

Effectiveness of Topical Glycerin Magnesium Sulfate Application Versus Cold Application on Patients with Peripheral Intravenous Catheters induced Thrombophlebitis

Reham Abdelhamed Abdelmawla Elsaid¹, Aml Ahmed Mohammed Elmetwaly², Wedad Saber Shafek Abdelkhalek³

^{1,2}Assistant Professor of Medical -Surgical Nursing, Faculty of Nursing-Mansoura University, Egypt

³Lecturer of Medical -Surgical Nursing, Faculty of Nursing-Mansoura University, Egypt

Corresponding Author*: wedadsaber@mans.edu.eg

Abstract: Peripheral intravenous catheters (PIVCs) are a widespread practice and considered the most common invasive procedure for hospitalized patients. Thrombophlebitis or Phlebitis is a common complication linked with the use of peripheral intravenous catheters. Nurses play an essential role in the prevention and treatment of thrombophlebitis. **Aim:** The study aimed to evaluate topical glycerin magnesium sulfate application versus cold application on patients with peripheral intravenous catheter-induced thrombophlebitis. **Design:** Quasi experimental research design had been utilized. **Settings:** The study was carried out in medical units at Mansoura University Hospital. **Subjects:** A purposive sampling technique was used. The study sample consisted of 60 adult patients, the sample was assigned to two experimental groups, 30 in each group (topical glycerin magnesium sulfate application- group I and cold application -group II). **Tools of data collection:** Data were collected using tool I: A structured interview questionnaire and tool II: Visual infusion phlebitis (VIP) scale. **Results:** It revealed that there was a highly significant difference in VIP scale score between the studied patients in topical glycerin magnesium sulphate group and cold application group after each intervention ($P= 0.000$). Likewise, there is a significant difference in mean score of VIP in two experimental groups after comparison baseline within 36, 48 hours after intervention ($P < 0.05$) while mean \pm SD score of VIP in group I, was 1.93 ± 0.583 & 1.52 ± 0.861 respectively and group II, was 2.26 ± 0.583 & 1.83 ± 0.694 respectively. **Conclusion:** Application of glycerin magnesium sulfate & cold application were effective in reducing severity of phlebitis. Also, the study demonstrated that using a dressing with glycerin magnesium sulfate is more effective than applying cold compresses in managing thrombophlebitis. **Recommendation:** It was recommended to monitor cannula site regularly, early detection of cannula-induced phlebitis. Using glycerin magnesium sulfate application and cold application to reduce severity of peripheral intravenous catheters induced thrombophlebitis in hospitalized patients.

Keywords: Cold application, Glycerin magnesium sulfate, Peripheral intravenous catheters, Thrombophlebitis.

Introduction

Peripheral intravenous catheters (PIVCs) are among the most frequently used vascular access devices worldwide, with their insertion being one of the most common practices for hospital nurses. PIVCs are indicated for short-term use, usually around a week, for the administration of intravenous therapy⁽¹⁾.

Peripheral line placement, is the insertion of an indwelling single-lumen plastic conduit across the skin into a peripheral vein^(2,3). Size of the cannula is chosen based on the duration and type of infused therapy^(4,5), and among the uses of PIVCs such as parenteral nutrition, fluid therapy, blood transfusion, and blood sample for diagnostic studies⁽⁴⁾.

There are several complications associated with peripheral intravenous catheters that are classified into local or systemic; Local complications including thrombophlebitis, extravasation, infiltration, and infections can occur, Systemic complications include pulmonary edema, air, and catheter embolism. The most common complication is thrombophlebitis ^(6,7). The Infusion Nurses Society (INS) indicates that the accepted phlebitis rate should be 5% or less (8). Presently, incidence of phlebitis change in various settings from 3.7% to 67.24% ^(9,10).

Thrombophlebitis or Phlebitis is a widespread complication associated with the use of peripheral intravenous catheters ^(4,11). Phlebitis is defined as an acute inflammation of the blood vessels wall, with irritation of the venous endothelium in the section cannulated by the catheter ⁽⁹⁾. That is characterized by pain, edema, erythema along the vein, heat, and fever. PIVC-related phlebitis may develop due to four causes: chemical, mechanical, bacterial, and post infusion ⁽¹⁰⁾.

Nurses play an essential role in prevention and treatment of thrombophlebitis. Nurses are responsible for prevention and interventions strategies such as insertion, monitoring and assessing peripheral venous catheter (PVC) site for early identification of phlebitis to minimize the severity of complications ⁽¹²⁾. Different interventions are available for thrombophlebitis, which consists of removal of IV line and restarting it in another site, applying a cold compress to decrease blood flow and increase platelet aggregation ⁽¹³⁾. Magnesium sulphate is a natural exfoliant and has anti-inflammatory properties. Topical application of magnesium sulphate enhances a process called reverse osmosis which absorbs excessive water and reduces edema. The cooling effect of applying cold compress to the

phlebitis is very beneficial, causing a numbing sensation and relieves pain. Those are the two interventions mainly used ⁽¹⁴⁾.

Significance of the study

Thrombophlebitis occurs in 20–70% of peripheral intravenous treatment patients according to 20-year studies⁽⁵⁾. The prevention of phlebitis is important in hospital setup. The nurses have more responsibility to prevent and reduce incidence of phlebitis. The cooling effect of applying ice to the phlebitis is very beneficial in addition, magnesium sulfate is a natural exfoliant and has anti-inflammatory properties. Nurses should prevent and reduce thrombophlebitis complications^(10,15).

Judgment in deciding on the treatment modality or selecting the optimal intervention for managing phlebitis remains a topic of ongoing controversy for the practicing nurse. Consequently, this study aims to address this issue and provide clarity on the matter.

Study aim

The study aimed to evaluate the effectiveness of topical glycerin magnesium sulphate application versus cold application among patients with peripheral intravenous catheter-induced thrombophlebitis.

Research Hypothesis

H1: There will be a significant reduction in the severity of phlebitis between pre- and post-intervention among patients in experimental group I (Glycerin Magnesium Sulfate Application).

H2: There will be a significant reduction in the severity of phlebitis between pre- and post-intervention among patients in experimental group II (Cold Application).

H3: There will be a significant difference between two experimental groups I and II in severity of phlebitis post-intervention.

Subjects and method

Study Design

Quasi Experimental (pre-post) test research design had been conducted.

Setting:

The study was carried out in medical units at Mansoura University Hospital.

Sample

Purposive sampling technique was used. The study sample consisted of 60 adults patients, admitted in medical units at Mansoura University Hospital who developed thrombophlebitis as a result of the peripheral intravenous catheter (PIC) during hospitalization. Estimation of sample size was performed using open Epi (<https://www.cdc.gov/epiinfo/index.html>) to calculate sample size of two groups. Mean difference module was used, this module calculates sample size by comparing two means. Estimation based on previously reported improvement in severity of phlebitis (14), 30 patients in each group were needed to achieve 80% statistical power, alpha error level 5% (95% significance). The sample was assigned to two experimental groups, 30 in each group (30 in glycerin magnesium sulphate application - group I, 30 in cold application – group II). The patients were selected according to the following criteria,

Inclusion criteria included: Patients who are.

- Between the age group from 18 to 60 years.
- Developed thrombophlebitis due to intravenous therapy in upper limbs.
- Willing to participate in this study.
- Available during the study period

Exclusion Criteria: Patients who are

- Poor skin condition.
- Receiving chemotherapy.
- Peripheral vascular diseases.
- Have a pre -existing skin condition (dermatitis, eczema)

Data collection tools

Tool I: A structured interviewing questionnaire.

This tool was developed by researchers after a review of relevant literature (1,2) to assess demographic data and factors associated with occurrence of phlebitis and divided into two parts.

Part I: Demographic characteristics

It included (gender, age, marital status, educational level, and occupation).

Part II: Factors associated with occurrence of phlebitis.

It included (size of cannula, insertion site, number of punctures during the IV cannulation, purpose of IV cannulation, and duration of cannulation).

Tool II: Visual infusion phlebitis (VIP) scale

It is a standardized tool developed by Andrew Jackson (1998)⁽¹⁶⁾ to assess the severity of phlebitis before and after intervention. The scoring system was done based on the stages and clinical appearance of phlebitis; score ranged from 0 (no signs of phlebitis) to 5 (advanced stage thrombophlebitis)

Score	Stages of phlebitis	Observation
0	No signs of phlebitis	IV site appears healthy
1	Possible first sign of phlebitis	One of the following signs is evident: <ul style="list-style-type: none"> • Slight pain near IV site OR • Slight redness near IV site

2	Early stage of phlebitis	TWO of the following are evident: • Pain at IV site • Redness • Swelling
3	Medium stage of phlebitis	ALL of the following signs are evident: • Pain along path of cannula • Redness around site • Swelling
4	Advanced stage of phlebitis	ALL of the following signs are evident and extensive: • Pain along path of cannula • Redness around site • Swelling • Palpable venous cord
5	Advanced stage of thrombophlebitis	ALL of the following signs are evident and extensive: • Pain along path of cannula • Redness around site • Swelling

		<ul style="list-style-type: none"> • Palpable venous cord • Pyrexia
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Ethical consideration

Approval from the director of Mansoura university hospital and ethical approval (Ref.No.P.0464) from the Institutional Review Board of the Faculty of Nursing, Mansoura University were obtained to collect the necessary data after explanation of the aim and nature of the study. All participants in the study were informed that participating in the research was voluntary and written informed consent was obtained. Confidentiality and privacy of information from health care professionals were maintained at all times.

Validity and Reliability

The questionnaire was finalized with the help of the five experts in medical- surgical nursing for testing content validity of the tools, therefore the necessary changes were done. Reliability for tool I testing was done using Cronbach's alpha (Alpha = 0.78). The reliability of the VIP score was checked by using Kappa's Co-relation Coefficient, was 0.83⁽¹⁶⁾.

A pilot study

A pilot study was carried out on 6 patients with thrombophlebitis to check and ensure clarity and applicability of the tools.

Data collection

1. The data collection for the study was done after obtaining permission from the institutional ethical committee at the Faculty of Nursing, Mansoura University.
2. The researchers introduced themselves to the patients and explained the purpose of the study.
3. Patients who met the inclusion criteria were selected, and informed consent was obtained. patients were assigned randomly

to two groups (glycerin magnesium sulphate - group I and cold application – group II).

4. From April 2023 to the end of June 2023, data were collected throughout a three-month period. Two days a week, researchers were present in the settings stated above.
5. Initial assessment was done to assess demographic data and factors associated with occurrence of phlebitis using tool I.
6. Previously inserted cannula was removed, and phlebitis was assessed using the tool II; VIP scale (pretest).
7. Regarding posttest, in glycerin magnesium sulphate (group I) after the initial assessment, normal saline was used to clean area and a dressing with glycerin magnesium sulphate soaked on a sterile gauze was applied by the researchers over the site of phlebitis for 10 minutes (3 times/ day) for two consecutive days.
8. While in the cold application (group II) after the pre-test, a gauze was soaked in cold water of a temperature $<15^{\circ}\text{C}$ taken from the refrigerator immediately before the dressing and applied at the phlebitis site for a duration of 20 min, (3 times/ day) for two consecutive days.
9. Post test was done for both groups every 12, 24, 36, 48 hours after the intervention using tool II.

Statistical analysis

The frequency and percentage distribution were used to analyze the demographic variables, factors associated with occurrence of phlebitis and the severity of thrombophlebitis among patients. Mean and standard deviation were used to assess the effectiveness of glycerin magnesium sulphate versus cold application on both groups, using chi square test. Friedman Test for comparing

the effectiveness of glycerin magnesium sulphate & cold application on severity of phlebitis in each group. Independent t-test for comparing the two experimental groups before intervention, after 12 hrs, after 24 hrs, after 36 hrs, and after 48 hrs respectively.

Results

Table (1): Frequency and percentage distribution of demographic variables of the studied groups no=60:

Showed the age of studied patients in two groups ranged from $49 \geq 60$ years old with mean age 46.20 in group I and 46.93 in group II. Female were controlling in the studied sample (63.3in group I & 53.3in group II). Regarding marital status (73.3 & 66.7 respectively) were married in both experimental groups and (33.3% & 30.0% respectively) in both groups were had secondary education. Regarding occupation, 36.7% of the group I was employee & housewife while 33.3 % of the group II was housewife. There was no significant difference of demographic data among both groups.

Table (2): Factors associated with occurrence of phlebitis (n = 60).

Showed that size of inserted cannulas was 18 and 20 gauge with the percentage of 36.7% in group I, while 40 % of group II inserted cannula size was 18 gauge. Pointing to the insertion site 43.3% of cannula was inserted in Median vein in group I, and 53.3 % of group II was inserted in Cephalic vein. Considering purpose of IV cannula was 50% & 56.7% for infusion in group I & group II respectively. 76.7% & 70.0% of studied patients in group I & group II respectively were cannulated from the first time. Concerning to duration of cannula, it lasted for 24-48 hrs in both groups with percentage of 43.3% and 40.0% in group I and group II

respectively. Cannula related factors show no significance difference between both groups.

Table (3): Signs & Symptoms of phlebitis in the studied patients pre- intervention (n = 60).

Illustrated that the studied patients in group I & group II experienced presence of pain along the cannulated vein with the percentage of (63.3% & 56.7 %) respectively, while 36.7% and 43.3 % had pain in site of cannula insertion in both groups correspondingly. Erythema was observed in 66.7% in group I and 46.7% in group II. Swelling was observed in 43.3% and 26.7% in group I and group II respectively. Considering presence of induration, it was 26.7% in group I and 23.3% in group II. Regarding presence of palpable venous cord, it was observed in 16.7% of patients in group I and 26.7% in group II. Pyrexia was observed in 3.3% of group I and 6.7 % of group II.

Table (4): Baseline severity of phlebitis according to VIP score of the studied patients pre-intervention (n = 60).

Revealed baseline severity of phlebitis according to VIP score pre- intervention while the medium stage/ moderate phlebitis as scored by “3” was noticed in 50.0% & 43.3% of the studied patients among group I &II respectively. Referring to early/mild stage as

scored by “2” noticed in 30.0% of group I & 46.7% group II. Advanced or severe thrombophlebitis as scored by “4” observed in them 6.7% & 3.3 % of group I and group II respectively with no significant difference between two groups.

Table (5): Comparison of the effectiveness of glycerin magnesium sulfate and cold application on severity of phlebitis with comparison to baseline score.

Illustrated that there is a highly significant difference in VIP score between the studied patients in glycerin magnesium sulphate group I and cold application group II after each intervention ($P = 0.000$). The mean score of VIP was reduced post- intervention in both groups. Consequently, it was concluded that both applications were helpful in reducing severity of phlebitis. Likewise, there is a significant difference in mean score of VIP in two experimental groups after comparison baseline within 36, 48 hours after intervention ($P < 0.05$) while mean \pm SD score of VIP in group I, was 1.93 ± 0.583 & 1.52 ± 0.861 respectively and group II, was 2.26 ± 0.583 & 1.83 ± 0.694 respectively. But it noticed that there is a more decline in mean score of VIP in group I, as compared with group II, so magnesium sulphate with glycerin was more effective than cold application.

Table (1): Frequency and percentage distribution of demographic variables of the studied groups no=60:

Items	Group I (Glycerin Magnesium Sulfate Application)		Group II (Cold Application)		Total		X ² (P)
	No=30	%	No=30	%	No=60	%	
Age (in years)							
18>29	3	10.0	4	13.3	7	11.7	1.115 (0.773)
29>39	7	23.3	4	13.3	11	18.3	
39>49	8	26.7	8	26.7	16	26.7	
49≥60	12	40	14	46.7	26	43.3	
Mean ± SD	46.200 ± 1.174		46.933 ± 1.170				
Gender							0.617 (0.432)
Male	11	36.7	14	46.7	25	41.7	
Female	19	63.3	16	53.3	35	58.3	
Marital status							
Married	22	73.3	20	66.7	42	70.0	1.706 (0.636)
Widowed	4	13.3	5	16.7	9	15.0	
Divorced	1	3.3	0	0.0	1	1.7	
Single	3	10.0	5	16.7	8	13.3	
Level of Education							
Illiterate	1	3.3	3	10.0	4	6.7	2.945 (0.567)
Read& write	7	23.3	6	20.0	13	21.7	
Basic education	10	33.3	7	23.3	17	28.3	
Secondary	10	33.3	9	30.0	19	31.7	
University & above	2	6.7	5	16.7	7	11.7	
Occupation							2.129 (0.546)
Employee	11	36.7	7	23.3	18	30.0	
Manual work	5	16.7	8	26.7	13	21.7	
Housewife	11	36.7	10	33.3	21	35.0	
No work	3	10.0	5	16.7	8	13.3	

*X² test Pearson Chi-Square**non-significant p > 0.05*

Table (2): Factors associated with occurrence of phlebitis (n = 60).

Items	Group I (Glycerin Magnesium Sulfate Application)		Group II (Cold Application)		Total		X2 test (P)
	No=30	%	No=30	%	No=60	%	
Size of Cannula							
16 gauge	1	3.3	1	3.3	2	3.3	3.304
18 gauge	11	36.7	13	43.3	24	40.0	(0.347)
20 gauge	11	36.7	14	46.7	25	41.7	
22 gauge	7	23.3	2	6.7	9	15.0	
Insertion site							
Cephalic	12	40.0	16	53.3	28	46.7	2.163
Basaltic	3	10.0	1	3.3	4	6.7	(0.539)
Median	13	43.3	10	33.3	23	38.3	
Metacarpal	2	6.7	3	10.0	5	8.3	
Purpose of IV cannula							
Infusion	15	50.0	17	56.7	32	53.4	1.968
Medication Administration	11	36.7	12	40.0	23	38.3	(0.374)
Blood transfusion	4	13.3	1	3.3	5	8.3	
Number of punctures							
First time	23	76.7	21	70.0	44	73.3	1.691
Second time	6	20.0	9	30.0	15	25.0	(0.429)
Third time	1	3.3	0	0.0	1	1.7	
Duration of cannula							
Less 24 hrs	7	23.3	9	30.0	16	26.7	
24-48 hrs	13	43.3	8	26.7	23	38.3	1.812
48-72 hrs	8	26.7	12	40.0	18	30.0	(0.612)
More than 72 hrs	2	6.7	1	3.3	3	5.0	

*X2 test Pearson Chi-Square**non-significant p > 0.05***Table (3): Signs & symptoms of phlebitis in the studied patients pre- intervention (n = 60).**

Signs & Symptoms of phlebitis	Group I (Glycerin Magnesium Sulfate Application)		Group II (Cold Application)		X2 test	P- Value
	No=30	%	No=30	%		
Presence of pain						
Insertion site of cannula	11	36.7	13	43.3	0.278	0.598
Along the cannulated vein	19	63.3	17	56.7		
Presence of Erythema	20	66.7	14	46.7	2.443	0.118
Presence of Swelling	13	43.3	8	26.7	1.832	0.176
Presence of Induration	8	26.7	7	23.3	0.089	0.766
Presence of Palpable Venous Cord	5	16.7	8	26.7	0.884	0.347
Pyrexia	1	3.3	2	6.7	0.351	0.554

*X2 test Pearson Chi-Square**non-significant p > 0.05*

Table (4): Baseline severity of phlebitis according to VIP score of the studied patients pre-intervention (n = 60).

Severity of Phlebitis according to VIP Score:	Group I (Glycerin Magnesium Sulfate Application)		Group II (Cold Application)		X2 test	P- Value
	No=30	%	No=30	%		
0 ---No Phlebitis.	0	0.0	0	0.0		
1--- Possible first sign/very mild.	4	13.3	2	6.7		
2--- Early stage/Mild.	9	30.0	14	46.7		
3--- Medium stage/Moderate.	15	50.0	13	43.3	2.230	0.526
4 ---Advanced phlebitis/severe.	2	6.7	1	3.3		
5--- Advanced Thrombophlebitis/Very severe.	0	0.0	0	0.0		

X2 test Pearson Chi-Square *non-significant p > 0.05*

Table (5): Comparison of the effectiveness of glycerin magnesium sulfate and cold application on severity of phlebitis with comparison to baseline score (n = 60).

Duration difference	Group I (Glycerin Magnesium Sulfate) No=30		Group II (Cold Application) No=30		Test of significant (independent sample t test)	(P ²) value
	Mean ± SD	Mean Rank	Mean ± SD	Mean Rank		
Baseline Score pre- Intervention)	2.50±0.820	3.77	2.43±0.678	3.35	0.343	0.733
After 12 hrs	2.40±0.813	3.57	2.36±0.668	3.20	0.173	0.863
After 24 hrs	2.20±0.714	3.17	2.30±0.651	3.07	-0.567	0.573
After 36 hrs	1.93±0.583	2.63	2.26±0.583	2.98	-2.213	0.031*
After 48 hrs	1.52±0.861	1.87	1.83±0.694	2.23	-2.475	0.016*
Friedman test (p)¹	59.718 (0.000)**		29.890 (0.000)**			

Friedman test (p)¹: Comparing the effectiveness of glycerin magnesium sulphate & cold application on severity of phlebitis in each group.

Independent t-test (p)²: Comparing the two experimental group before intervention, after 12 hrs, after 24 hrs, after 36 hrs, and after 48 hrs respectively.

* Statistically significant $p \leq 0.05$

** Highly statistically significant $p \leq 0.01$

Discussion

Intravenous therapy is prescribed for various medical purposes. A considerable proportion of hospitalized patients undergo peripheral venous cannulation as a routine procedure to facilitate swift and precise medication delivery. Nonetheless, this intravenous cannulation may lead to unwanted consequences, with phlebitis being the most common among them. Phlebitis can arise from mechanical, chemical, or infectious factors⁽¹⁷⁾.

The study was carried out to assess the effectiveness of topical glycerin magnesium sulphate versus cold application on thrombophlebitis among patients with peripheral intravenous cannula. Nearly half of studied patients were in the age group ranged from 49≥ 60 years old and female were prevalent representing more than half of the studied sample and more than two third were married where secondary education representing nearly one third of studied sample. From researchers' point of view these findings may be due to association between chronic diseases and age, especially medical diseases and this age group explain the marital status of studied patients. These findings are similar to a study conducted in Kerala by Neethu and Pillai (2020) who found that half of his studied sample were in the age group 50-60 years where female were more prevalent, and nearly two third of studied sample were married while one third of the sample had secondary education⁽¹⁸⁾.

Regarding to insertion site of cannula, the current study noticed that the main site for cannula insertion was Median vein which represents above forty of sample in Glycerin magnesium sulfate application group I & above half was inserted in cephalic vein in cold application group II. Considering size of cannula nearly three quarter of studied patients in group I, were cannulated by 18–20-gauge cannula and nearly half of studied sample in group II, were cannulated by 20-gauge cannulas.

Researchers point of view regarding site of cannula insertion in cephalic and median vein attributed to the characteristics of these veins as they most frequently accessed vein which naturally explains the size of inserted cannula to be 18–20-gauge This was in the same line with a study done by Jayabharathi (2015) who investigated "The effect of glycerin magnesium sulphate application versus cold application on thrombophlebitis among patients received intravenous therapy " who reported that nearly above one third of group I and above half of group II cannulated at Cephalic vein⁽¹⁹⁾. Similarly, a study conducted in Dharan, Nepal by Amuda (2019) found that half of the sample were cannulated with 20 gauge⁽²⁰⁾. While the finding is incompatible with a study by Rukhsana , Rahman, , Tamang, and Kochhar (2016) who studied "effectiveness of Magnesium Sulphate with Glycerin Dressing versus Heparinoid Ointment Application on Management of Phlebitis among Patients" which

showed that Metacarpal vein is the most preferred site of cannulation in his two experimental groups⁽²¹⁾.

Concerning duration of cannula, just about half of the sample in group I, developed phlebitis after 24 to 48 hrs., and forty of sample in group II developed phlebitis after 48 to 72 hrs. This may attributed to type and amount of administered medication or infusion given to patients. This result is confirmed by study conducted by Varghese and Moly (2018) who investigated "effectiveness of magnesium sulfate with glycerine versus cold compress on patients with peripheral intravenous cannula induced phlebitis who found that phlebitis developed in half of sample after 2 days, and forty of sample developed phlebitis < 2 days and one tenth only from 3-5 days⁽²²⁾.

On the other hand the current study results is conflicting with the results by Urbanetto, Peixoto, and May (2016) who reported that the occurrence of phlebitis increases after IV cannula left in place more than 72 hrs⁽²³⁾.

Regarding the effectiveness of glycerin magnesium sulphate & cold application on thrombophlebitis. The result revealed that there is a significant difference in mean score of VIP among the patients in glycerin magnesium sulphate group I & cold application group II after each intervention. The mean score of VIP was reduced post-intervention in two groups. Consequently, it was fulfilled that both the applications were helpful in reducing severity of thrombophlebitis.

This can be attributed to the fact that Magnesium sulfate is known for its anti-inflammatory properties. When

applied topically, it can help reduce inflammation and swelling in the affected veins, which is a hallmark of phlebitis. Glycerin, often used as a vehicle for drug delivery, can enhance the penetration of magnesium sulfate through the skin. This allows the medication to reach the inflamed veins more effectively, potentially speeding up the healing process. So, combining magnesium sulfate with glycerin may create a synergistic effect, where the two substances work together to provide a more potent anti-inflammatory action, further aiding in reducing phlebitis symptoms and pointing to cold compresses, typically made by applying ice or a cold pack to the affected area, are widely used for reducing inflammation and pain in various medical conditions, including phlebitis.

The application of cold constricts blood vessels, which can help reduce blood flow to the inflamed veins. This constriction decreases the swelling and inflammation in the affected area. Cold compresses can also provide relief from pain and discomfort by numbing the area and slowing down nerve conduction, which may help ease the sensation of pain associated with phlebitis.

This result is consistent with the study by Varghese and Moly (2018) where results showed that both magnesium sulfate with glycerin & cold compress were found to be effective in reducing level of phlebitis. The difference in post-intervention VIP scores between two groups was found to be significant⁽²²⁾.

Another similar study conducted in Coimbatore by Arthi and Tamilselvi (2019) to evaluate "effectiveness of

magnesium sulphate with glycerin versus ice pack application on phlebitis among patients with peripheral intravenous cannula induced phlebitis" demonstrated that there was a significance differences in mean score of phlebitis between pre-test & post-test among patients with peripheral intravenous catheters induced phlebitis who received magnesium sulphate with glycerin application & ice pack application. Hence it is fulfilled that the magnesium sulphate with glycerin & ice pack application significantly reduces phlebitis ⁽¹⁴⁾.

Similarly, the study conducted in New Delhi by Rukhsana, Rahman, Tamang, and Kochhar (2016) showed significant difference in mean score of VIP among the patients in glycerin magnesium sulphate group I & cold application group II after each intervention. Therefore, this indicates that cold application & glycerin magnesium sulfate were useful in reducing phlebitis ⁽²¹⁾. Another similar study conducted by Jayabharathi (2015) in Perambalur, which found the difference between pre & post score were significant in two groups, and there is a significant reduction on level of thrombophlebitis after glycerin magnesium sulphate & cold application ⁽¹⁹⁾.

Concerning the comparison of the effectiveness of glycerin magnesium sulphate and cold application on thrombophlebitis. The current study revealed that there is a significant difference in mean score of VIP in two experimental groups after comparison baseline within 36, 48 hours after intervention. But it noticed that there is a more decline in mean score of VIP in experimental group I, as compared

with experimental group II. This can be explained by the fact that the combination of magnesium sulfate and glycerin may work synergistically to provide a more potent and targeted anti-inflammatory effect on the inflamed veins.

On the other hand, while cold compresses can help reduce inflammation and pain, they primarily act by constricting blood vessels and may not have the same focused anti-inflammatory action as the specific medication. Magnesium sulfate with glycerin, when applied topically, can potentially penetrate deeper into the affected tissues, reaching the inflamed veins more effectively. This deeper penetration allows for a more direct and concentrated delivery of the anti-inflammatory properties of magnesium sulfate, leading to a more pronounced reduction in inflammation.

Cold compresses provide temporary relief by numbing the area and reducing blood flow, but their effects may wear off once the cold application is removed. In contrast, magnesium sulfate with glycerin could have a longer-lasting impact due to its sustained anti-inflammatory action, even after the application has been discontinued. So, magnesium sulfate with glycerin was more effective than cold application in reducing the level of phlebitis, likely due to its targeted anti-inflammatory properties, potential for deeper penetration, and sustained effects.

This result of the study is being confirmed by the study carried out in Coimbatore by Arthi and Tamilselvi (2019) who reported that there was a significant difference in the effect of magnesium sulphate with glycerin and

ice pack application in day 2 and 3. Also stated that magnesium sulphate with glycerin application was effective in reducing the level of phlebitis in the experimental group I than who receive ice pack application in the experimental group II ⁽¹⁴⁾.

Another similar study conducted in Kerla by Varghese and Moly (2018) found that the mean VIP scores post-intervention of magnesium sulfate with glycerin was less than the mean VIP score of cold compress. The study fulfilled that magnesium sulfate with glycerin was more effective than cold compress for treatment phlebitis ⁽²²⁾. Similarly, a study carried out by Jayabharathim (2015) in Perambalur, showed the glycerin magnesium sulphate application will be effective than the cold application on reduction of thrombophlebitis between participants received IV therapy ⁽¹⁹⁾.

On the other hand, this finding conflicts with a study carried out in New Delhi by Rukhsana, Rahman, Tamang, and Kochhar (2016) reported that there is no significant difference between cold application and glycerin magnesium sulfate application in relieving phlebitis. This indicates that both the treatments were effective in relieving phlebitis (21). Also the finding is incoherent with the findings from a study carried out in India by Yadav et al. (2016) who stated that cold compress was more effective as compared with glycerin and alovera ⁽²⁴⁾.

Conclusion

The findings of the current study concluded that both glycerin magnesium sulfate and cold application were effective in reducing the severity of thrombophlebitis among patients received intravenous therapy, but among them the mean VIP score is reduced in glycerin magnesium sulphate group as compared with cold application group so magnesium sulphate with glycerin was more effective than cold application.

Recommendations

- Using glycerin magnesium sulphate application and cold application to reduce severity of peripheral intravenous catheters induced thrombophlebitis in hospitalized patients.
- Regular monitoring of the cannula site, early detection of cannula-induced phlebitis, and timely management are crucial for treatment and the avoidance of subsequent complications.
- Nurses must possess the necessary knowledge and abilities to manage cannula-induced phlebitis and prevent its complications.
- Additional research might be done utilizing a larger sample and different types of items.

Conflict of interest

The authors announce that they have no conflict of interest.

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