctors usually stop the post-extraction bleeding by pressing the post-extraction area with sterile gauze (*digital pressure*), either moistened with a local hemostatic agent such as epinephrine or tranexamic acid, or without any local hemostatic material covering.^{2,3} In addition, bleeding can be stopped by administering local hemostatic materials such as *surgicel* into the socket, suturing or a wounds that cannot be sutured can be covered with dressing materials such as *periodontal packs*.³ Administration of local hemostatic agents often cannot stop bleeding immediately because of the large volume of blood that comes out of the socket. Therefore researchers want to find a new local hemostatic agent that is effective and efficient to stop post-extraction bleeding.

Bismuth subgallate is a one of local hemostatic agent that has been used by several experts to stop bleeding in the palate,⁴ in the tails of Wistar rats, both induced with Clopidogrel and not⁵ and in the anterior tooth sockets that had previously been sutured.⁶ However, this material has not been studied to stop posterior tooth socket bleeding.

Arroyo Júnior et al. discovered that bismuth subgallate has an effect on factor 12 activation, which accelerates the intrinsic pathway in the coagulation cascade, contributing to the hemostatic characteristic of this compound. The authors also considered the possibility that bismuth subgallate might inhibit fibrinolysis and, consequently, increase fibrosis.⁷ The researcher wanted to know the

effect of *bismuth subgallate* as a local hemostatic agent after the extraction of the mandibular first permanent molars.

MATERIALS AND METHODS

This study is a simple randomized sampling group design with a *double-blind post test only control group design* that has been declared ethically feasible by the Health Research Ethics Commission, Rumah Sakit Gigi dan Mulut Pendidikan Nala Husada, Universitas Hang Tuah with No. EC/049/KEPK.RSGMNH/IX/2023. The sample was patients who came to the Oral Surgery Clinic, Nala Husada Hospital Surabaya, aged 18-60 years old, with permanent mandibular first molars diagnosed with chronic apical periodontitis et causa pulpal gangrene or radix gangrene without systemic disorder and planned for tooth extraction *close method*. The number of research subjects was obtained from the minimum sample size formula for unpaired numerical comparative research of two groups once measured by Slovin, namely:

$$n = \frac{N}{1 + N(e)^2}$$

Based on the results of the sample calculation, the minimum sample size is 11 patients per group or 22 patients for 2 groups. The samples were divided into 2 groups, namely the control group and the treatment group. After extraction of the mandibular first molars with *the close method*, a local hemostatic agent will be applied to the socket. *The close method* of extraction is a tooth extraction technique without opening the flap and reducing the bone, so that no suturing is needed in the socket.

The control group used a paste containing vaseline, while the treatment group used a paste containing *bismuth subgallate*. This paste contains 2.25% *bismuth subgallate* mixed with Peruvian balsam. Both the patient and the operator did not know about the type of drug that would be administered after the

extraction. After administration of local hemostatic agents, both the control group and the treatment group calculated for bleeding time, bleeding volume, and whether or not secondary bleeding is present.

Bleeding time was the time that calculated from the time of the local hemostatic agent has been applied until the blood stops coming out of the socket calculated with a stopwatch in seconds. Bleeding volume was the difference in the weight of the cotton roll before and after it is used to absorb blood that comes out of the socket. Weight was measured on a digital gold scale in milligrams. Secondary bleeding was blood that comes out of the socket after a blood clot has formed. Secondary bleeding was positive if blood comes out again from the socket after 30 minutes the patient bit the tampon, it was known from the tampon which is stained with blood.

The data was collected and analyzed. The data scale used in this study is the ratio with 2 sample groups and unpaired. Normality test using Shapiro-Wilk and homogeneity test using Levene Test. Data analysis used Mann Whitney with $p < 0.05$ to determine the effectiveness of bismuth subgallate as a local hemostatic agent after the extraction of the mandibular first permanent molars. The research flow diagram was shown below:

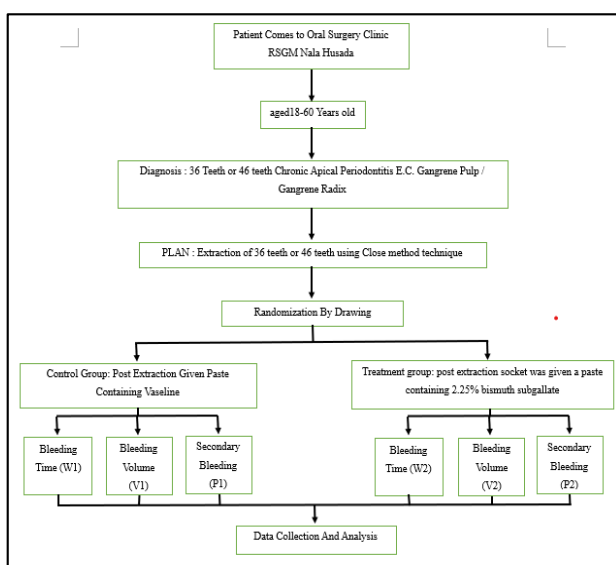


Figure 1. The research flow diagram

RESULTS

Table 1 showed the results of bleeding volume and bleeding time after administration of local hemostatic agents to the post-extraction tooth socket. Based on table 2, the results of the normality test with the Shapiro-Wilk showed that the blood volume of the control group, the blood volume of the treatment group, the bleeding time of the control group and the bleeding time of the treatment group had a p-value greater than 0.05 ($p \geq 0.05$) indicating that normally distributed data. Based on table 3 the results of the homogeneity test with the Levene test showed that blood volume and bleeding time had a p-value less than 0.05 ($p \leq 0.05$) indicating that the data were not homogeneous so the hypothesis test uses the non-parametric Mann-Whitney test.

Table 1. The mean value and standard deviation of blood volume and bleeding time

	Average	Standard deviation
Blood volume(ml)	1.73	1.46
Bleeding time (seconds)	70, 81	20.04

Table 2. Results of the normality test with Shapiro-Wilk

	Group	Shapiro-Wilk Sig.
Blood volume (ml)	Control	0.232
	Treatment	0.385
Bleeding time (seconds)	Control	0.895
	Treatment	0.377

Table 3. Homogeneity test results

	Sig.
Blood volume(ml)	0.013
Bleeding time (seconds)	0.028

Table 4. Mann-Whitney Hypothesis Test

	Sig.
Mann-Whitney	0.00*

From the results of the Mann-Whitney test, if the p value <0.05 , there was a significant difference in each group. Based on Table 3, a significant value of 0.00 is obtained, which means that there was a significant difference in each treatment group. Then a post hoc test was carried out to find out significant differences between groups.

DISCUSSION

Bismuth subgallate has been used for some time as an ingredient to stop bleeding in adenotonsillectomy surgery.⁴ Bismuth subgallate is an insoluble material in the oral cavity. In this study, the results showed a significant difference between post-extraction M1 tooth sockets that were given bismuth subgallate, which experienced a faster bleeding time than the control group. Formed within them are chemical compounds, growth factors, and inflammatory mediators (cytokines) that contribute to the processes of re-epithelialization and wound contraction. Saliva contains plasminogen activator, while the movements in the mouth, including chewing and speaking, trigger an extension of the bleeding time.⁸

The first molar with a sufficiently large dimension is felt to be capable of presenting a wider socket compared to the dimensions of the other tooth elements.⁹ However, according to research data, no effect was found from these conditions. The application of bismuth subgallate was able to help the formation of blood clots faster than the control.

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