

<p><b>Research Report</b></p>
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## Wound healing process of hemisection lower right first molar tooth after administration of silver ion water

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### ABSTRACT

**Background:** Hemisection Is a procedure for amputation of roots and resection of teeth performed due to periodontal abnormalities involving bifurcation, abnormalities in one root, very deep gingival margin due to caries or fracture. Tooth extraction is a process of alveolar dental expenditure, where the teeth are no longer able to do the treatment again. After the extraction of one of the roots the tooth socket heals slowly. Some factors such as lack of blood supply, dehydration, exudate excess, or foreign bodies hamper socket healing. Silver Ion Water is liquid embedded with silver ion which is known to promote wound healing. This study utilizes silver ion water of 15 ppm concentrate. **Purpose:** To understand the process of wound healing after 1 root tooth extraction the water supply of silver ions **Method:** Marmot teeth removed, then the wound was given H<sub>2</sub>O<sub>2</sub> for 3 days to make chronic inflammation. Samples were divided into 3 groups. Wounds of the control group were not given water silver ions, group 1 was given a silver ions water for 3 days, group 2 was given a silver ion water for 5 days. On day 8, the socket is cut and fabricated plate HPA. **Results:** The number of fibroblasts, chronic inflammatory cells, blood vessels of the control group was 64, 97, 22, group 1 was 84, 78, 31, group 2 was 119, 40, 45. **Conclusion:** Silver Ion Water shown to accelerate wound healing after one root extraction.

**Keywords:** Hemisection, Silver ions water, chronic inflammation cell, wound healing.

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### INTRODUCTION

In the field of dentistry, especially in government clinics and private clinics, tooth extraction is one of the daily actions. Teeth that require extraction generally have abnormalities such as abnormalities in the supporting tissues of the teeth, dental caries, malpositioned teeth, excess teeth, and idiopathic resorption<sup>1</sup>.

The last effort that can be done is to remove or remove one of the roots, especially on the lower molars if it is still possible to maintain them. Hemisection Is a procedure for amputation of roots and resection of teeth which is carried out due to periodontal abnormalities involving bifurcation, abnormalities in one root. Despite efforts to extract it, the patient is not completely free of complaints. There is still a possibility for the patient to experience symptoms that may occur at the stage after the extraction of one of the roots of the teeth<sup>2</sup>. If after the tooth extraction there are complaints, this may be due to negligence such as extraction technique, the patient violates post-extraction instructions such as smoking, consuming drinks that are too hot, gargling too hard or the patient has decreased resistance to infection<sup>2</sup>. In general, the extraction technique is divided into two techniques, namely the intra-alveolar extraction method

and the surgical method. The extraction technique is carried out according to the type of tooth and the position of the tooth to be extracted. Then it will cause different injuries to one another. The area or size of the wound that arises as a result of each extraction technique will affect the length of the healing process<sup>2,3</sup>.

In the final stage after tooth extraction, the patient is instructed to bite the tampon on the surface of the extraction wound. This serves to control bleeding, restrain blood clots, protect against the accumulation of food debris in the wound so that the healing process is not disturbed<sup>4</sup>.

According to Morison, in the healing process, there are various factors that can prevent the wound from closing completely and slow down healing, such as lack of blood supply, dehydration, excessive exudate, and the presence of foreign bodies. Therefore we need a drug that can help speed up the wound healing process in the oral mucosa<sup>5</sup>.

In line with the development of science and technology, Robert O and Beker, MD, again focused his attention on the use of silver ion water which is known to be useful as an anti-microbial and anti-toxin for our body to fight infection and is used by doctors as an antibiotic, antiviral and anti-parasitic<sup>6</sup>.

Silver ion water (AIP) is obtained from the results of the catalytic process using a catalyst, which in this study used AIP concentration of 15 ppm. Research conducted by Robert O and Beker MD at the UCLA School of Medicine health science center proved that silver ion water effectively fights and kills hundreds of types of viruses, bacteria, germs, fungi, parasites just minutes after contact. In addition, silver ion water is non-toxic and very effective in treating periodontal disease. Silver ion water can also be used to get rid of bad breath and kill bacteria, cure pain in the gums, bleeding gums or surgical procedures to remove infection, as a mouthwash in cases of gingivitis, periodontitis, stomatitis, as a cleaning mucosa, cleaning dental cavities, disinfection of canal treatments. roots and accelerate healing<sup>6,7</sup>.

## MATERIALS AND METHODS

This type of research is laboratory experimental research. The experimental animal that will be used in this study is the guinea pig of the *Cavia cobbaya* type, with the criterion of a guinea pig measuring between 400 – 500 mg, aged 2 – 3 months, and being fed corn. Tools and materials used in this study: cages containing places to eat and drink guinea pigs, animal scales, glass boxes for anesthesia, sterile scalpels and handles, needle holders, anatomical tweezers, syringes, digital cameras, pipettes, silver ion water, aquadest water, sterile gauze, ether anesthetic, staining agent hematoxylin eosin, alcohol, formaldehyde 10%, betadine, H<sub>2</sub>O<sub>2</sub> 10%.

Before receiving treatment, the experimental animals were given inhalation anesthesia first with the aim that the experimental animals did not feel pain in the initial treatment. The experimental animals were put into a glass tube given a cloth mat that had been given an ether solution, then closed tightly and waited until the experimental animals did not move and there was still a pulse<sup>8</sup>. water spray using a syringe then dried.

Extraction by cutting the crown and roots of the mandibular molar teeth of guinea pigs is carried out using a low speed contra angle then leveraged with a bein and done carefully so that the roots of the teeth do not fracture and one of the roots of the tooth is completely removed. The extraction site is covered with sterile gauze until the blood stops. Then guinea pigs aged 2-3 months were divided into 3 groups, namely the control group, treatment group 1, treatment group 2, each consisting of 7 guinea pigs. Each was given the following treatment: First, control group (KK). The removal scar was given an application of H<sub>2</sub>O<sub>2</sub> 10% using a sterile syringe 2 times a day for 3 days with the aim of creating chronic inflammation. Then on day 4 to day 8, drip Aquadest water. Second, treatment group 1 (KP1). The extraction scar was given an application of 10% H<sub>2</sub>O<sub>2</sub> using a sterile syringe 2 times a day for 3 days with the aim of creating chronic inflammation. Then on days 4, 5 and 6, 6 drops of Silver Ion Water were added 5 times every 2 hours then on the 7th and 8th day it was dripped with Aquadest Water. Third, treatment group 2 (KP2). The extraction scar was given an application of 10%

H<sub>2</sub>O<sub>2</sub> using a sterile syringe 2 times a day for 3 days with the aim of creating chronic inflammation. Then on the 4th to 8th day, 6 drops of Silver Ion Water are dripped 5 times every 2 hours. Fourth, On the 8th day, all experimental animals were executed. All experimental animals that had been sacrificed were made specimens of the socket part of the extraction marks on one of the mandibular molar roots, then the tissues were fixed with 10% formaldehyde and microscopic preparations were made.

Analysis of the data that has been collected is then presented in tabular form and described to get an overview of the research results. From the results of calculating the number of chronic inflammatory cells, proliferation of capillary blood vessels and fibroblast cells that had been collected, a data normality test was performed using the Kolmogorov Smirnov test. Then it was analyzed with a one-way ANOVA statistical test to see the difference in the number of chronic inflammatory cells, proliferation of capillary blood vessels and fibroblast cells in the control and treatment groups. After that, it was continued with the LSD test to see if there were differences in the speed of the wound healing process between groups.

## RESULTS

The guinea pigs in the treatment group that were dripped with silver ion water with a concentration of 15 ppm had a significant difference to the control group's guinea pigs which were not dripped with silver ion water as measured by an increase in the number of fibroblasts and blood vessels and a decrease in chronic inflammatory cells.

## DISCUSSION

This research was carried out by removing one of the roots of the mandibular right molar tooth on 21 *Cavia Cobbaya* guinea pigs. Then, silver ion water was given to the extraction wound with the aim of knowing whether silver ion water could speed up the healing process of chronic inflammation. In this study, 15 ppm silver ion water was used because it is a safe dose for humans<sup>6</sup>.

In this study, guinea pig *Cavia Cobbaya* was used and a wound was made to extract one root of the mandibular right molar. The wound is then applied with 10% H<sub>2</sub>O<sub>2</sub> until the 3rd day which aims to make the wound chronic. The control group was given distilled water because it is a material that has a neutral pH so it does not cause irritation to the tissues. While the treatment group was applied Silver Ion Water with different administration in each treatment group. The concentration of silver ion water used was 15 ppm.<sup>9,10</sup>

Examination of histopathological results was carried out on the 8th day in accordance with Kumar's opinion which stated that the wound healing process was characterized by granulation tissue filling the incision gap and fibroblast proliferation began to occur, occurring on the 4th day after extraction.<sup>11</sup>

From the research results shown in Table 1, it can be seen that the average number of chronic inflammatory cells in the control group (97.8571) is higher than the 2 treatment groups. The control group did not get the Silver Ion Water application. Table 1 shows that there is a difference in the number of chronic inflammatory cells the longer the Silver Ion Water is given. The decrease in the number of chronic inflammatory cells seen in the treatment group indicated that the inflammatory process progressed more quickly so that chronic inflammatory cells were less needed to eliminate wounds<sup>12</sup>

One of the wound healing processes involves the Metallo Proteinase (MMP) collagenase enzyme which functions to cut peptide bonds, as well as growth factors which function for tissue synthesis. Metallo Proteinase plays a role in wound healing, but it is metallo proteinase collagenase that can degrade fibronectin and growth factor peptides. Medicines based on silver ion water function to reduce MMP levels so that the degradation of fibronectin and growth factor peptides occurs. Drugs containing silver ion water also function to reduce cell apoptosis. Several studies have shown that silver ion water can suppress inflammation and accelerate wound healing. Silver ion water can increase blood calcium levels. Calcium plays an important role in the process of hemostasis. Silver ion water can also increase the concentration of zinc and copper. Zinc and copper are minerals that play an important role in cell epithelial proliferation<sup>13</sup>.

Oral bacterial colonization of the wound can result in secondary infection and inhibit the wound healing process. Silver ion water has an anti-bacterial effect so that secondary infections can be prevented<sup>14</sup>.

**Table 1.** Distribution of Mean and Standard Deviation of chronic inflammatory cells

Group	N	Mean	SD
Control	7	97.85717	0.81989
KP-1	7	78.285711	0.41219
KP-2	7	40.285714	0.41890

**Table 2.** Distribution of Mean and Standard Deviation of Fibroblast Cell Numbers

Group	N	Mean	SD
Control	7	64.142919	0.98690
KP-1	7	84	8.26640
KP-2	7	119	20.82466

**Table 3.** Distribution of Mean and Standard Deviation of Blood Vessel Cell Counts

Group	N	Mean	SD
Control	7	22.57143	0.25869
KP-1	7	31.71437	0.56559
KP-2	7	45.85713	0.48466

Fibroblasts are important cells for tissue repair. Table 2 shows an increase in the number of fibroblast cells along with the duration of Silver Ion Water administration in the treatment group. At this stage of the wound healing process, self-fibroblasts will begin to enter the wound area after the inflammatory phase enters its final stage. The increase in the number of fibroblasts indicated that the inflammatory process progressed more quickly in the treated group. Chronic inflammatory cells, especially macrophages, produce several growth factors that play an important role in fibroblast cell proliferation and angiogenesis. After completing its function, chronic inflammatory cells will undergo apoptosis and then the wound area will be filled with fibroblast cells and capillary blood vessel proliferation. At the end of inflammation, the number of chronic inflammatory cells will decrease and be replaced by self-fibroblasts<sup>15</sup>.

Table 3 shows an increase in the number of blood vessels in the treatment group that was given Silver Ion Water. Differences were seen between the three treatment groups where there was an increase in the number of capillaries along with an increase in the duration of Silver Ion Water giving.

In this study, there was a significant difference in the number of chronic inflammatory cells, fibroblast cells and blood vessels between KP-1 and KP-2. This is because the longer the administration of Silver Ion Water is more effective in accelerating wound healing after hemisection. Granulation tissue generally begins to form in the wound area on the 4th day after injury. This tissue consists of chronic inflammatory cells, proliferating fibroblast cells and proliferating blood vessels. The main function of fibroblast cells is to produce extra cellular matrix (ECM) protein which will then be replaced with collagen fibers needed for tissue regeneration. Capillary blood vessels function to transport oxygen and nutrients needed for cell metabolism. Based on their respective functions, chronic inflammatory cells, fibroblast cells, and capillary blood vessels have an important role in the wound healing process. The decrease in the number of chronic inflammatory cells, the increase in the number of self-fibroblasts and blood vessels in the treatment group that was applied Silver Ion Water indicated that Silver Ion Water could help heal chronic wounds<sup>16</sup>. In conclusion, giving Silver Ion Water to the wound after extraction of 1 lower molar root (hemisection) has been shown to speed up the wound healing process.

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