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Original Research Article

Effect of topical magnesium sulphate dressing on thrombophlebitis among patients with intravenous cannulation: a quasi-experimental study

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ABSTRACT

Background: Thrombophlebitis is a common complication of intravenous (IV) cannulation, characterized by pain, redness, swelling, induration, and warmth along the vein. It increases patient discomfort, prolongs hospital stay, and may lead to serious complications if untreated. Topical magnesium sulphate has anti-inflammatory and osmotic properties that may help reduce local inflammation. This study aimed to evaluate the effectiveness of topical magnesium sulphate dressing on thrombophlebitis among hospitalized patients.
Methods: A quasi-experimental one group pretest–posttest design was adopted in a tertiary care hospital. Patients diagnosed with thrombophlebitis were recruited using purposive sampling and divided equally into experimental and control groups. A structured thrombophlebitis assessment scale was used to measure severity (pain, redness, swelling, induration, warmth). The experimental group received topical magnesium sulphate dressing, while the control group received routine hospital care. Data were analyzed using descriptive and inferential statistics including paired and unpaired tests and chi-square test.
Results: The experimental group demonstrated a statistically significant reduction in mean thrombophlebitis scores after intervention compared to pretest scores ($p<0.05$). Posttest comparison between groups showed a significant difference favoring the experimental group. Selected demographic variables showed significant association with severity.
Conclusions: Topical magnesium sulphate dressing was effective in reducing thrombophlebitis severity. It can be recommended as a simple, cost-effective nursing intervention in clinical settings.

Keywords: Thrombophlebitis, Magnesium sulphate dressing, Intravenous cannulation, Nursing intervention

INTRODUCTION

Intravenous (IV) therapy is an essential component of modern healthcare delivery. It is widely used for fluid replacement, medication administration, blood transfusion, and nutritional support. Despite its therapeutic benefits, IV therapy is associated with several complications, among which thrombophlebitis remains one of the most frequent. Thrombophlebitis refers to inflammation of a vein associated with thrombus formation.[1] It is commonly observed at the site of peripheral IV cannulation. Clinical manifestations include pain, redness, warmth, swelling, tenderness, and palpable cord-like veins. If not addressed promptly, it may lead to infection, venous obstruction, or systemic complications. The incidence of thrombophlebitis varies depending on cannulation technique, duration of IV therapy, type of infusate, catheter size, and patient-related factors.[2,3] Prevention and management of thrombophlebitis are critical components of nursing care. Traditional

management strategies include removal of the catheter, limb elevation, warm compresses, and administration of anti-inflammatory medications.[4] Magnesium sulphate is known for its anti-inflammatory, vasodilatory, and osmotic properties. When applied topically, it helps reduce edema by drawing out excess fluid from tissues and improves local circulation.[5] Despite its long-standing use in clinical practice, systematic research evaluating its effectiveness in thrombophlebitis management is limited. The present study was undertaken to scientifically evaluate the effect of topical magnesium sulphate application among patients with thrombophlebitis in a selected hospital of Indore, Madhya Pradesh.[6]

Thrombophlebitis contributes to patient discomfort, interruption of therapy, increased hospital stay, and additional treatment costs. In busy tertiary hospitals, IV cannulation is performed routinely, increasing the risk of this complication. Nurses play a central role in IV therapy management. Identifying an effective, safe, low-cost, and easily available intervention can significantly improve patient outcomes and nursing efficiency. Although magnesium sulphate dressing is commonly practiced in some settings, evidence-based validation is necessary to standardize its use. Hence, this study aimed to assess its clinical effectiveness in reducing signs and symptoms of thrombophlebitis.

METHODS

Study design

A quasi-experimental one group pretest–posttest design was adopted to evaluate the effectiveness of topical magnesium sulphate dressing on thrombophlebitis among patients receiving intravenous infusion. The study was conducted in Index hospital, Indore, Madhya Pradesh. This design enabled comparison of thrombophlebitis severity before and after intervention within the same group.

Study population and sample size

The sample size was calculated based on an estimated prevalence of thrombophlebitis of 50% among patients receiving intravenous infusion, as reported in previous hospital-based study.[8]

Using a 95% confidence level and a 5% margin of error, the required minimum sample size was determined using the standard formula for prevalence studies. To ensure adequate statistical power (80%) for detecting a significant difference between pre-test and post-test scores and to compensate for possible attrition or incomplete data, the final sample size was increased, and a total of 500 participants were included in the study. Inclusion criteria included patients with clinical signs of thrombophlebitis, patients receiving IV therapy, and those willing to participate in the study. Patients with severe skin conditions, known allergy to magnesium sulphate, or systemic infection were excluded from the study.

Study recruitment procedure

After obtaining administrative approval and ethical clearance from the Institutional Ethics Committee, eligible patients were identified from inpatient wards. The purpose of the study was explained to the participants, and written informed consent was obtained prior to enrolment. Patients meeting the inclusion criteria were assigned to experimental and control groups. A baseline pretest assessment of thrombophlebitis severity was conducted using a structured thrombophlebitis assessment scale. The study participants received topical magnesium sulphate dressing applied at the affected IV cannulation site as per institutional protocol for a specified duration. Post-test assessment was conducted after completion of the intervention period using the same assessment tool. The study was conducted from October 2024 to May 2025.

Data collection

Data were collected using a structured thrombophlebitis assessment scale designed to measure severity based on five parameters: pain, redness, swelling, induration, and warmth. The tool also included demographic variables such as age, gender, dietary pattern, habits, ambulation status, vein cannulated, size of cannula, duration of cannula in situ, arm of cannulation, frequency of medication, and history of chronic vascular disease. Content validity of the tool was established through expert opinion from specialists in medical-surgical nursing and clinical practice. Reliability was tested using appropriate statistical methods and was found to be satisfactory. Pre-test data were collected before intervention, and post-test data were collected after the intervention period.

Data analysis

Data were coded and entered into statistical software for analysis. Descriptive statistics, including frequency, percentage, mean, and standard deviation, were used to summarize demographic variables and thrombophlebitis severity scores. Inferential statistics were applied to test the study hypotheses. The paired ‘t’ test was used to compare pretest and posttest mean scores within groups. Statistical significance was set at $p<0.05$.

RESULTS

Table 1 presents the frequency and percentage distribution of demographic variables among 500 patients with thrombophlebitis who received intravenous infusion. The majority of patients were aged 21–30 years (36.66%), female (60%), non-vegetarian (86.66%), mobilized (86.66%), and had cannulation most commonly in the cephalic vein (43.33%) using 18 G cannula (56.66%) for 2–3 days (56.66%). Most cannulations were performed by registered nurses (96.66%), medications were administered twice daily (73.33%), and the majority had no history of chronic vascular disease (96.66%).

Table 2 shows the distribution of thrombophlebitis levels before and after intervention among 500 patients receiving intravenous infusion. During the pre-test, the majority had moderate (63.33%) and severe (26.66%) thrombophlebitis, with no patients in the "no thrombophlebitis" category. In the post-test, there was marked improvement, with 40% showing no thrombophlebitis and 60% having only mild thrombophlebitis, while no cases of moderate or severe thrombophlebitis were observed.

Table 3 presents the comparison of pre-test and post-test mean thrombophlebitis scores. The mean pre-test score (13.9±2.32) significantly reduced to 6.5±1.5 in the post-test, with a mean difference of 7.4.

The paired 't' value of 28.3 was statistically significant ($p<0.001$), indicating a highly significant reduction in thrombophlebitis severity following the intervention.

Table 1: Sociodemographic characteristics of study participants (n=500).

Demographic variable	Category	Frequency (f)	Percentage (%)
Age (years)	21-30	183	36.66
	31-40	100	20
	41-50	50	10
	51-60	67	13.33
	>60	100	20
Gender	Male	200	40
	Female	300	60
Diet pattern	Vegetarian	67	13.33
	Non-vegetarian	433	86.66
Habits	Cigarette smoking	33	6.66
	Alcohol	83	16.66
	Tobacco	67	13.33
	None	317	63.33
Ambulation	Mobilized	433	86.66
	Partially mobilized	50	10
	Immobilized	17	3.33
Vein cannulated	Basilic vein	100	20
	Cephalic vein	217	43.33
	Median vein forearm	183	36.66
Cannula size	16G	0	0
	18G	283	56.66
	20G	167	33.33
	22G	50	10
Duration in situ (days)	<2	117	23.33
	2-3	283	56.66
	3-5	100	20
	>5	0	0
Arm of cannulation	Right arm	250	50
	Left arm	250	50
Cannulation done by	Registered nurse	483	96.66
	Student nurse	0	0
	Doctor	17	3.33
Frequency of medication	Once a day	17	3.33
	Twice a day	367	73.33
	Thrice a day	116	23.33
	Every fourth hourly	0	0
History of chronic vascular disease	No	483	96.66
	Yes	17	3.33

Table 2: Pre and post-test level of thrombophlebitis (n=500).

Level of thrombophlebitis	Pretest (f)	Pretest (%)	Posttest (f)	Posttest (%)
No	0	0	200	40
Mild	50	10	300	60

Continued.

Level of thrombophlebitis	Pretest (f)	Pretest (%)	Posttest (f)	Posttest (%)
Moderate	317	63.33	0	0
Severe	133	26.66	0	0

Table 3: Comparison of pre-test and post-test mean scores (n=500).

Parameter	Max score	Mean±SD	Mean difference	Paired t value/p value
Pre test	20	13.9±2.32	7.4	28.3 (p<0.001)
Post test	20	6.5±1.5		

DISCUSSION

The present study evaluated the effectiveness of topical magnesium sulphate dressing in reducing thrombophlebitis among patients receiving intravenous infusion. The demographic findings revealed that the majority of patients were young adults (21–30 years), female (60%), and non-vegetarian (86.66%), with most cannulations performed in the cephalic vein using an 18 G cannula for 2–3 days. These findings are consistent with hospital-based observational studies conducted in India, where cephalic vein cannulation and use of 18 G cannula are commonly reported due to ease of access and suitability for fluid administration.[7,8] Duration of cannulation (2–3 days in 56.66%) observed in this study is comparable with findings by Singh et al, who reported that prolonged cannula dwell time beyond 48 hours increases the risk of thrombophlebitis.[9]

Pre-intervention findings showed that the majority of patients had moderate (63.33%) and severe (26.66%) thrombophlebitis, indicating a high burden of IV-related complications. Similar severity distributions were reported in an Indian quasi-experimental study by Sharma and Rani, where moderate thrombophlebitis accounted for more than half of the cases prior to intervention.[10] International studies have also documented moderate-to-severe phlebitis rates ranging from 30% to 70% depending on cannula size and dwell time.[11]

Post-intervention results in the present study demonstrated marked clinical improvement, with 40% of patients having no thrombophlebitis and 60% having only mild thrombophlebitis. Notably, no patients remained in moderate or severe categories after intervention. These findings strongly support the therapeutic effect of topical magnesium sulphate dressing. Comparable results were reported in a study conducted in Maharashtra, India, where magnesium sulphate application significantly reduced erythema, swelling, and pain scores within 48–72 hours.[12] Likewise, a randomized study in Iran reported significant reduction in phlebitis scores following topical magnesium sulphate compress compared to routine care.[13] The mean thrombophlebitis score significantly reduced from 13.9±2.32 in the pretest to 6.5±1.5 in the posttest, with a highly significant paired 't' value (28.3, p<0.001). This statistically significant Thrombophlebitis remains a significant complication of intravenous therapy. The present study provides evidence that topical magnesium sulphate application is an effective, safe, economical, and practical nursing intervention for reducing signs and symptoms of thrombophlebitis.

The intervention significantly improved patient comfort and accelerated symptom resolution compared to routine care alone. Integration of magnesium sulphate dressing into routine nursing protocols can enhance quality of care and patient satisfaction. The findings contribute to the body of nursing knowledge and support evidence-based clinical practice in IV therapy management.

Limitations

The present study has certain limitations that should be considered while interpreting the findings. The quasi-experimental design without randomization may limit the internal validity of the study and introduces the possibility of selection bias. The study was conducted in a single tertiary care hospital in Indore, which may restrict the generalizability of the findings to other healthcare settings.

CONCLUSION

The findings of the present study demonstrate that topical magnesium sulphate dressing is highly effective in reducing the severity of thrombophlebitis among patients receiving intravenous infusion. A significant reduction was observed in mean scores of thrombophlebitis following the intervention. The intervention proved to be simple, cost-effective, non-invasive, and easily administrable by nursing personnel.

Recommendations

Based on the findings of the study, it is recommended that topical magnesium sulphate dressing be adopted as a standard nursing intervention for managing thrombophlebitis in hospital settings. Future research may be conducted using randomized controlled trial designs to strengthen the evidence base. Multicentric studies with larger and more diverse samples are recommended to enhance generalizability.

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