

COMPARATIVE STUDY OF EFFECTIVENESS OF WOUND CLEANSING SOLUTION IN DIABETIC WOUND CARE

(Studi Komparatif Efektivitas Cairan Pencucian Luka Diabetes Mellitus)

Achmad Fauji*, Puji Sarwati*, Nur Miladiyah Rahmah*, Aluwi Sani Nirwana**

*Lecturer of Nursing Program, **Lecturer of Pharmacy Program

STIKES Bani Saleh Bekasi Jl. R A Kartini No. 66 Bekasi, Tel. (021) 88345064

E-mail: afauji.odji@gmail.com

ABSTRAK

Pendahuluan. Proses pencucian dalam penanganan luka diabetes umumnya menggunakan larutan NaCl atau larutan komersial lainnya. Saat ini penggunaan ekstrak daun jambu (*Psidium guajava* L.) sebagai larutan pencuci luka sudah mulai diperkenalkan sebagai bagian dari teknik keperawatan komplementer. Penelitian ini bertujuan untuk melihat efektivitas dari cairan pencuci luka ekstrak daun jambu, dan NaCl dalam proses penyembuhan luka pasien diabetes mellitus. **Metode.** Penelitian ini mempunyai sampel sebanyak 6 orang, dengan metode quasi eksperimen 4x pencucian luka terhadap kelompok kontrol yang menggunakan NaCl sebagai cairan pencuci luka dan ekstrak daun jambu. **Hasil.** Data menunjukkan bahwa ada perbandingan efektivitas yang signifikan antara jenis cairan pencuci luka NaCl dengan ekstrak daun jambu terhadap karakteristik luka (presentasi slough pada luka P value: 0,043, presentasi granulasi pada luka P value 0,037) ($\alpha=0,05$). Serta tidak ada perbandingan efektivitas yang signifikan antara jenis cairan pencuci luka NaCl dengan ekstrak daun jambu terhadap karakteristik luka responden (lebar luka P value: 0,184, Panjang luka P value: 0,361, presentasi jaringan epitel P value 0,072) ($\alpha=0,025$). **Diskusi.** Hasil penelitian ini mengkonfirmasi bahwa larutan ekstrak daun jambu dapat dijadikan alternative cairan pencuci luka sebagai cairan pembersih luka komersial seperti NaCl 0.9%.

Kata kunci: Cairan pencuci luka, Diabetes Mellitus, Ekstrak daun jambu, Perawatan Luka

ABSTRACT

Introduction. Wound cleansing for diabetic wound care always used 0.9% of NaCl or other commercial solutions. Currently, the use of guavas leaves extract (*Psidium guajava* L) as an alternative wound cleansing solution has been started to be introduced as a part of complementary nursing. The aim of this study was to compare the effectiveness of commercially wound cleansing solution of 0.9% NaCl and guavas leaves extract in wound healing process of diabetes mellitus patients. **Methods.** This study used six respondents as a sample, by using quasi experiment methods of 4 times wound cleansing. In this experiment, the control group used NaCl 0.9% while a group of sample used guavas leaves extract as wound cleansing solutions. **Result.** The experimental result revealed that there was a significant result between types of wound cleansing solution effectiveness in NaCl 0.9% with an extract guavas leaves for some wound characteristics (Presentation of wound slough P value: 0.043; presentation of wound granulation P value: 0.037 ($\alpha=0.05$)). However, There were no significant result of effectiveness comparison between wound cleansing solution (NaCl 0.9% and Guavas Leaves Extract) for wound dimension and epithelial tissue characteristics (Wound wide P value: 0.184; wound long P value: 0.361; epithelial tissue presentation P value: 0.072 ($\alpha=0.05$)). **Discussion.** These results confirmed that guava leaves extract can serve as an alternative wound cleansing solution as commercial wound cleansing solution such as 0.9% NaCl.

Keywords: Guavas leaves extract, Diabetes mellitus, wound care, wound cleansing solution

INTRODUCTION

Impairment in skin integrity by accident can cause an imbalance against psychology, physical defect, or even death. However, some technique developments dealing with wound care as part of nursing technique lowered those effects. The process of wound healing involves phases which involves activation of the gene. In this process, some commercial solution that show anti bacteria effect can accelerate healing process of the wound. In addition, some plants

are also used in speeding up that process. Several plants that could be used are: fruit and seed of rambutan, betel leaf, and guava. Guava (*Psidium Guajava* L.) potential has been known for long time among traditional society. These conditions can comprehended remember that these plant which customarily grown something that easily in backyard, particularly in rural communities, such as guava leaves. Its nature characteristics as anti-radical, anti-inflammatory, and anti-bacteria in modern research also support their potential. So far,

research report on side effect of guava leaves extract, especially for wound healing has not been well documented. While oral discharge of guavas leaves extract that shown its efficacy has been reported in scientific journal.

Utilization of guava leaves extract for wound care is far cheaper than the use of commercial one. The cheap manufacturing process leads the treatment using guava leaves extract potentially to be developed into commercialization. However, importantly, in the utilization of herbs always lacks of information regarding usage dose and concentrations of how herbs plants can be implemented to the body. It is to avoid the potential side and adverse effects reaction of the body that may appear as a results of excessive usage more than the dosage requirement. The aim of this study was to compare the effectiveness of commercially wound cleansing solution of 0.9% NaCl and guavas leaves extract in wound healing process of diabetes mellitus patients.

METHODS

This study used six respondents as a sample, by using quasi experiment methods of 4 times wound cleansing. In this experiment, the control group used NaCl 0.9% while a group of sample used guavas leaves extract as wound cleansing solutions.

Ten (10) gram of guava leaves (more or less seven sheets) was aerated and dried. Extraction component of guava leaves used 1 (one) liter of fresh water subsequently was heated at a temperature of 100° C (concentration of 10 g of guava leaves/L). Next process was to extract and to filter the solution by using Whatman paper no. 1. Finally, the extract was kept at 4° C for future used in diabetic patients foot ulcer.

An object of this research was the patient that positively had diabetes mellitus with foot ulcer. Wound healing level progress monitored for 1 (one) months.

RESULTS

Based on macroscopic image displayed that diabetic wound cleaned with guava leaves extract for four times cleansing was more experienced in wound bed color changes (slough, granulation, and ephitelization tissue) as well as distinct in wound size (length and width). In contrast, a wound that cleaned with 0.9% of NaCl was not experienced a significant change in wound bed colors and wound size. Wound care treatment given to 6 (six) respondents for wound dressing consist of ointment containing zinc and metronidazole as primary dressing, and gauze as secondary dressing. Treatment was given only in wound cleansing solution.

Table 1. The Average Distribution of Respondent Wound Characteristics based on Wound Cleansing Solutions

Wound Characteristic	Mean	SD	Mean Differensiasi	P value
Width	4,667	3,0605	4,5 ^a 2,5 ^b	0,184
Length	3,833	2,6204	4,17 ^a 2,83 ^b	0,361
Slough Presentation	60,83	47,267	5 ^a 2 ^b	0,043
Granulation Presentation	25,83	30,364	2 ^a 5 ^b	0,037
Epitelisation Tissue	13,22	17,224	2,17 ^a 4,83 ^b	0,072

Note: a. NaCl 0.9% as wound cleansing solution; b. Guava leaves extract as wound cleansing solution

Average wound width cleaned with NaCl 0,9% and guava leaves extract was $4,667 \pm 3,0605$ cm, and average width wound on guava extract leaves group much lower for 2,50 cm wide compared with wound on group cleaned with 0.9% of NaCl for 4,5 cm. Average wound length cleaned with 0.9% of NaCl and guava leaves extract was $3,833 \pm 2,6204$ cm, while average length wound on guava extract leaves group much lower for 2,83 cm compared with wound on group washed with NaCl 0,9% for 4,17 cm. Average wound epithelial tissue cleaned with NaCl 0,9% and guava leaves extract was $13,33\% \pm 17,224\%$, while average wound epithelial tissue on group NaCl 0,9% much lower for 2,17% compared with wound on group washed with guava extract leaves for 4,83%. Statistical test result for wound width obtained p value = 0.184 ($\alpha = 0.05$), wound length obtained p value = 0.361 ($\alpha = 0.05$), and for epithelial tissue presentation obtained p value = 0.072 ($\alpha = 0.05$).

Average wound slough presentation cleaned with 0,9% of NaCl and guava leaves extract is $60,83 \pm 47,267\%$, while average wound slough presentation on group cleaned with guava leaves extract much lower for 2% compared with wound on group with 0.9% of NaCl for 5%. Average wound granulation presentation tissue cleaned with 0.9% of NaCl and guava leaves extract was $25,83 \pm 30,564\%$, while average wound granulation presentation on group 0.9% of NaCl much lower for 2% compared with wound on group washed with guava extract leaves for 5%. Statistical test result for wound slough presentation obtained p value = 0.043 ($\alpha = 0.05$), wound granulation presentation obtained p value = 0.037 ($\alpha = 0.05$).

Taken together, it can be concluded there was significant difference in the average of wound slough presentation, wound granulation presentation, but no effect on the average of wound width, length, and epithelial tissue between the average of respondent who cleans with guava leaves extract and 0.9% of NaCl.

DISCUSSION

Management for chronic wound care especially in diabetes mellitus has growing rapidly. Various wound assessment can be used in wound care nursing practice. It is generally to assess or examine wound status in order to understand the cause of molecular and cellular abnormality and to prevent wound severity. Wound assessment used in this study was focusing to wound assessment with TIME concepts (Sculz, Sibbald, Falanga, et al, 2003 in Smith & Nephew, 2011).

A TIME concept is the form of assessment of Tissue management, Inflammation & infection control, Moisture balance, and epithelial edge advancing. This concept becomes the framework used in nursing practice (Dowset, 2009). Dowset (2009) also stated that knowledge and skills increase in community nurse after training using TIME concept ($t[39]=17.37$, $p < 0.001$ and $t[32]=7.12$, $p < 0.001$).

Other wound assessment is proposed by Sardina (2007) which consist of 16 phase of wound assessments. Another wound assessment is wound assessment guidance by woundinternational.com (2009) who assess healing phase, wound location, wound size, amount of exudate, odor, pain, margin/surrounding tissue, and skin around the wound.

Keast, et al. 2004 (in Dealey, 2005) explained that chronic wound assessment framework a MEASURE concept is the form of assessment of Measure (length, width, depth, and wound area), Exudate (quality and quantity), Appearance (wound bed color, tissue type and amount of presentation), Suffering (pain type and level), Undermining (present or not), Re-evaluate (monitoring all parameters regularly) and Edge (tissue and skin around the wound). In this study, we used one wound assessment, which is TIME concept, because this assessment has been used in wound care clinic for this study and for its simplicity use in assessing a wound.

Wound overviews in macroscopic observation were an observation on the object observed directly. It consisted of the width of the wound, length, slough presentation, granulation presentation, as well as the epithelial tissue presentation. This observation observed since first onto fourth wound cleansing by looking at a component that will be examined.

The changes that occur in wound especially in patient that used extract guava leaves as wound cleansing solution were granulation and slough presentation. This change appear after 3rd wound cleansing. Margolis, et al. (2002) stated that size, duration, and wound grading significantly will undergo healing in weeks 20 after treatment. Moreover, Zimny, et al. (2003) reported that the wound extensively in diabetic patient with foot ulcer begin with 6,12-17,1 cm and gradually decrease to 0,32 – 0,15 after day 70th (*p value*=0,005), wound size reduced 0,045 mm daily (95% CI 0,039 – 0,005) and the healing phase occurred in first and seventh weeks after wound taking place. This statement was supported by Oyibo *et al.* (2001) who reported the amount of the wound in diabetic patient about 3,9–1,2 cm² (*p value*<0,0001) and related to healing time (*rs* = 0,27, *P* < 0,0001) also wound healing predictor factor (*P*=0,04).

Guava leaves extract allege to have the ability as an analgesic, anti-inflammation, anti-microbial, because its contains anti-oxidant and phenolic compounds (Ryu, et al (2012); Ojewole (2006); Nair & Chanda (2007); Huiyin & Gow-Chin (2007); Hawrelak (2003); in Barbalho, et al. (2012)). Component in guava leaves extract was assumed to speed wound healing, inhibits the growth of gram-positive and gram-negative bacteria in diabetic patients. This result in line with the study by Fernandes *et al.* (2010) who revealed a guava leaves extract declined in cellular viability and growth of microorganism *in vitro* according to control group, while in *in vivo* showed wound healing process faster in day 3rd. A NaCl 0,9% are sterile, non-pyrogenic and isotonic solutions (MIMS, 2014). According to Drugs.com, NaCl 0,9% has characteristics

un-bacteriostatic, not as an antimicrobial agent or buffer solution, if used as wound cleansing solution only act as cleaner and bacterial shed. In control group there are no perceptible to the progress or improvement of the wound.

CONCLUSION

Guava leaves extract was assumed to speed wound healing, inhibits the growth of gram-positive and gram-negative bacteria in diabetic patients.

RECOMMENDATION

This and our results confirmed that guajava leaves extract can serve as an alternative wound cleansing solution as commercial wound cleansing solution such as 0.9% NaCl.

REFERENCE

- Barbalho, S.M., Farinazzi-Machado, F.M.V., De Alvares, G.R., Brunnati, A.C.S., Otoboni, A.M. & Nicolau, C.C.T., (2012). *Psidium Guajava (guava): A plant of multipurpose medicinal applications*. Med Aromat Plants 1:104. doi:10.4172/2167-0412.1000104
- Dealey, C. (2005). *The care of wounds: A guide for nurses*. (3rd Ed). Oxford, UK. Blackwell Publishing Ltd.
- Dowset, C. (2009). *Use of TIME to improve community nurses' wound care knowledge and practice*. Wound UK, Vol 5 No. 3 Hal 14-21.
- Fernandes, K.P.S., Bussadori, S.K., Maques, M.M., Wadt, N.S.Y., Bach, E., & Martins, M.D., (2010). *Healing and cytotoxic effects of psidium guajava (guava) leaf extracts*. Brazilian Journal of Oral Science. Vol. 9., No. 4, 2010, Hal 449-454. EISSN: 1677-3225
- Margolis, D.J., Allen-Taylor, L., Hoffstas, O. & Berlin, J.A., (2002). *Diabetic neuropathic foot ulcer: The association of wound size, wound duration, and wound grade on healing*. Diabetes Care, Vol. 25 No. 10. Hal. 1835-1907.

Comparative Study of Effectiveness of Wound Cleansing Solution (Achmad Fauji, dkk.)

- MIMS (2014). NaCl 0,9% diakses dari <https://www.mims.com/Indonesia/drug/search/?q=NaCl%20%2C9%25> pada tanggal 20 Oktober 2014.
- Oyibo, S.O., Jude E. B., Tarawneh, I., Nguyen, H.C., Armstrong, D.G., Harkless, L.B., & Boulton, A. J., (2001). *The effects of ulcer size and site, patient's age, sex and type and duration of diabetes on the outcome of diabetic foot ulcers*. Diabet Med. Vol 18. No. 2. Hal. 133
- Sardina, D. (2006). *Skin and wound Resource manual*. Lake Geneva WI: Wound Care Education Institute.
- Sardina, D. (2007). *Wound and skin care pocket guide*. Lake Geneva WI: Wound Care Education Institute (August 2007) ISBN 13:978-0-9789208-1-4.
- Smith-nephew (2011). *Wound bed preparation: TIME defining the principles of wound bed preparation*. Diakses dari http://www.smith-nephew.com/global/assets/pdf/products/wound/wbp_english.pdf pada tanggal 20 Oktober 2014.
- Zimny, S., Voigt, A., Schatz, H., & Pfohl, M. (2003). *Prediction of wound radius reductions and healing times in neuropathic diabetic foot ulcers*. Diabetes Care, Vol 26, No. 3. Hal. 959-960.