Comparison of effectiveness of normal saline, aquades and mineral water as an irrigation solution in odontectomy of impacted mandibular third molar in University of Sumatera Utara Hospital

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Abstract

Objective: To compare effectiveness of normal saline, aquades and mineral water as an irrigation solution on post-operative pain, swelling and trismus after odontectomy of impacted mandibular third molar.

Material and Methods: This study is a clinical experimental study using a post-test only control group design study design. Measurement of pain, trismus and swelling was checked on the third and seventh days after odontectomy. The number of patients studied was 33 people which 11 people used normal saline solution, 11 people used distilled water solution and 11 people used mineral water solution.

Results: Was statistically analyzed using one way ANOVA test. There was no significant difference (p> 0.05) in effectiveness of normal saline, aquades and mineral water solutions as irrigation solutions to pain, trismus and swelling on the third and seventh days after odontectomy. However, on the third day after the odontectomy, irrigating of normal saline solution showed lower levels of pain, trismus and swelling compared to other irrigation solutions.

Conclusion: Normal saline solution can promote oral wound healing and stimulates cell migration.

Keywords: Distilled water, Irrigating solution, Mandibular third molar, Mineral water, Normal saline

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Introduction

The extraction of impacted mandibular third molars is a most common procedure in oral and maxillofacial surgery. Often the removal of impacted lower third molar involves trauma to the soft and hard tissues due to retraction of a mucoperiosteal flap and the removal bone, which is frequently followed by edema of varying degree, pain and trismus. There are standards that used as benchmarks in treatment, as a duration of surgery, flap design, instruments used, the amount of bone removed, the use of irrigation, bone removal methods and suturing. Irrigating on the surgical site can help a doctor to have a better view of the surgical area by removing blood, bone fragments, removing necrotic tissue, reducing the heat effects of rotating instruments used to cut bones and reducing bacterial contamination on the surface of the surgical area so that wound healing is more effective.

Normal saline is the most common irrigating solution used among the dental professionals during the surgical removal of lower impacted wisdom tooth. Normal saline does not contain bacteriostatic and antimicrobial agents but is compatible with organs and body tissues. Distilled water is the water that has gone through various filtration processes to remove the contaminants. Aquades can eliminate pathogens that are transmitted through water. Mineral water has an advantage as an irrigation solution because it is easily accessible and cost-effective without side effects. Normal saline, distilled water and mineral water are an irrigating solutions that do not have bacteriostatic or antimicrobial properties, but from previous studies it can have an effect on wound healing. The aim of this study to compare effectiveness of normal saline, aquades and mineral water as an irrigation solution on post-operative pain, swelling and trismus after odontectomy of impacted mandibular third molar.

Material and Methods

This research was a clinical experimental study with post-test only control group design. Subject included in this study were patient with third molar impaction class I and II position A from 20-45 years old at University of Sumatera Utara Hospital from May until July 2019. A total of 33 patients were randomly divided into 3 groups and patients was treated with normal saline, distilled water and mineral water as an irrigant. Pain, trismus and swelling were measured before the procedure, the third and seventh days after the odontectomy.

Figure 1. Swelling is measured using a meter at three points, namely the distance from the angle of the mandible to the corner of the eye, the distance...
from the corner of the mouth to the tragus and the distance from the pogonion to the tragus. Figure 2.

Results

The comparison between the score showed that they were lesser for normal saline group on the third day with a mean score 3.45 ± 1.440, followed by an aquadest solution 4.27 ± 1.104 and mineral water solution 4.73 ± 1.489 with a p-value of 0.100. The score of pain on the seventh day in the irrigation action group using normal saline with a mean score 0.18 ± 0.405, followed by mineral water -0.227 ± 0.293 and aquadest -0.245 ± 0.180 with a p-value 0.232. Table 1. Thus it can be concluded that there is no significant difference in effectiveness of normal saline, aquades and mineral water solutions as irrigation solutions to pain on the third and seventh days after odontectomy.

The lowest score of the trismus which was evaluated on the third day was found in the normal saline group with a mean score -0.662 ± 0.249 followed by aquadest -0.691 ± 0.408 and mineral water solution of -0.777 ± 0.456 with a p-value 0.673. The score of trismus on the seventh day using normal saline with a mean score -0.100 ± 0.126 followed by mineral water -0.227 ± 0.293 and aquadest -0.245 ± 0.180 with a p-value 0.232. Table 2. Thus it can be concluded that there is no significant difference in effectiveness of normal saline, aquades and mineral water solutions as irrigation solutions to trismus on the third and seventh days after odontectomy.

The score of swelling on the third day after odontectomy was the lowest in the group of irrigation using normal saline with a mean score 0.909 ± 0.512 followed by aquadest solution 1.609 ± 0.476 and mineral water solution 1.936 ± 0.890 with a p-value 0.103. The swelling score on the seventh day in normal saline group with a mean score 0.191 ± 0.192 followed by aquadest solution 0.473 ± 0.355 and mineral water solution 0.500 ± 0.596 with a p-value 0.173. Table 3.

Thus it can be concluded that there is no significant difference in effectiveness of normal saline, aquades and mineral water solutions as irrigation solutions to swelling on the third and seventh days after odontectomy. Table 4

Discussion

Irrigating on the surgical site can help a doctor to have a better view of the surgical area by removing blood, bone fragments, removing necrotic tissue, reducing the heat effects of rotating instruments used to cut bones and reducing bacterial contamination on the surface of the surgical area so that wound healing is more effective. Complications such as pain, edema and trismus caused by surgical trauma depend on the inflammatory process. In surgical removal of impacted mandibular third molars, the time of intervention is considered to be related to the position of the teeth, angle, and experience of the surgeon.

The inflammatory phase begins the moment tissue injury occurs and, in the absence of factors that prolong inflammation, lasts 3 to 5 days. In general, this phase aims to get rid of tissue affected by the wound and prevent invasive infections. The irrigation solution used remove of necrotic tissue so
Normal saline is the most common irrigating solution used not only during surgery but also in wound cleansing. This solution is isotonic and contains Na+ and Cl- electrolytes. Na+ is a major cation in extracellular fluid and has an important role in the treatment of disorders and electrolytes. Cl- has a role as a buffer when oxygen and carbon dioxide are exchanged in red blood cells. Normal saline does not contain bacteriostatic and antimicrobial agents but is compatible with organs and tissues. Normal saline increases wound healing by affecting cell migration but not proliferation. Irrigation using normal saline solutions stimulates the migration of human gingival fibroblasts cells (hGFs) and increases extracellular matrix and cytoskeletal protein (FAK).

Mineral water has gone through some additional processing needed to ensure the safety of the water to be used and contains minerals that are useful for the body. Drinking water has levels of sodium (Na+) as in normal saline, calcium (Ca2+) and magnesium (Mg2+) which are important in bone and cardiovascular health. However, drinking water does not provide a direct effect to accelerate wound healing due to mineral content which contained in water will only be absorbed into the body when consumed and in certain amounts.

Distilled water was steam is separated from contamination and cooled back to pure distilled water. Distillation kills bacteria and viruses and removes complex chemicals, dangerous inorganic substances, pesticides, chlorine and fluoride. Distilled water help dissolve toxins that accumulate in our body, helping to cleanse body cells, organs and fluids.

Irrigating in the impacted tooth removal socket can help to clean the wound so it can help wound healing process faster. However, patient cooperation is also needed during the wound healing process. Patients must follow the instructions given by the doctor and still maintain oral hygiene. Sockets must be cleaned every day to prevent food residue from remaining in the socket where it can be a factor that inhibits wound healing.

**Conclusion**

Based on the results and data analysis, it can be conclude that irrigating with normal saline solution showed lower levels of pain, trismus and swelling compared to other irrigation solutions. Normal saline increases wound healing by affecting cell migration. Although the wound healing process in each individual is different depending on the physiological response of each individual's body. At least normal saline can help reduce discomfort in patients after surgical extraction of impacted mandibular third molar.

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**Conflict of Interest**

The authors report no conflict of interest.

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**Table 1. Mean pain score on the third- and seventh-days post odontectomy**

| Groups      | Day 3 SD | Day 3 Mean | Day 7 SD | Day 7 Mean |
|-------------|----------|------------|----------|------------|
| Normal Saline | 1.440    | 3.45       | 0.405    | 0.18       |
| Distilled water | 1.104    | 4.27       | 0.647    | 0.27       |
| Mineral Water | 1.489    | 4.73       | 1.168    | 0.82       |

**Table 2. Mean trismus score on the third- and seventh-days post odontectomy**

| Groups      | Day 3 SD | Day 3 Mean | Day 7 SD | Day 7 Mean |
|-------------|----------|------------|----------|------------|
| Normal Saline | 0.2494  | -0.627     | 0.1265   | -0.100     |
| Distilled water | 0.4085  | -0.691     | 0.1809   | -0.245     |
| Mineral Water | 0.4563  | -0.773     | 0.2936   | -0.227     |

**Table 3. Mean swelling score on the third- and seventh-days post odontectomy**

| Groups      | Day 3 SD | Day 3 Mean | Day 7 SD | Day 7 Mean |
|-------------|----------|------------|----------|------------|
| Normal Saline | 0.5127  | 0.909      | 0.1921   | 0.191      |
| Distilled water | 0.4763  | 1.609      | 0.3552   | 0.473      |
| Mineral Water | 0.8903  | 1.936      | 0.5967   | 0.500      |

**Table 4. P-value of normal saline, distilled water and mineral water irrigating solution on the third and seventh day**

| Irrigant Solution | Pain P-value | Trismus P-value | Swelling P-value |
|-------------------|--------------|-----------------|------------------|
|                   | Day 3 Mean   | Day 7 Mean      | Day 3 Mean       | Day 7 Mean |
| Normal Saline     | 0.100        | 0.152           | 0.673            | 0.232      |
| Distilled water   | 0.173        | 0.103           | 0.103            | 0.130      |
| Mineral Water     | 0.173        | 0.103           | 0.103            | 0.130      |
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