ORIGINAL RESEARCH

Autolytic & Conservative Sharp Wound Debridement For Granulation Tissue on Unstageable Diabetic Foot Ulcer

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Abstract

Diabetic foot ulcer (DFU) is a condition of deep tissue damage associated with Diabetes Mellitus in the lower extremities. Conducted with quantitative research of single group method with pre and post test design approach, this research primarily aims to know the effectiveness of utilizing combination of Autolysis & Conservative Sharp Wound Debridement in preparing granulation on unstageable DFU. It involved 30 respondents in the wound care clinic as the research sample and used the Wound Bed Score observation sheets measured on days 1, 7 and 28. The data analysis to determine effectiveness before and after intervention was carried out using dependent t-test (paired t-test), whilst to test effectiveness of giving intervention after controlled confounder was performed by linear regression. Based on the characteristics of the respondent's, it is revealed that most of them were female (83.3%) and have normal BMI (80%). The average age of the respondents were 55.43 years old with the duration of DM of 13.27 years with average blood sugar of 101.2 mg/dL. The highest mean difference was on the 1st day of the 28th. The statistical results of this study indicated that the mean difference values for day 1 and 7 were 0.133 (SD 1.19, p value = 0.546), mean difference of day 7 and day 28th grade was of 2.5 (SD 1.306, p value=0.0001) and mean difference between day 1 and day 28 was of 2.63 (SD 1.273, p value=0.0001). This research recommends that the further research use different research methods.

Keywords: autolysis; CSWD; Unstageable diabetic foot ulcer

Introduction

Diabetic Foot Ulcer (DFU) is the most common complication of Diabetes Mellitus (Botros et al., 2010). Diabetes mellitus has been experiencing an increasing trend since in 2014 it amounted to 422 million cases worldwide and was predicted to be the seventh lethal disease leading to death in 2030 (World Health Organization, 2016). In some developed countries such as the United States in 2012, its prevalence reached 29.1 million or about 9.3% of the population (American Diabetes Association, 2012). Such disconcerting condition is not much different from that in Indonesia since it is noted that Diabetes has witnessed an increasing trend since in 2015 it has skyrocketed to 10,021 cases (IDF, 2013).

DFU has had detrimental effects either psychologically or physically. Psychologically, DFU will adversely affect clients as it triggers the feeling of sadness, anger, depression, anxiety, social isolation, and immobilization (Costa, 2011). The sufferer will also experience an increasing risk of amputation to 12-fold, especially if accompanied by complications of Charcot's feet (Rodney & Todd, 2010). The

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required care costs can be 5.4 times higher when compared to diabetics without injury. Even worse, they may have a higher risk of admission to hospital with longer treatment (Driver et al., 2010). This should be of high concern as DFU may recur with an extremely high recurrence rate of about 35-40% of patients every 3+ years and increases to 70% of patients every more than 5 years (Galea et al., 2009). It is possible to curb such devastating consequence by providing good care, in which the client must have a good insight on the correct management of Diabetes Mellitus (Thomas, 2015).

With the benefit of hindsight, it came to light that patients with the new DFU would only come to health care when their wound has become necrotic with black wound base and extreme difficulty to determine the wound stadium (unstageable). Given such condition, the wound nurse will perform the debridement process in the first place. Wound debridement is an attempt to remove dead tissue (necrotic), irreversible tissue, infected tissue or other foreign objects from the wound and surrounding areas so as to allow the growth of a healthy wound tissue (Haycocks & Chadwick, 2012). The desired base color of the wound is red where it can be said that the wound is ready to heal.

One possible debridement effort to conduct for DFU patients is Autolysis and CSWD/Conventional Sharp Wound Debridement (Alexiadou & Doupis, 2012). This method is seen as an option because it has several advantages, such as affordable cost, minimal pain, minimal risk of infection, minimal bleeding and most importantly it can be done independently by nurses with advanced competence certificates for wound care. Unfortunately, there is no research that combines both methods to be used as an evidence-based. On this basis, the researchers are interested to conduct more research about Autolytic & Conservative Sharp Wound Debridement for Tissue Granulation on Unstageable Diabetic Foot Ulcer.

Method

This is a quantitative research using single group method with pre and post test approach of research design where every research subject becomes the control of itself (Marsden & Torgerson, 2012; Smith, 2013). The research populations were all clients who performed wound care at a clinic in Bekasi area.

The sample of this research is clients with unstageable DFU receiving treatment at Bekasi wound clinic with selected inclusion criteria of male or middle age woman of 52-60 years old, having Diabetic Foot Ulcer ≥ 4 months, having unstageable stage of wound with a minimum of 25% of black wound as the basic color, and having a long time span of DM for 12-15 years, without taking any medication that can inhibit wound repair (Steroid, Non - Steroidal Anti Inflammatory immunosuppressive drugs), living in Jabodetabek area and willing to become respondents by signing informed consent sheets given by the researcher. The feasibility of ethical review is derived from the ethical commissions of Health Polytechnic of Malang.

The exclusion criteria for ineligible sample are the clients with acute ischemic clients (marked by severe pain in the wound), clients with blood clotting disorders with anticoagulant medications, uncooperative or unconscious/inadequate clients and drop-out clients (e.g., lost contact). The sampling in this study was not performed randomly, but was done based on certain considerations/criteria been made by the researchers (Purposive sampling). The sample size will be 30 clients who meet the

experimental research criteria. Wounds were observed on day 1, 7 and 28.

This research was conducted in wound care clinic Bekasi with the reason of ease to get to clients with unstageable specificity DFU. Another reason is the lack of such research on this topic. The tool used to collect data used in this study is a structured format containing information on the characteristics of respondents and Wound Bed Score (WBS) and tools for examination of blood glucose (glucometer). The Wound Bed Score (WBS) domain measured and evaluated is the wound edges, the presence of eschar, the depth conditions of the wound compared to the surrounding skin, the amount of exudate, edema, the presence of dermatitis, the callus, the base color of the wound and the distance between injury and treatments. All items are scored and summed.

Statistical analysis was performed by computer. In the univariate analysis, the researcher describes the respondent's distribution based on the respondent's characteristic and the basic scores distribution on the 1st, 7th and 28th days. In the bivariate test analysis, normal distributed data (categorical and numerical variables) was tested by T dependent statistic, while normal (numerical and numerical variables) was done by Pearson correlation test statistic. All resulted data were normal distribution except blood sugar level so that researcher conducted data transformation using statistical test of Spearman correlation and linear regression.

Results

Based on the characteristics of the respondent's distribution it is unveiled that most of them were female (83.3%) and had normal BMI (80%). The average age of the respondents were 55.43 years old, while the duration of DM pain was 13,27 years with average blood sugar 101,2 mg/dL. The highest mean difference score occurs on day 1 to 28. Such details are as can be seen in table 1.

The basic scores of the wound are as illustrated in Table 2. The graphic increase in baseline scores can be seen in graph 1, where increasing scores on the base of the wound can be interpreted as an improvement of the wound. The lowest score that may appear is 0 and the best score is 18. This score is measured on day 1, 7 and 28. Based on the graph, it is fair to conclude that the range of scores on the 1st day and the 7th do not change significantly. However, a significant improvement happened on the 28th day.

Based on table 3 it came to light that the average wound bed of wound score on day 1 measurement as compared with the 7th day measurement resulted in the mean difference value of 0.133 (SD 1.196). The results of statistical tests in the group lead to p value = 0.546. Therefore p value is > 0.05 , hence it is just to conclude that statistically there is no difference of wound base score significantly between the measurement of day 1 and that of day 7. Similarly, there was a significant difference in wound base scores between day 7 and day-28 measurements and there were significant differences in wound base scores between day 1 measurement (before intervention) and day 28 (after intervention). The picture 1 clearly depicts the changes that occurred on day 1, 7 and 28.

Table 1: Distribution of respondents based on demographic data (n = 30)

Variable	Number	p value
Sex		
Male	5	0.001
Female	25	
Nutritional Status (IMT)		
Normal	24	0.198
Abnormal	6	
Age (years)		
Mean	55.43	0.044
Range	52–60	
Duration of DM pain (years)		
Mean	13.27	0.104
Range	12–15	
Blood sugar (mg/dL)		
Mean	101.2	0.482
Range	80–130	
Mean Difference Score		
Day 1 to 7	0.133	0.546
Day 7 to 28	2.5	0.0001
Day 1 to 28	2.63	0.0001

Table 2: The Basic Score of wounds on day 1, 7 and 28 (n=30)

Variable	Mean	SD	Min- Max	95%CI
Day 1st	9.13	1.81	6-12	8.46–9.81
Day 7th	9.27	1.96	6-12	8.53–10
Day 28th	11.77	1.96	8-16	11.03-12.50

Graph 1: The wound base score on day 1, 7 and 28 with combinations of Autolysis & Conservative Sharp Wound Debridement against the mean score of wound base (n=30)

Table 3: Analysis of wound base scores based on measurement days on wound by debridement with combination of autolysis & conservative sharp wound debridement (n=30)

Measurement base of wound	Mean	SD	SE	P value
Day 1–Day 7	0.133	1.196	0.218	0.546*
Day 7–Day 28	2.5	1.306	0.239	0.0001
Day 1–Day 28	2.63	1.273	0.232	0.0001

Notes: *not significant

Figure 1: Changes in wound conditions on day 1, 7 and 28

Discussion

The statistical results are clarified with figure 1 where on day 1 it is revealed that black wound was predominant (necrotic). However, on day 7, the necrotic tissue disappears and changes with red granulation tissue and on day 28 there has been an epithelial process where the wound begins to close. The insignificant changes on the 1st day to the 7th day are due to almost all domains measured on the Wound Base Score instrument, especially the wound edges, the presence of eschar, the depth of the wound and the amount of exudate. The basic color of the wound domain is a significant change in which a bright red granulation network begins. The presence of significant wound repair, either statistically or by the appearance of the wound, can be seen clearly when compared between wounds on day 1 to day 28 or day 7 to day 28.

With the benefit of hindsight of the researcher, it is unveiled that on the 7th day there was no eschar found to be nearly 100% blackened in respondents, although the number of exudates in almost 100% of respondents increased by combining the debridement of autolysis and CSWD. This condition signifies that macrophages and endogenous proteolytic enzymes successfully soften, lyse and destroy dead tissue (eschar and slough) proteins in wounds. The end result of the process is the separation of dead tissue from healthy wound tissue.

The noteworthy point in this condition is how to increase the number of exudates that does not interfere with the process of repairing the wound. Excessive exudate on the wound base may cause maceration and tissue damage and stimulate new bacterial growth. Therefore, this exudate must be removed by using bandages that can absorb them. It is necessary to remember that nurses conduct the CSWD very carefully.

The results of this study proves that wound debridement is an essential step of wound treatment conducted by the nurse, especially to remove necrotic tissue and stimulate the emergence of granulation tissue. The wound will not be able to heal so long as the black wound (necrotic tissue) has not been removed (Chadwick et al., 2013). According to them, the usual dead tissue of black or brown color in the wound has many disadvantages, including: (1) creates a physical gap with healthy tissue and complicates the formation of extracellular matrix, angiogenesis, granulation (new tissue growth), (2) decreases effectiveness (3) stimulates the occurrence of infection as a food source for bacteria, especially *Clostridium anaerobic* bacteria, (4) contributes to excessive cytokines production that can stimulate sepsis and matrix metalloproteinases (MMPs), (5) makes it difficult for wound nurses to conduct an accurate wound assessment, for example to know the extent and depth of the wound, and (6) stimulates the occurrence of exudate and odor on the wound.

Benbow (2011) mentions that there is no ideal single debridement for all cases. However, in general, using 2 or more ways of debridement will commonly lead to the best result. Therefore, this research tries to combine debridement of autolysis and debridement of CSWD. If the wound has grown healthy granulation tissue without any necrotic tissue, there is no need to conduct debridement anymore. In general (60-80%) Diabetic Foot Ulcer will heal, although among them (about 10-15%) will recur and 5-24% of them will experience leg amputation in the period of 6-18 months after the first evaluation (Alexiadou & Doupis, 2012).

Once the wound care is completed, it is necessary to evaluate it to know the effectiveness of the performed therapy on the client. Many studies have unveiled that re-evaluation performed at 4 weeks after the wound treatment can determine whether treatment is effective or not. Coerper et al.'s research (2009) argue that unless the wound size improves, at least 50% after wound care compared to initial wound conditions, the wound healing process is said to be slow. This essentially underlies the selection of therapy with other methods and needs to be done in-depth assessment of possible influencing factors, such as infection, osteomyelitis, ischemia, inadequate glucose control, inadequate offloading, lack of nutrition or other possible factors.

The ultimate goal of wound care on DFU clients is the achievement of a "wellbeing" healthy condition. The World Health Organization (WHO) in 1948 has defined wellbeing as not only being free from disease, but to meet 4 domains (International consensus, 2012). The four domains are: (1) Physical wellbeing, where clients are able to perform their daily activities independently, such as bathing, wearing their own clothes, eating or carrying out other raids, (2) Mental wellbeing, where clients are free from fear, anxiety, stress, depression, or other negative emotional feelings, (3) Social wellbeing, where clients can actively participate in their families, communities, friends, or colleagues, (4) Spiritual/cultural wellbeing, where clients are able to share experiences or integrate meaning and the purpose of his life by connecting what is believed with what others have based on their religion, beliefs, culture and living norms.

Researchers are aware of the limitations in this study, one of which is one-group research method of pre-test post-test design which position each research subject to have a control of himself. This method is proven to possess a weakness because of possible bias from the research results (Marsden & Torgerson, 2012). To minimize the bias of the research results, there are several things done before the study began, which is narrowing the criteria of patients to become the respondents. This study

recommends that further research uses different research methods, for example by adding intervention groups in other ways.

Conclusion

Debridement by means of autolysis and CSWD is an important step in the preparation of wound base which stimulates granulation.

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