

Beneficial Effect of Application of Virgin Coconut Oil (VCO) Product from Padang West Sumatra, Indonesia on Palatoplasty Wound Healing

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Abstract

The goal of wound care is to heal wounds quickly and relieve minimal pain, discomfort and scarring by providing adequate nutrition and the use of topical and systemic antimicrobial agents. Of various types of surgical wounds, each causing different wound -healing responses in a particular tissues, palatoplasty surgical wound for example. Coconut oil is an easily available edible oil. VCO is unique because of containing MCFAs with 45-50 percent lauric acid as predominant content. Previous study reported the effect of coconut oil pulling/oil swishing on plaque formation and plaque induced gingivitis. The objective of this study is to evaluate the beneficial effect of VCO on palatoplasty palatal surgical wound healing. In this study, the researchers included 6 patients who followed the palatoplasty procedure. Virgin coconut oil was applied onto and after palatal wound closure. All standard operating procedures were applied in this study. As a conclusion, VCO accelerated wound healing, accompanied by an increased number of fibroblast cells appeared in the wound, as well as fewer pain complaints.

Keywords: palatoplasty; VCO; fibroblast; post-operative pain.

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1. Introduction

Cleft palate repair is of concern to surgeons, especially plastic surgeons. The objective of this procedure is to close the palatal defect and create an adequately functioning velopharyngeal mechanism for normal speech production. The main goal of the palatoplasty surgery is therefore to correct this anomaly and enable the patient to breathe, swallow and speak without much difficulty. Generally, palatoplasty is performed at the age of 9 to 18 months and whether the repair performed in primary or gradual steps is depend on the surgeon [1].

There are however some other cleft lips patients who after undergoing palatoplasty show various side effects which range from mild to severe and they include mild or severe reactions to the anaesthesia process , allergy to the anesthesia medications, blood clotting and bleeding from the site of operatin. The side effects can be treated with medications to reduce inflammation, stop the bleeding and prevent infection by microorganisms at the site of operation. The complications which may arise from the palatoplasty surgery include blockage of the airways and the site of operation failing to heal correctly within the required time. In all cases, palatoplasty will lead to development of permanent scar at the site of operation [2].

Wound healing activates a serial of vascular, cellular and biochemical mechanisms that result in regeneration or repair of surgical wounds, whereas in palataloplasty lesions, secondary healing results in the formation of large amounts of granulation tissue to bridge the wound gap [3]. The goal of wound care is to heal wounds quickly and relieve minimal pain, discomfort and scarring by providing adequate nutrition and the use of topical and systemic antimicrobial agents [4]. Virgin Coconut Oil (VCO) is a high value coconut product because it has medical potential such as antibacterial, antiviral and antifungal activity resuled from its medium chain fatty acids (MCFAs), especially lauric acid (C12: 0) in monoglyceride form (monolaurin or ML) [5].

West Sumatra has genetic diversity and local products that are potentially beneficial to health. An example is a VCO. The VCOs that have reached the market in West Sumatra have been studied and proven to contain lactic acid bacteria that are active against pathogenic bacteria, such as *Staphylococcus aureus* , *Escherichia coli*, *Bacillus subtilis* and *Salmonella typhosa*. This potential is proven through microbiological examination, and inhibitory zone measurements. BAL is grow in VCO, and also in the fermentation of green cocoa and fermented buffalo milk known as curd named dadih [6,7,8,9] Lactic acid bacteria is found in fermented milk and safe to consume by human [10].

Lauric acid controls infection by destroying microorganisms and will stimulate collagen production and accelerate wound healing with scarring. The antibacterial properties in the VCO is caused by the presence of hydrophobic bacteriocin from fermentation process with Lactic Acid Bacteria (LAB)[11] .

2. Materials and Methods

This study was designed as a prospective study to evaluate the beneficial effect of post-operative application of VCO productet in Padang West Sumatra on palatoplasty wound healing. Of six patients included in this study, five patients received VCO application after wound closure. In five patients, the surgical suture was smeared with VCO, while one patient was not given VCO. Ten ml of virgin coconut oil were applied on sutured surgical

wound. Analgesic drugs were given to all patients when surgery was almost complete. Existing standard treatment were used unaltered, and the only added intervention was the use of VCO. Patients were monitored continuously during the treatment period, including monitoring of pain complaints and bleeding. Twenty four hours post-surgery, 10 mL of VCO were given every 8 hours as mouth wash to the subjects. All subjects were fed through feeding tube. Twenty-four 24 hours after surgery, the patient was given a 10 ml VCO three times daily every 8 hours, the VCO was used as mouth wash liquid for a minute. Cytology scrapping of palatal mucosal were done 24 hours post-palatoplasty, after which the examination is repeated on the fourth day. Histologic examination and Giemsa staining was performed on samples obtained from scrapping. [12] Evaluation of pain complaints also made on every visit. The study was conducted according to the Declaration of Helsinki and approved by Ethical Committee of Faculty of Medicine University of Andalas, Padang, West Sumatra.

3. Results

The characteristics of the patients are shown in table 1. Five patients included received treatment, two were male and three were female patient. Age range were 10 - 22 yr old.

Table 1: Characteristic of patients underwent palatoplasty procedure.

Treatment patient (2 male, 3 female)	5
Control patient (male)	1
Age (yr)	(10-22)

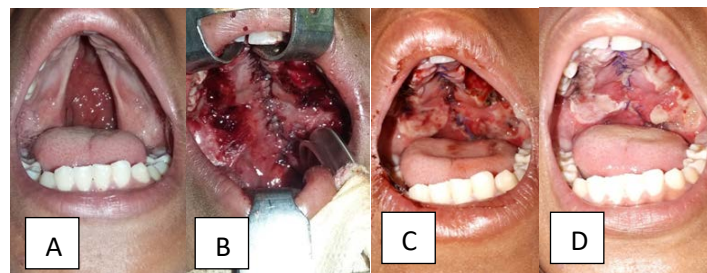


Figure 1: Wound closure after using VCO as mouth wash.

Figure 1 (A) is a patient with clef palate (before surgery). Figure 1(B) was taken 24 hr post surgery. Figure 1 (C) and (D) were taken on day 2 and 4 post surgery. Twenty-four hours post surgical, severe pain arises, usually morphine is used with consequencey to keep the patient in the recovery room or intensive care unit for at least 24 hours to monitor airway and ventilation dysfunction [13]. The swelling was drastically reduced at 4 days after surgery. Patients were monitored for their pain complaints after twenty-four hours post-surgery, of all patiens whose wound were treated with VCO, no one complained pain, hence the analgesic drug was discontinued. The administration of analgesic drug was continued in a patient who was not given a VCO and complained severe

pain. VCO has a moderate antiinflammatory effect on ethyl phenylpropiolate induced edema in rat. The VCO exhibits effect on chronic inflammation by reducing transudative weight, granuloma formation and decreasing serum alkaline phosphatase activity. The results show that VCO has anti-inflammatory, analgesic and antipyretic properties [14].

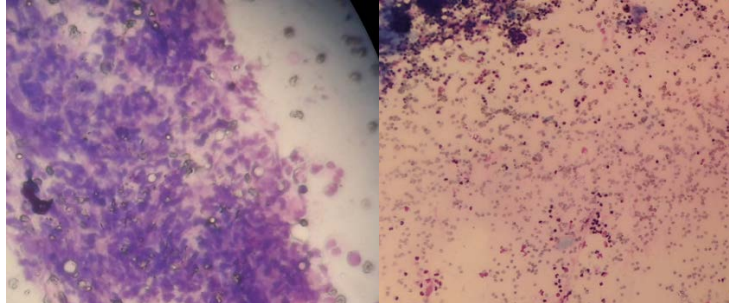


Figure 2: Histologic examination results of samples obtained by mucosal scrapping of palate.

Figure 2 above are images of histologic examination on samples obtained by scrape cytology in Giemsa staining. In the left figure, the histologic examination of the sample obtained from patient treated with VCO showed excessive fibroblasts cells and granulation cells. In the right figure (without VCO), less fibroblast cells found, except many inflammatory cells. These findings is supported with a theory stated that wound healing of the skin is a complex process in response to a wound, and consist of several phases which are hemostatis and inflammation, proliferation, maturation and remodeling. In the proliferative phase, the continuity of the wound tissue is infiltrated by fibroblasts and endothelial cells infiltrate. Fibroblasts colonize lactated-regenerated collagen through mechanisms involving adenosine diphosphate (ADP) -ribosylation and endothelial cells play a role in angiogenesis. Collagen synthesis is highly dependent on systemic factors, such as an adequate supply of oxygen, amino acids, and carbohydrates, co-factors (vitamins and metals) and local wound environments in the form of vascular supply and low infection[15].

The goal of wound care is to heal wounds quickly and relieve minimal pain, discomfort and scarring by providing adequate nutrition and the use of topical and systemic antimicrobial agents [4]. Bacteria and endotoxins may cause prolonged elevations of pro-inflammatory cytokines such as interleukin-1 (IL-1) and tumor necrosis factor- α (TNF- α), thus prolonging the inflammatory phase and if this continues the injury will enter chronic stages and fail to recover [16].

The results of this study is supported by previous study using rabbits that injured and treated with VCO mixed with vaseline (1: 3) compared with densinfectant (iodine). The study indicated that the wound healing process was faster when treated with VCO compared with control. This was proven by the presence of granular tissue, an excessive collection of collagen with remodeling of epithelial cells and found macrophages around the wound area [17]. VCO - treated wound healed faster, as indicated by accelerated epithelialization, in which increased pepsin-soluble collagen, indicating high cross-linking of collagen. Histopathological studies showed an increase in fibroblast cleavage and neo vascularization in wounds given VCO when compared with controls [4]. Another study concluded that VCO has a better ability to reduce the size of recurrent mouth ulcers of

recurrent aphthous stomatitis, relieve pain and cure ulcers more quickly by accelerating reepithelialization mechanisms, increasing antioxidant enzyme activity and stimulating cross-linking of collagen on the wound tissue [18].

4. Conclusion

As a conclusion, VCO accelerated wound healing, accompanied by an increased number of fibroblast cells appeared in the wound, as well as fewer pain complaints.

5. Recommendation

Based on the findings of this study, it can be recommended as follows:

- Post-palatoplasty patients are allowed to opt for VCO after recovering from the anesthetic effects.
- The use of VCO is not meant to replace standard procedure. For patients using VCO, surgeons are expected to continue to apply standard treatment procedures until the patients fully recovered.
- The patients remains monitored by the surgeon for pain complaints and other complaints relating to the palatoplasty procedures. Any problems that still occur are treated with appropriate medical treatment.

References

- [1] Reena, K. H. Bandyopadhyay, A. Paul. "Postoperative analgesia for cleft lip and palate repair in children." *Journal of Anaesthesiology Clinical Pharmacology*. vol. 32, pp. 5 –11, 2016.
- [2] P. R. S. De Ladeira, N. Alonso "Protocols in Cleft Lip and Palate Treatment: Systematic Review" [On-Line]. Vol. 2012. Available: <http://dx.doi.org/10.1155/2012/562892>, 2012 [July 23, 2017].
- [3] J. W. Harrison. "Healing of surgical wounds in oral mucoperiosteal tissues." *The American Association of Endodontists. Journal of Endodontics*. vol. 17, pp. 401- 408, 1991.
- [4] K.G. Nevin, T. Rajamohan. " Effect of Topical Application of Virgin Coconut Oil on Skin Components and Antioxidant Status during Dermal Wound Healing in Young Rats." *Skin Pharmacology Physiology*. vol. 23, pp. 290-297, 2010.
- [5] Elysa, U. Harahap, J. Silalahi. "Antibacterial activity of Enzymatic Hydrolysis of Virgin Coconut oil against Salmonella." *International Journal of PharmTech Research*. vol. 6, pp. 589-599, 2014.
- [6] S. Syukur, Syafrizayanti, S. Zulaiha, M. Ismet, E. Fachrial. "Virgin coconut oil increase high density lipoprotein, lower triglyceride and fatty acids profile (C6-C18) in blood serum of *Mus musculus*". *Research Journal of Pharmaceutical, Biological and Chemical Sciences*. vol.2 , pp.1077 -1081, 2017.
- [7] H. Rajagukguk, S. Syukur, Syafrizayanti, S. Zulaiha, Y. Syaputri, E. Purwati, H. Iwahashi. "Strong antimicrobial of lactic acid bacteria and species identification of virgin coconut oil products in Padang

- West Sumatera, Indonesia,” presented at the 4th Int. Conf. on Earth Sciences and Engineering, Padang, Indonesia, 2017.
- [8] S. Syukur, B. Bisping, Z. A. Bisping, Z. A. Noli, E. Purwati. “Antimicrobial properties and lactase activities from selected probiotic *Lactobacillus brevis* with green cacao fermentation in West Sumatra, Indonesia”. *Journal Prob Health*. vol. 1, pp.1-4, 2013.
- [9] S. Syukur, A. Hermansyah, E. Fachrial. “Probiotics and strong antimicrobial of buffalo milk fermentation (dadih) from different places in West Sumatera Indonesia”. *Research Journal of Pharmaceutical, Biological and Chemical Sciences*. vol. 7, pp. 386-392, 2016.
- [10] S. Syukur, F. Rijal, Jamsari, E. Purwati. “Isolation and molecular characterization of lactic acid bacteria by using 16s rRNA from fermented buffalo milk (dadih) in Sijunjung, West Sumatra”. *Research Journal of Pharmaceutical, Biological and Chemical Sciences*. vol.5, pp. 871-876.
- [11] P. Srivastara, S. Durgaprasad, S. “Burn wound healing property of *Cocos nucifera* : An appraisal.” *Indian Journal of Pharmacology*. vol. 40, pp. 144-146, 2008.
- [12] B. M. Jha, A. Roy, S. H. Jana, C. Patel, P. Vaghela, S. Gupta. “Scrape cytology – can it replace punch biopsy in diagnosing oral lesions?” *International Journal of Medical Science and Public Health*. Vol.3, pp. 224-228, 2014.
- [13] M. Mesnil, C. Dadure, G. Captier, O. Raux, A. Rochette, N. Canaud, M. Sauter, X. Capdevila. “A new approach for peri-operative analgesia of cleft palate repair in infants: the bilateral suprazygomatic maxillary nerve block”. *Paediatric Anaesthesia*.” vol. 20, pp. 343-9, 2010.
- [14] S. Intahphuak, P. Khonsung, A. Panthong. “Anti-inflammatory, analgesic, and antipyretic activities of virgin coconut oil.” *Pharmaceutical Biology*, vol. 48, pp. 151-7, 2010.
- [15] A.Barbul , D.T. Efron, S.L. Kavalukas. “Wound Healing“ *Schwartz principles of surgery*, 10th ed., F.C.Brunnicardi, New York : Mc Graw Hill, 2015, pp. 241-271.
- [16] S. Guo, L. A. DiPietro. “Factors affecting wound healing.” *Journal of Dental Research*. vol. 89, pp. 219-229, 2010.
- [17] S.H. Batool. “The effect of coconut oil extract on full thickness wound healing on the female rabbit.” *Basra Journal of Veterinary Research*. vol. 1, pp. 28-36, 2012.
- [18] D. S. Halim, N. A. Abdullah, M. K. Alam, S. N. B. Samsee, T. S. May. “Comparison of the effectiveness between virgin coconut oil (VCO) and triamcinolone for treatment of minor recurrent aphthous stomatitis (RAS).” *International Medical Journal*. vol. 2, pp. 319-320, 2014.