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ORIGINAL RESEARCH

Use of Hydrocolloids in The Treatment of Phlebitis scores 2 and 3 in Siloam Hospitals Lippo Village Inpatient Room

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Abstract

Background Peripheral intravenous catheter insertion, a common hospital procedure, often results in phlebitis complications, crucial for assessing nursing quality and patient safety at Siloam Hospitals Lippo Village. To address this issue, a study led by a wound care nurse aims to introduce hydrocolloids as an intervention, targeting vascular responses assessed through the Peripheral Intravenous Catheter Phlebitis Scale (PIVAS) and pain scale.

Method This study, conducted at Siloam Hospitals Lippo Village, employed a pre-experimental design with 39 eligible respondents meeting criteria such as a PIVAS score of 2 or 3, age ≥3 years, and willingness to participate. Data analysis included univariate and bivariate methods (paired t-test for PIVAS scores and Wilcoxon signed-rank test for the pain scale), validating the reliability and clinical feasibility of PIVAS, a standardized phlebitis scale..

Results The study utilized modified PIVAS tools, showing significant reduction in both PIVAS scores (p-value 0.000) and pain scale (p-value 0.000) post-hydrocolloid intervention. The correlation coefficient for pre and post-test PIVAS scores was 0.934, with an average decrease of 1.974. No significant differences were found in age (p-value 0.725), comorbidities history (p-value 0.777), or phlebitis wound location (p-value 0.133) regarding treatment effects. Hydrocolloid dressing effectively reduces PIVAS scores and pain scale among phlebitis patients, regardless of age or comorbidities..

Conclusion The hydrocolloid dressing intervention study showed positive results in treating stage 2 and 3 phlebitis wounds.

Background

The most common invasive clinical procedure in hospitals involves inserting a peripheral intravenous catheter to access intravenous administration of fluids, drugs, blood products, and nutrients in patients. However, this procedure is prone to complications such as phlebitis (Kassahun, 2021). Phlebitis is the inflammation of a vein caused by chemical, mechanical, or bacterial irritation. It is characterized by a reddish and warm area, swelling, and pain upon palpation near the injection site or along the vein, which may also produce pus (Infusion Nurses Society, 2016). According to the Centers for Disease Control and Prevention (2017), the incidence of phlebitis is around 10% annually. The Health Research and Development Agency (2013) reported that the incidence of phlebitis in Indonesian hospitals is 50.11% in government hospitals and 32.70% in private hospitals. An observational study conducted from June to

December 2020 at Siloam Hospital, Lippo Village, found an incidence of phlebitis in 44 patients with a PIVAS≥ 2 (Incidence rate = 0.64%).

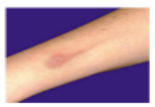
Phlebitis can lead to the formation of a thrombus, which can develop into thrombophlebitis—an inflammation of the venous wall usually accompanied by the formation of a blood clot. If the thrombus becomes dislodged and travels through the bloodstream to the heart, it can cause sudden blockage, leading to potentially fatal conditions. Phlebitis is a significant issue affecting 75% of hospitalized patients, impacting patient comfort, the duration of peripheral catheter use, the length of hospitalization, and treatment costs (Ana Maria et al., 2014).

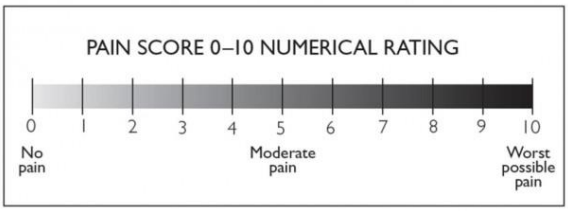
Untreated phlebitis can result in sepsis or systemic infection, with the primary symptom being pain experienced by the patient. Treatment for phlebitis at Siloam Hospitals Lippo Village involves using hydrocolloid dressings, which have led to improvements in inflammation levels. There is currently a lack of research on the use of hydrocolloid dressings for phlebitis wounds in the literature. According to literature recommendations, hydrocolloid dressing is a viable option for treating superficial wounds with moderate exudate production. Hydrocolloid is a mucoadhesive developed from carboxymethyl cellulose (CMC) combined with adhesive and tackifier, forming a flexible semipermeable gel. The impermeable nature of hydrocolloids provides a protective layer for the wound, preventing the spread of pathogenic microorganisms (Pott et al., 2014). Studies have shown that hydrocolloids' occlusive nature and moisture-retaining ability can prevent infection and promote healing. This study aims to assess the impact of hydrocolloid intervention on phlebitis scores and pain scales, providing evidence-based insights into the choice of interactive dressing for phlebitis scores 2 and 3.

Method

This research employed a quantitative pre-experimental design with a one-group pre- and post-test approach. The sampling technique utilized was purposive sampling, resulting in a total sample of 39 respondents who met the inclusion criteria: having phlebitis wounds with PIVAS scores of 2 or 3, being aged 3 years or older, and consenting to participate by signing the informed consent form. Exclusion criteria encompassed phlebitis wounds from other hospitals and advanced extravasation wounds.

After obtaining approval from the Ethics Committee of Siloam Hospitals Lippo Village, the researchers treated phlebitis wounds treatment to patients who met the inclusion criteria. Before the hydrocolloid intervention was given, researchers provided the phlebitis scores using PIVAS tools (Pheriperally Inserted Vascular Access Score tools) (score 1-5) and the pain scale using the Numeric Rating Pain Scale (1-10). After the hydrocolloid intervention was given for 4 days, the researchers measured the PIVAS return and pain scale using the same instrument.
This study used the modified Infusion Nurses Society (INS, 2021) scale to measure Phlebitis. The observer was one researcher with two nurses as assistant observers; they were asked to assess PIVAS from 15 cases. Cohen's Kappa test showed a Kappa value of 0.826 with a significance value of 0.000, indicating that the coefficient value suggested a correlation and that rater A and B were mutually consistent.

picture	Indication and Implication	Score
	**No signs or symptoms of phlebitis. IV site appears healthy, there is no redness, swelling or pain**	0
	**Possible first signs of phlebitis. One of the following is evident:** • Slight pain at the insertion site • Slight redness at or near the insertion site	1
	**Early signs of phlebitis. Two of the following are evident:** • Pain at the insertion site • Redness (erythema) at the insertion site • Swelling at the insertion site	2
	**Midstage of phlebitis. All of the following evident:** • Pain along the path of the cannula • Redness (erythema) • Induration (hardening of the tissue) at the site	3
	**Advanced phlebitis or start of thrombophlebitis.** All of the following are evident: • Pain along the path of the cannula • Redness (erythema) • Induration (hardening of the tissue) at the site • Palpable venous cord	4
	**Advanced phlebitis or start of thrombophlebitis.** All of the following are evident: • Pain along the path of the cannula • Redness (erythema) • Induration (hardening of the tissue) at the site • Palpable venous cord\ • Pyrexia	5



Results

This study shows that the respondents with the highest number of phlebitis cases and who were given hydrocolloid dressing intervention were respondents aged 56 years (48.7%). The insertion site with the most Phlebitis in this study was the insertion site in the metacarpal vein (48.7%). Most of the respondents in this study were female (56.4%). Meanwhile, the history of comorbidities in the patient was diabetes (20.5%) and immunocompromised (7.7%) (Table 1)

Univariate Analysis

Table 1 Characteristics of respondents based on age, sex, history of disease and location of phlebitis wounds

Age	**F**	**%**
Paediatric (3-10 yo)	1	2,6
Teenage (11-19 yo)	2	5,1
Adult (20-55 yo)	17	43,6
Geriatric (≥ 56 yo)	19	48,7
Gender		
Female	22	56.4
Male	17	43.6
Comorbidities		
Diabetes Mellitus	8	20,5
CVD Non-Hemoragic	5	12,8
Carcinoma on Chemotherapy	3	7,7
Other	23	59
Location of Phlebitis		
Metacarpal vein	19	48,7

Cephalic vein	6	15,4
Brachialis vein	1	2,6
Radialis vein	11	28,2
Antebrachii vein	1	2,6
others	1	2,6

Table 1 illustrates the findings of the PIVAS score analysis using paired t-tests, indicating a correlation value of 0.934, signifying a strong and positive relationship between PIVAS scores before and after the intervention. The significant p-value of 0.000 (< 0.05) indicates a discernible difference in PIVAS scores before and after the hydrocolloid intervention. Moreover, the mean PIVAS score exhibited a tendency to decrease before and after hydrocolloid application on day 4, with an average decrease of 1.974. Additionally, the analysis of the pain scale using the Wilcoxon Signed Rank Test yielded a p-value of 0.000, demonstrating a significant difference between the pre-intervention and post-intervention groups. Specifically, 39 respondents experienced a reduction in pain scale after the intervention compared to before the hydrocolloid intervention.

Table 2: Results of PIVAS analysis, Pain scale and Confounding Variables

Variable	***result***
PIVAS	
Mean	1.974
Correlation	0.934
p-value	0.000
Pain scale	*0.000*
Confounding	
Age	0.725
Comorbid	0.777
Location of Phlebitis	0.133

Table 2 presents the results of the analysis for the respondents' age variable (p-value 0.725), comorbidity history variable (p-value 0.777), and phlebitis wound location variable (p-value 0.133). The findings of this study suggest that there is no significant difference in treatment outcomes before and after the hydrocolloid intervention concerning age, comorbidity history, and phlebitis wound location (p-value < 0.5).

Discussion

Wound healing is a complex process involving interactions between cytokines, growth factors, blood, and the extracellular matrix. Cytokines play a pivotal role in promoting healing by triggering the production of basal membrane components, preventing dehydration, and facilitating inflammation and granulation tissue formation. The choice of wound dressing material should be tailored to the specific wound type, considering its ability to maintain a moist environment, promote epidermal migration, angiogenesis, connective tissue synthesis, and gas exchange. Additionally, the dressing should help maintain an appropriate tissue temperature to enhance blood flow to the wound bed and promote epidermal migration. Furthermore, it should offer protection against bacterial infection, easy removal without adhering to the wound, support debridement measures to facilitate leukocyte migration and enzyme accumulation, and ensure sterility, non-toxicity, and non-allergenic properties (Dhivya, S., Padma., V. Santhini, E, 2015).

Hydrocolloid dressings have become a staple in clinical practice due to their ability to adhere effectively and shield wounds from external factors, creating a warm and moist environment conducive to healing. Their water-absorbent properties and low molecular weight allow hydrocolloids to form a gel that not only stimulates the immune system but also mitigates the effects of bacterial colonization. The findings of this study demonstrate a significant

reduction in the PIVAS score following hydrocolloid intervention, consistent with prior research highlighting their clinical efficacy in treating various wound types. Additionally, hydrocolloid dressings act as occlusive barriers, preventing water, bacteria, and oxygen from infiltrating the wound while lowering wound pH and inhibiting bacterial growth. Their unique clinical properties enable them to adhere to both moist and dry wounds, making them suitable for wounds with minimal to moderate exudation levels (Ghomi, Khalili, Khorasani, Ramakrishna, 2019).

Research conducted by Yanli et al. (2021) highlighted that hydrocolloid dressings possess the ability to enhance blood vessel elasticity, stimulate the release of macrophages and interleukins, and promote local tissue microcirculation, leading to accelerated inflammation regression and tissue debridement while preventing necrosis. Following treatment with hydrocolloids, the clinical manifestations of phlebitis notably decreased, resulting in reduced patient pain, shortened disease duration, and increased satisfaction, particularly among individuals requiring long-term infusion therapy.

Consistent with these findings, our study observed a significant decrease in pain scale scores among phlebitis patients following a four-day hydrocolloid intervention (p-value 0.000). Hydrocolloid dressings are recommended for pediatric wound care management due to their painless removal process. Upon contact with wound exudate, hydrocolloids form a gel that maintains a moist environment, protecting granulation tissue by absorbing and retaining exudate. This gel formation facilitates easy and atraumatic dressing removal, while the moist, oxygen-deprived environment helps shield nerve endings, thereby reducing pain in the wound bed.

Moreover, hydrocolloids exhibit superior absorption capabilities, requiring fewer dressing changes and resulting in less pain compared to gauze dressings. Their mechanism of action against mechanical phlebitis involves vasodilation, increased blood flow, enhanced microcirculation, and regeneration of venous tissue, ultimately reducing local inflammatory responses. Additionally, hydrocolloid dressings are thin, elastic, and conformable, adhering well to the skin without impeding daily activities, ensuring patient comfort throughout the healing process.

Research Limitations

This study has several limitations that need to be considered. First, its sample size is relatively small, consisting of only 39 respondents, thus limiting the generalizability of its findings to a broader population. Second, the study's duration is limited to a four-day intervention period, providing insufficient insight into the long-term effects of hydrocolloid closure intervention on phlebitis wound healing outcomes. Third, the research only focuses on the effectiveness of hydrocolloid closure in reducing PIVAS scores and pain scales among phlebitis patients, without exploring additional outcome measures such as wound healing rates and infection rates. Moreover, the study does not involve a control group or comparative intervention, which could diminish the validity of its findings. Furthermore, the research does not assess the potential side effects or complications associated with hydrocolloid closure, and future research should consider evaluating the safety profile more comprehensively. Finally, the study is conducted only at one healthcare facility, limiting the generalizability of its findings to other patient populations, and multi-center studies with diverse patient cohorts are recommended to enhance the external validity of the findings and provide stronger evidence for clinical practice.

Conclusion

The hydrocolloid dressing intervention study yielded positive results in treating stage 2 and 3 phlebitis wounds. The intervention effectively reduced the PIVAS score and alleviated

pain levels. Hydrocolloid dressing application is suitable for patients of all ages with comorbidities and phlebitis wounds at any location. Consequently, the clinical evidence presented in this study serves as a recommendation for selecting dressings for phlebitis wounds. This study exemplifies evidence-based clinical practice, representing a synthesis of evidence supporting the transition from conventional dressings to interactive dressings.

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