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Topical Insulin Versus Insulin Irrigation on Wound Healing among Patients with Venous Leg Ulcer

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ABSTRACT

Background: Venous Leg Ulcer (VLU) is a serious condition affecting the lower extremities and accounts for 70% of leg ulcers globally. **Objective:** To evaluate the effects of topical insulin versus insulin irrigation on wound healing in patients with venous leg ulcers. **Methods:** A quasi-experimental design (pre/post-test non-equivalent control group) was employed. The study was conducted at the Vascular Disease Outpatient Clinic of Cairo University Hospitals, Egypt. A convenience sample of 90 adult male and female patients was divided into three groups receiving wound dressings: Study Group A (using topical insulin), Study Group B (using insulin irrigation with normal saline), and a control group (using Betadine or Betadine with normal saline as part of routine hospital care). Two tools were utilised: (1) Personal and Medical Data Form, and (2) the Bates-Jensen Wound Assessment Tool. **Results:** The mean ages of patients were 41.1 ± 11.7, 42.5 ± 12.3, and 39.2 ± 13.1 years in Study Group A, Study Group B, and the control group, respectively. Statistically significant differences were observed between Study Groups A and B and the control group in relation to total mean scores for wound healing (X^2 = 21.1, 91.1, 0.80; P = 0.00, 0.00, 0.45, respectively) during the first and second assessments. **Conclusion:** The study concluded that both topical insulin and insulin irrigation are effective new modalities for wound dressing and significantly enhance VLU healing. The study should be replicated with a larger sample size in different settings. It is essential for nurse researchers to conduct regular workshops and training sessions in collaboration with healthcare providers working in vascular disease units, emphasising the importance of insulin application in improving wound healing among VLU patients.

Keywords: Insulin Irrigation; Topical Insulin; Venous Leg Ulcer; Wound Healing

INTRODUCTION

Leg ulcer is a serious global health issue that poses a significant burden on both patients and health services worldwide. Leg ulcer is a medical term that simply describes a break (wound) or sore in the skin below the knee caused by problems with arteries and veins, as a result of venous insufficiency and ambulatory venous hypertension. According to Gunasegaran *et al*. (2024), different types of leg ulcers have been reported, with VLUs being the most common. They typically take more than four to six weeks to heal and are considered a major clinical challenge. In fact, VLUs account for approximately 70% of all leg ulcers and are estimated to affect between 0.1% and 0.3% of the global population in the United Kingdom (Probst *et al*., 2023).

According to Pinkova and Monaro (2024), effectively managing patients with VLUs requires a multidisciplinary team to perform proper assessments, which include determining the aetiology of the VLU, selecting appropriate treatments, wound dressings and compression materials, evaluating preventive

measures, and designing individualised treatment regimens. In a recent systematic review, several modalities and advanced wound dressings have been used, including insulin applications delivered through various methods, such as herbal origins, collagen sponges, synthetic origins, and hydrogels. The most recent advancements involve insulin application through topical insulin and insulin irrigation dressings. These methods contribute to all stages of wound healing by improving fibroblast proliferation during the fibroplasia stage, increasing macrophage activation in the inflammatory phase, and encouraging keratinocyte differentiation, migration, and proliferation during the re-epithelialisation stage. These processes enhance collagen synthesis and the extracellular matrix (Bhuiyan, Adebayo & Ahmed, 2023).

Insulin is a growth factor and peptide hormone that can restore damaged skin. It has several physiological functions that play a beneficial role in wound healing through collagen synthesis. It specifically and effectively induces skin fibroblasts to produce more collagen. Its primary role is to regulate blood glucose levels, and it now also plays a crucial role in wound healing by maintaining the integrity of the affected skin (Carreira *et al*., 2024). Furthermore, insulin dressings are less expensive compared to other growth factor agents. The effect of insulin dressing on wound healing depends on the dose and the severity of the ulcers (Mirhoseini *et al*., 2021).

Nurses play a crucial role in effective VLU healing and in preventing further ulcer worsening through weekly assessments of patients, which can help detect the degree of VLU and lead to earlier identification of wound infections, a reliable indicator of wound healing. Nurses are also responsible for keeping ulcers clean by removing debris and bacteria from the ulcer bed to prevent infection, as well as educating patients on the importance of adhering to systemic medication regimens. Additionally, nurses should be knowledgeable and aware of new dressing techniques as a modality that improves the healing process, enhances the quality of care, and reduces care costs. Currently, insulin solutions, sprays, creams, and dressings are effectively used to treat various types of wounds.

Significance of the Study

The prevalence of VLUs in Westernised countries is 3%, whereas it ranges from 1% to 3% in the USA. Furthermore, several previous studies have found a broad variation in the prevalence of VLUs, with up to 56% in men and up to 60% in women (Kruszewska, Wesolowska-Gorniak & Czarkowska-Paczek, 2020). The researcher of the current study observed that the flow rate of newly diagnosed VLU patients has increased, and most of them reported a sense of disappointment due to their inability to carry out everyday tasks and a deficit in their self-care abilities caused by poor wound healing.

The literature reports that insulin is effective in the process of wound healing; however, the effects of different forms of insulin, such as irrigation, have not been studied (Ali *et al*., 2021). Consequently, applying topical insulin and insulin irrigation with normal saline as a modality for wound dressing in this study is expected to enhance the healing process for patients with VLUs.

The findings of this study are expected to equip nurse practitioners, healthcare providers, and researchers with evidence-based insights into alternative wound management techniques involving insulin for patients with VLUs. These techniques may improve wound healing, prevent recurrence, and contribute to achieving desired health outcomes. Furthermore, in nursing education, this study may provide valuable material about wound dressing for nursing students specialising in surgical nursing.

Aim of the Study

The aim of this study was to evaluate the effect of topical insulin versus insulin irrigation on wound healing among patients with VLUs.

Research Hypotheses

H1: The total mean scores for wound healing in patients with VLUs who receive topical insulin dressing are different from the total mean scores for wound healing in patients with VLUs who receive routine hospital

care.

H2: The total mean scores for wound healing in patients with VLUs who receive insulin irrigation dressing are different from the total mean scores for wound healing in patients with VLUs who receive routine hospital care.

H3: The total mean scores for wound healing in patients with VLUs who receive topical insulin dressing are different from the total mean scores for wound healing in patients with VLUs who receive insulin irrigation dressing.

METHODOLOGY

Research Design

A quasi-experimental (pre/post-test non-equivalent control group design) was used to achieve the aim of the current study. The design used is considered a subtype of quasi-experimental research in which multiple assessments of the same variables are undertaken at different intervals (Rogers & Revesz, 2019).

Setting

This study was conducted in the Vascular Disease Outpatient Clinic at Kasr El-Aini Hospital, affiliated with Cairo University.

Research Sample

A convenient sample of 90 adult male and female patients over six consecutive months was enrolled in the current study and divided into three groups: two study groups (A and B) and one control group. The following selection criteria were established: (a) aged 18 years or older, (b) having 2nd or 3rd degree VLUs confirmed by a Doppler report, (c) not diabetic or hypertensive, (d) free from other vascular diseases, (e) no communication problems, and (f) willing to be enrolled in the study.

Data Collection Tools

The following two tools were utilised:

Personal and Medical Data Form (PMDF): This was developed by the researcher and included two parts:

Part I: Personal data related to age, gender, marital status, level of education, occupation, etc.

Part II: Medical data related to medical diagnosis, date of onset, causes and location of the ulcer, BMI, associated chronic diseases, smoking history, laboratory investigations and vital signs.

Bates-Jensen Wound Assessment Tool (BWAT)

Developed by Bates-Jensen *et al*. (2019), this tool was used by the researcher to measure wound status scores before, during, and after wound dressing and at the time of healing. It provides objective numerical scores along the wound continuum.

Scoring System

The BWAT contains 13 items to assess wound status, each with five categories and associated scores ranging from one to five. A total score of 13 indicates minimal severity, while 65 represents extreme severity. Total BWAT scores are categorised as follows:

13–20: Minimal severity

21–30: Mild severity

31–40: Moderate severity

41–65: Extreme severity

The reliability of this tool was confirmed with an excellent Cronbach's alpha ($\alpha = 0.96$).

Data Collection Procedure

Preparatory Phase: The researcher individually interviewed all patients in the study groups who met the inclusion criteria in the waiting area of the Vascular Disease Clinic. The nature and purpose of the study were explained, and consent forms were obtained from all patients who agreed to participate. This phase took 15–20 minutes per patient.

Official permission was obtained from hospital administrators. The purpose and importance of the study were explained to each participant. Anonymity and confidentiality were assured through coding of data. Participants were informed that their participation was voluntary and that they could withdraw at any time. Written consent forms were obtained from all participants.

Implementation Phase: Patients were divided into three groups (one control and two study groups). Data were first collected from the control group, who received routine hospital care for wound dressing using Betadine or Betadine with normal saline. Next, data were collected from the two study groups to avoid contamination.

Group A received topical insulin dressing, where the researcher cleaned the ulcer with normal saline, applied 4 units of Mixture insulin onto 1 cm² of the ulcer, then covered the ulcer with sterile dressing and secured it with adhesive tape.

Group B received insulin irrigation dressing, where the researcher cleaned the ulcer with saline, irrigated the wound with 4 units of human soluble insulin (Mixture) mixed with 1 ml of normal saline (0.9%) using an insulin syringe, and then covered the ulcer with sterile dressing secured with adhesive tape.

The intervention for both groups was repeated once every 7 days for two consecutive weeks. This phase took 30–45 minutes per intervention.

Evaluation Phase: Conducted after the intervention for the three groups, evaluation was done twice:

Post I: At the end of the first week to assess improvement following the inflammatory stage.

Post II: At the end of the second week to assess VLU healing.

The BWAT (Tool II) was used to measure wound healing during this phase.

Statistical Design

The Statistical Package for the Social Sciences (SPSS), version 23, was used for data analysis. Descriptive statistics, including frequency, percentage, mean, and standard deviation, were calculated. Inferential statistics, including the Friedman test, Mann-Whitney U test, Wilcoxon signed-rank test, Kruskal-Wallis test, Pearson correlation coefficient, and chi-square tests, were also utilised. The probability error was considered significant at $P \leq 0.05$.

Ethical Consideration

The Ethical Approval for the present study was received from the Research Ethics Committee of the Faculty of Nursing, Cairo University, Egypt with reference number RHDIRB 2019041701 on 30th July 2023.

RESULTS

Section I: Descriptive Statistical Analysis of Personal and Medical Related Data between Study (A and B) and Control Groups

Table 1: Frequency and Percentage Distribution of Personal Data among Study (A and B) and Control Group (n=90)

Variables	Study Group A (n=30)		Study Group B (n=30)		Control Group (n=30)		X^2	P
	No.	%	No.	%	No.	%		
Age							5.6	0.68
18<30	5	16.7	5	16.7	4	13.3		
30<40	6	20.0	5	16.7	10	33.3		
40<50	12	40.0	10	33.3	9	30.1		
>50	7	23.3	10	33.3	7	23.3		
	Mean±SD 41.1+11.7		Mean±SD 42.5+12.3		Mean±SD 39.2+13.1			
Gender							0.31	0.85
Male	28	93.3	27	90.0	28	93.3		
Female	2	6.7	3	10.0	2	6.7		
Level of Education							17.7	0.12
Cannot read & write	13	43.3	11	36.7	16	53.3		
Read & write	5	16.7	6	20.0	4	13.3		
Primary	5	16.7	6	20.0	0	0.0		
Preparatory	4	13.3	4	13.3	1	3.3		
Secondary	0	0.0	1	3.3	0	0.0		
Diploma	3	10.0	2	6.7	8	26.7		
College	0	0.0	0	0.0	1	3.3		
Residence							0.21	0.9
Rural	4	13.3	4	13.3	3	10.0		
Urban	26	86.7	26	86.7	27	90.0		
Marital Status							3.6	0.72
Single	1	3.3	3	10.0	3	10.0		
Married	26	86.7	26	86.7	26	86.7		
Wisdom	1	3.3	0	0.0	0	0.0		
Divorced	2	6.7	1	3.3	1	3.3		
Occupation							0.35	0.83
Worker	15	50.0	17	56.7	15	50.0		
Not worker	15	50.0	13	43.3	15	50.0		

*Significant at p value <0.05

Table 1 clarified that the mean age ± SD of the three groups was 41.1 ± 11.7, 42.5 ± 12.3, and 39.2 ± 13.1 years, respectively. Regarding gender, 93.3%, 90%, and 93.3% of the participants in study groups A and B and the control group were male, respectively. In relation to the level of education, patients who could not read or write represented 43.3% in study group A, 36.7% in study group B, and 53.3% in the control group. The same table illustrated that 86.7% of participants in both study groups A and B and 90% in the control group came from urban areas. Regarding marital status, 86.7% of participants in study groups A and B and the control group, respectively, were married. Concerning occupation, 50%, 56.7%, and 50% of participants in study groups A and B and the control group, respectively, were workers. There were no statistically significant differences among the three groups regarding the demographic characteristics ($P > 0.05$).

Table 2: Frequency and Percentage Distribution of Medical Related Data among Study (A and B) and Control Groups (n=90)

Variables	Study Group A (n=30)		Study Group B (n=30)		Control Group (n=30)		X^2	P
	No.	%	No.	%	No.	%		
Date of Ulcer Onset							2.4	0.87
1 < 3 Months	6	20.0	6	20.0	4	13.3		
3 < 5 Months	4	13.3	2	6.7	3	10.0		
5 < 7 Months	2	6.7	4	13.3	5	16.7		
>7 Months	18	60.0	18	60.0	18	60.0		

Causes of Ulcer							2.3	0.88
Varicose Vein	16	53.3	17	56.7	12	40.0		
DVT	12	40.1	11	36.7	14	46.6		
Accident	1	3.3	1	3.3	2	6.7		
Post-operative Complication	1	3.3	1	3.3	2	6.7		
BMI Classification							7.6	0.47
Normal	3	10.0	8	26.7	3	10.0		
Overweight	15	50.0	11	36.7	11	36.7		
Class I Obese	8	26.7	7	23.3	11	36.7		
Class II Obese	4	13.3	3	10.0	3	10.0		
Morbid Obese	0	0.0	1	3.3	2	6.7		

Table 2 illustrated that the onset of the ulcer was less than 7 months among 60.0% of patients in the three groups. Regarding the causes of ulcers, 53.3% and 56.7% of patients in study groups A and B, respectively, had ulcers caused by varicose veins, while in the control group, 46.7% of ulcers were caused by deep venous thrombosis. As regards the classification of Body Mass Index, 50.0%, 36.7%, and 36.7% of patients in study groups A and B and the control group, respectively, were categorised as overweight.

Section II: Represented Difference between Study Groups (A and B) and Control Group

Table 3: Distribution of the Study Groups (A and B) and Control Group According to Total Means Scores of Wound Assessment at Three Time of Assessment (n=90) (30/each)

Times	**Study Group A (Topical Insulin)**		**Study Group B (Insulin irrigation)**		**Control Group**		**Kruskal-Wallis**	*P*
	Mean	**SD**	**Mean**	**SD**	**Mean**	**SD**		
Baseline	46.23	3.35	45.53	3.32	46.1	3.60	0.32	0.70
1st Assessment (End of 1st Week)	37.66	7.63	33.20	6.35	47.1	5.19	36.2	0.00*
2nd Assessment (End of 2ndt Week)	31.10	13.30	23.23	8.47	48.00	7.81	46.5	0.00*
Friedman Test (X^2)	21.1		91.1		0.80			
P	0.00*		0.00*		0.45			

Significant at p value <0.05

Table 3 illustrated that the wound assessment scores post-intervention confirmed a statistically significant difference in study groups A and B compared to the control group at the 1st and 2nd assessments (P = 0.00*, 0.00*, 0.45).
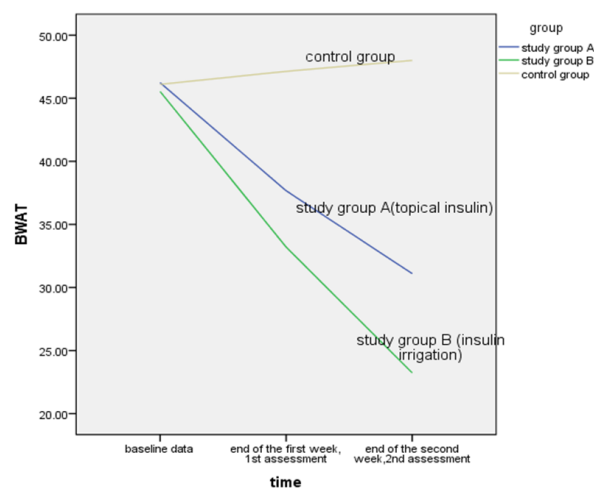

Figure 1: Distribution of the Study Groups A and B and Control Group According to Total Means Scores at Three Time of Assessment of Wound

Figure demonstrated a statistically significant reduction in wound severity among patients in study groups A and B compared to the control group at the baseline, 1st and 2nd assessments

Table 4: Distribution of the Study Groups (A and B) and Control Group According to Means Scores of Wound Assessment Items (n=90)

Wound Assessment Items	Study Group A (n=30)		Study Group B (n=30)		Control Group (n=30)	
	Friedman (X^2)	P	Friedman (X^2)	P	Friedman (X^2)	P
Size	17.05	0.000*	49.44	0.000*	0.97	0.61
Depth	15.49	0.001*	41.82	0.000*	14.04	0.00*
Edges	17.83	0.000*	42.13	0.000*	6.73	0.03*
Undermining	23.91	0.000*	46.66	0.000*	0.19	0.91
Necrotic Tissue Type	21.28	0.000*	54.08	0.000*	1.64	0.44
Necrotic Tissue Amount	24.63	0.000*	47.68	0.000*	0.38	0.38
Exudate Type	26.78	0.000*	54.79	0.000*	4.90	0.09
Exudate Amount	26.88	0.000*	48.52	0.000*	0.01	0.99
Skin Colour Surrounding Wound	23.67	0.000*	42.81	0.000*	0.41	0.81
Peripheral Tissue Edema	29.34	0.000*	45.50	0.000*	1.77	0.41
Peripheral Tissue Induration	22.72	0.000*	39.99	0.000*	0.19	0.91
Granulation Tissue	24.94	0.000*	44.90	0.000*	5.00	0.08
Epithelialization	21.78	0.000*	47.10	0.000*	0.01	1.00

*Significant at p-value <0.05

Table 4 revealed highly statistically significant differences were found between study groups A and B (P=0.0001) in relation to wound assessment items at 1st and 2nd assessment.

Table 5: Frequency and Percentage Distribution of Wound Severity at Three Different Times of Both Study Groups (A and B) and Control Group (n=90)

Wound Severity	Study Group A (Topical Insulin) (n=30)						Study Group B (Insulin Irrigation) (n=30)						Control Group (n=30)					
	Baseline		1st Week Assessment		2nd Week Assessment		Baseline		1st Week Assessment		2nd Week Assessment		Baseline		1st Week Assessment		2nd Week Assessment	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Minimum Severity	0	0.0%	1	3.3%	20	66.7%	0	0.0%	2	6.7%	26	86.7%	0.0	0.0%	2	6.7%	1	3.3%
Mild Severity	4	13.3%	22	73.3%	3	10.0%	6	20.0%	26	86.7%	2	6.7%	3	10.0%	2	6.7%	4	13.3%
Moderate Severity	26	86.7%	7	23.3%	7	23.3%	24	80.0%	2	6.7%	2	6.7%	27	90.0%	28	93.3%	25	83.3%

*Significant at p-value <0.05

Table 5 clarified the differences in wound severity at the 1st and 2nd assessments. After applying topical insulin dressing, 73.3% of patients in study group (A) had mild wound severity at the 1st assessment, while 66.7% had minimal severity at the 2nd assessment. In group (B), which used insulin irrigation, 86.7% of patients had mild wound severity at the 1st assessment, and 86.7% had minimal severity at the 2nd assessment. In contrast, 93.3% of the control group had moderate wound severity at the 1st assessment, and 83.3% had moderate severity at the 2nd assessment.

Section III: Represented the correlation between Medical Data, and Healing of Venous Leg Ulcer

Table 6: Correlation between Medical Data and Healing of Venous Leg Ulcer among the Three Groups

Medical Variables	Study Group A (n=30)		Study Group B (n=30)		Control Group (n=30)	
	r	p	r	p	r	P
Date of Ulcer Onset	0.09	0.62	-0.03	0.73	0.06	0.53
BMI	0.06	0.52	0.001	0.99	0.03	0.73
Smoking	0.02	0.81	0.06	0.54	-0.06	0.51
Cause of Ulcer	1.78	0.15	1.3	0.26	2.9	0.03*
Location of Ulcer	1.1	0.39	0.42	0.83	1.6	0.15

*Significant at p-value <0.05

Table 6 clarified that no statistically significant differences were found between study groups A and B in relation to medical data. However, a statistically significant difference was observed among patients in the

control group concerning the causes of ulcers (P=0.03*).

DISCUSSION

Venous leg ulcer is a serious global health issue that poses a significant burden on both patients and health services worldwide. Whilst it is challenging to establish the exact prevalence of leg ulceration, the discussion of the current study is presented in three sections: Section One describes the personal and medical data. Section Two provides an analysis of the study hypotheses, and Section Three discusses the correlation between study variables.

Section One

The present study found no statistically significant differences between the two study groups A, B, and the control group in all personal characteristics. The mean age ± SD of the subjects was (41.1±11.7, 42.5±12.3, and 39.2±13.1) respectively. This finding is consistent with (Bouguettaya *et al.*, 2023; Mayrovitz, Wong & Mancuso, 2023), who reported the linkage between VLU and age.

In relation to gender, the current study illustrated that the majority of the studied subjects were males. This finding is congruent with (Klein, Ennis & Fukaya, 2023), who reported that the prevalence of VLU is up to 53.9% in men and up to 46.1% in women. Other researchers mentioned that females had more VLUs than males, while males presented more frequently with ulcers (O'Banion *et al.*, 2023). In the researcher's opinion, this might be due to the smaller number of subjects enrolled in the study.

Regarding marital status, the majority of the studied subjects were married. These findings are consistent with research conducted by Smith *et al.* (2023), which highlighted that the majority of the subjects studied were married. One possible interpretation for this finding could be that VLUs often affect older adults, when marriage is more common.

Concerning patients' education, the present study found that around half of the patients cannot read or write. This finding might indicate that lower education levels affect awareness and understanding of the disease, resulting in less participation in managing it and an increased incidence of VLU. The delayed healing could also be a consequence. This result aligns with research conducted by Martinato *et al.* (2023).

Regarding residence, the majority of the subjects studied came from urban areas. This finding is consistent with Kiguchi and Cutler (2024). However, Guo *et al.* (2024) contradicted the current study's findings and noted that people living in rural areas often form stronger social connections with neighbors, positively impacting their social relationships.

Regarding medical data, the majority of the studied subjects had ulcers for more than seven months. This finding corresponds with Placke *et al.* (2020), who noted that many VLU patients suffer from pain and non-healing wounds for 6 weeks to several years if not treated properly. The researcher interprets this finding to mean that early detection facilitates healing and reduces recurrence rates.

Concerning BMI, around half of the subjects in the present study were overweight. This finding is supported by Smith *et al.* (2023) and Langan *et al.* (2023), who highlighted that obesity leads to lower limb venous disease.

As regards the causes of VLUs in the current study, around half of the studied subjects' ulcers were caused by varicose veins and deep venous thrombosis. A previous study by Stanek *et al.* (2023) reported the same finding and added that varicose veins and previous deep venous thrombosis exacerbate the condition of VLUs.

Section Two

The statistical analysis of the current study indicated that the first hypothesis was accepted, as statistically significant differences were observed between study group A (topical insulin dressing) and the control group (hospital routine care) regarding VLU healing.

There was an improvement in VLU healing among study group A compared to the control group at the first and second assessments. This could be attributed to the effectiveness of topical insulin in improving the

total mean VLU scores for wound status. This finding aligns with Edek *et al*. (2023) and Ramirez-Garcia Luna *et al*. (2023), who revealed that patients with VLU experienced improved healing when using topical insulin compared to routine care on 13 items of the BWAT.

The current study also supported Liu *et al*. (2021), who added that applying topical insulin dressing significantly reduced signs of inflammation and pain, improved venous reflux, increased blood supply, and enhanced collagen deposition at the ulcer site.

Similarly, the second hypothesis was accepted, as statistically significant differences were found between study group B (insulin irrigation dressing) and the control group (hospital routine care) regarding VLU healing.

The current study found that insulin irrigation had excellent and safer effects than traditional methods of wound healing, as it accelerates the healing process. Bhuiyan, Adebayo and Ahmed (2023), in their systematic review, highlighted that insulin irrigation enhances wound healing by promoting granulation tissue regeneration.

Moreover, the study findings revealed that highly statistically significant differences were observed between study groups A (topical insulin dressing) and B (insulin irrigation dressing) regarding VLU healing, and the third hypothesis was accepted.

Section Three

In relation to the correlation between medical data and VLU healing, the current study findings highlighted that although half of the studied subjects had a BMI categorised as overweight or obese, there were no statistically significant differences between BMI and VLU healing. This contrasts with O'Donnell (2023), who reported that increased BMI is associated with delayed wound healing.

Regarding smoking, the current study clarified that there was no significant correlation between smoking and VLU healing. However, this finding contradicts Bechara, Hng & Gunton (2024), who revealed that smoking delays wound healing by decreasing blood flow and causing tissue ischaemia.

Limitation

The study utilised a small sample size; therefore, the results cannot be generalised to all patients with VLU. To enhance the study's scope and applicability, future research should also consider participatory care between academic team members at the Faculty of Nursing and nurses in clinical practice.

CONCLUSION

The study concluded that the application of new modalities for wound dressing, such as topical insulin and insulin irrigation, improves VLU healing and is considered a promising strategy for promoting tissue healing. The nursing implications of the current study highlight the importance of applying topical insulin versus insulin irrigation, as it significantly increases wound healing in VLU. Moreover, this study may provide a framework for the future development of nursing practice in wound healing. Additionally, it is hoped that this study opens the door for further research regarding VLU dressing to build a body of knowledge that may be integrated into the medical-surgical nursing curriculum.

Recommendation

Based on the study results, the researcher recommended the following: Transdisciplinary research should be conducted on patients with VLU in different settings in Egypt for faster validation and generalisation of the findings. Furthermore, nurses should be encouraged to collaborate with other health team members in applying insulin dressing as a new modality for patients with VLU. Standardised instructions should be established to increase knowledge among patients with VLU about insulin dressing as a new strategy for wound healing.

Conflict of Interest

The authors declare that they have no conflict of interest.

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