

A Study to Evaluate Effectiveness of Cold and Magnesium Sulphate Application on Superficial Thrombophlebitis among Patients receiving Intravenous Therapy in selected Hospitals Amritsar

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Abstract

The use of intravenous therapy is an integral part of patient care in hospitals. In modern medical practice, up to 80% of hospitalized patients receive intravenous therapy at some point during their stay. There are different types of complications that occur frequently in patients with peripheral intravenous therapy. Infusion phlebitis occurs in almost all cases. Studies have shown that 20% to 70% of patients receiving peripheral intravenous therapy develop phlebitis. Infusion phlebitis, defined as the inflammation of a cannulated vein, is a common cause of pain and discomfort in these patients. A study to evaluate effectiveness of cold application and magnesium sulphate application on superficial thrombophlebitis among patients receiving intravenous therapy in selected hospitals Amritsar.

Keywords: Infusion phlebitis, superficial thrombophlebitis, intravenous therapy

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INTRODUCTION

An ounce of prevention is worth a pound of cure. Health is a dynamic process and it is always changing. All have times of good health, times of sickness, and maybe even times of serious illness. As lifestyles change, so does the level of health. Health is the level of functional and (or) metabolic efficiency of a living being. It is the general state of mind, body and spirit of a person, usually meaning to be free from illness, injury or pain^[1].

The use of intravenous devices is an integral part of patient care in hospitals. These devices are used for the administration of fluid, nutrients, medications, blood products and to monitor the hemodynamic status of a patient. Up to 80% of hospitalized patients receive intravenous therapy at most of the point during their admission^[2-4].

Some factors are responsible for increasing the risk of infection from intravascular devices. For example, in large hospitals infection rates are higher among patients who may be especially ill, those with burns or surgical wounds or those who are malnourished or immune compromised. In addition, the rates are higher for certain devices, the type of fluid being infused and the length of time the catheter is left in place^[5].

There are guidelines in different hospitals about the recommended duration that a peripheral IV should be in place as serious complications related to peripheral IVs are uncommon. But problems do occur, especially with prolonged use. As with any side effect or complication of health care procedures, early detection, and good communication between the patient and healthcare provider are important^[6].

Infusion phlebitis, defined as the inflammation of a cannulated vein, is a common cause of pain and discomfort in these patients. Studies over the past two decades have shown that 20 to 70% of patients receiving peripheral IV therapy develop phlebitis. According to statistics; about 80% of the patients with intravenous therapy develop varying degrees of infusion phlebitis in China alone^[7].

The incidence of superficial venous thrombosis is highly dependent on the population studied as well as the means by which it is documented. It is generally believed that incidence rates from epidemiological studies are underestimates since autopsy studies indicate that up to 50% of venous thromboembolism are not recognized ante mortem.

Population based studies of healthy volunteers have produced estimates of 122 per 100,000 while community based studies of hospitalized patients have suggested an annual incidence of 56 per 100,000. Studies confirmed thrombophlebitis in Sweden has recommended a slightly higher incidence of 160 cases of new or recurrent disease per 100,000 populations per year. Extrapolated to the population of the United States, this represents 116,000 to over 250,000 new cases of clinically recognized infusion phlebitis per year^[8].

Aim of the study was: To evaluate the effectiveness of two interventional strategies on treatment of superficial thrombophlebitis. The research design adopted for this study was quasi experimental two group pre-test-post-test design; samples size was 60 clients receiving IV therapy selected randomly. A standardized visual infusion phlebitis scale (VIP scale) was selected for the study. The result of the study included that the overall pre-test means VIP score found to be 3.2 with SD 0.62 as compared to overall post-test mean VIP score noticed as 2.3 with SD

0.73 in cold applications group. In magnesium sulphate group, overall pre-test mean VIP score found to be 3.3 with SD 0.65 as compared to overall post-test mean VIP score noticed as 1.9 with SD 0.98. Thus it is inferred that cold applications and magnesium sulphate applications has a significant effect in reducing superficial thrombophlebitis among clients receiving IV therapy, while magnesium sulphate is more effective as compared to cold applications. Recommendations of the study were a similar study can be undertaken on large sample for better generalization, adopting an experimental factorial design for better results and can be conducted by taking other topical therapies along with these two therapies for better results.

REVIEW OF LITERATURE

A prospective, randomized, controlled unblinded study was conducted to assess the effectiveness of elective re-siting of intravenous cannula decrease peripheral thrombophlebitis. Forty-two patients admitted for major abdominal surgery were included in the study. The patients were allocated to either the study or the control group using block randomization–restricted randomization method. Cannula in the study group were changed and re-sited electively every 48 hours. All the patients were examined every 24 hours for signs and symptoms of peripheral thrombophlebitis at the current and previous sites of infusion. The incidence of peripheral thrombophlebitis was 100% (21/21) in the control group and only 9.5% (2/21) in the study group ($p < 0.0001$). The severity of peripheral thrombophlebitis was also less in the study group compared with that in the control group. Day-wise correlation of the incidence of peripheral thrombophlebitis showed that 82.6% of the episodes of peripheral thrombophlebitis occurred on day three^[9].

A study was conducted to compare the rates of phlebitis of peripheral intravenous

lines left in place for 72 hours versus rates of those left in place 96 hours. Design was a prospective, nonrandomized study. Setting was a university teaching hospital with 375 beds. Results were a total of 2503 peripheral lines were evaluable. The overall phlebitis rate was 6.8%. It was estimated that in 1 month approximately 300 intravenous lines potentially could be prolonged beyond 72 hours; 215 lines were changed at 72 hours despite no signs of inflammation, 61 lines were kept till 96 hours, and 19 lines were kept beyond 96 hours. Conclusion of the study was Phlebitis rate for our peripheral intravenous catheters at 96 hours was not significantly different from that at 72 hours^[10].

A Randomized Controlled Trial on factors Affecting Complications and Patency of peripheral IVs. This sample was composed of 88 patients, from neonates to 12-year-olds, on whom a total of 377 catheters were started. Intravenous cannulations were randomized for heparin flushes (1:100 dilutions) and splints. Prospective data was collected regarding duration of patency and complications. Both univariate and multivariate analysis were done. There was a statistically significant increase in the duration of patency with the use of heparin flushes and splints. Shorter patency duration and increased complications were associated with younger age, wrist and scalp insertions, and 24-gauge catheters. A quasi-experimental study was conducted to assess the effectiveness of the therapeutic effect of tanshinone, magnesium sulphate and hirudoid in the treatment of infusion phlebitis on 150 in patients with infusion phlebitis. Patients were randomly divided into tanshinone group (n=50), hirudoid group (n=50) and magnesium sulphate group (n=50). The therapeutic effect was assessed after 5 days treatment. The results shows the excellence rate of 64% in tanshinone group, 36% in hirudoid group

and 18% in magnesium sulphate group, the differences was statically significant at level of $p=0.05$. The efficacy rate was 94% in tanshinone group, 80% in hirudoid group and 60% in magnesium sulphate group, the differences was statically significant at level of $p=0.001$ ^[11-12].

A quasi experimental study was conducted to assess the effectiveness of cold application, heparinoid application and magnesium-sulphate application on superficial thrombophlebitis among patients in selected hospitals of Indore. Three-group pre-test and post-test design was adopted for the study. 45 patients were selected using purposive sampling and they were randomly assigned into three groups. A superficial thrombophlebitis scale and pain intensity distress scale was used for data collection. Following the pre-test, intervention with cold application was given to 1st experimental group (C), for a period of twenty minute, 2nd experimental group (H) was intervened with heparinoid application using thrombophobe ointment by gentle massage and similarly in 3rd experimental group (M), magnesium-sulphate dressing was done by dipping the gauze in the magnesium sulphate glycerine solution and applied on superficial thrombophlebitis three times a day for three days. The finding of the study indicated that the computed 't' value of cold application group ($t_{14}=14.33$), heparinoid application group ($t_{14}=11.90$) and magnesium sulphate application group ($t_{14}=20.82$) were statistically significant, which suggested that all three interventions were effective in reducing the signs and symptoms of superficial thrombophlebitis. The computed 'F' ratio of all the three groups ($F_{2,42}=10.10$) showed that three types of application differ significantly. However, the mean difference of magnesium sulphate group (18.34) was higher than the cold application (13.33) and heparinoid application (12.8) group. This study

concluded that magnesium sulphate application is most effective intervention in reducing the superficial thrombophlebitis.

The purpose of the study was to evaluate the effectiveness of two interventional strategies on treatment of superficial thrombophlebitis.

RESEARCH METHODOLOGY

The research design adopted for this study was quasi experimental two group pre-test-post-test design, to measure the effectiveness of cold applications and magnesium sulphate on superficial thrombophlebitis on a sample of 60 clients receiving IV therapy.

This study had been conducted at medical and surgical units of Guru Nanak Dev Govt. Hospital and Civil hospital, Amritsar. Random sampling technique was a type of probability sampling approach, it was found to be appropriate for the present study. A standardized visual infusion phlebitis scale (VIP scale) was selected for the study. It was considered to be the most appropriate instrument to judge the degree of superficial thrombophlebitis by observation method.

Tool-1

Demographic questionnaire was used to assess the demographic data of the clients such as age, gender, duration of cannula, size of cannula, site of intravenous cannula, type of fluid infused, number of prick during the intravenous Cannulation procedure, size of peripheral intravenous cannula, types of medication infused, and duration of peripheral intravenous cannula.

Tool-II

Visual infusion phlebitis scale was used to assess the severity of peripheral intravenous cannula induced phlebitis. It

was a five point scale. It includes following parameters to assess the degree of superficial thrombophlebitis.

Grade 0 = No symptoms

Grade 1 = Erythema at access site with or without pain

Grade 2 = Pain at access site with erythema and/or edema

Grade 3 = Pain at access site with erythema and/or edema, streak formation, palpable venous cord

Grade 4 = Pain at access site with erythema and/or edema, streak formation, palpable venous cord > 1 inch in length, purulent drainage

ANALYSIS

Frequency and Percentage Distribution of Demographic Characteristics of clients having superficial thrombophlebitis depicts classification of subjects according to age, gender, size of cannula, site of cannula, duration of cannula, type of fluid infused and no. of pricks. It represents distribution of subjects according to age.

Present study revealed that maximum number of samples 10 (33.33%) belong to age group above 40 in cold applications group and 10 (33.33%) in 31–35 years in magnesium sulphate group. While minimum samples 5 (16.66%) included in 36–40 years age in cold applications group and 2 (6.66%) samples in magnesium sulphate group.

Above table illustrates that cold applications group contains more no. of females *i.e.* 18 (60%) as compared to magnesium sulphate group which have 14 (46.66%) females. Number of males also slightly varies in both groups, *i.e.* 16 (53.33%) in magnesium sulphate group and 12 (40%) in cold applications group.

Table: 1 Frequency and Percentage Distribution of Demographic Characteristics of clients having superficial thrombophlebitis

	Cold applications group		Magnesium sulphate group	
1. Age	No. of samples	Percentage	No. of samples	Percentage
25-30	08	26.66	9	30
31-35	07	23.33	10	33.33
36-40	05	16.66	2	6.66
40 and above	10	33.33	09	30
2. Gender				
Male	12	40	16	53.33
Female	18	60	14	46.66
3. Size of cannula				
18 gauze	5	16.66	6	20
20 gauze	7	23.33	9	30
22 gauze	18	60	15	50
4. Site				
Basalic	6	20	8	26.66
Cephalic	7	23.33	8	26.66
Cubital	3	10	2	6.66
Antebrachial	8	26.66	7	23.33
Metacarpal veins	5	16.66	3	10
Saphenous veins	1	3.33	2	6.66
5. Duration of cannula				
1-2 days	6	20	6	20
3-4 days	9	30	10	33.33
5-6 days	10	33.33	10	33.33
7 or more	5	16.66	4	13.33
6. Type of fluid infused:				
Colloids	3	10	2	6.66
Crystalloids	14	46.66	12	40
Blood based products	5	16.66	6	20
Parenteral nutrition	0	0	1	3.33
Other medications	8	26.66	9	30
7. Number of pricks				
1	6	20	11	36.66
2	7	23.33	8	26.66
3	12	40	8	26.66
4 and more	5	16.66	3	10

Based on the size of cannula the maximum no. of samples *i.e.* 18 (60%) in cold applications group and 15 (50%) in magnesium sulphate group were using 22 gauze cannula. Minimum no. of samples were using 18 gauze needle *i.e.* 5 (16.66%) in cold applications group and 6 (20%) in magnesium sulphate group.

It is revealed that most of the samples have 5–7 days duration of cannula in both groups *i.e.* 10 (33.33%). while minimum samples were having 7 or more days

duration in both groups *i.e.* 5 (16.66%) in cold applications group and 4 (13.33%) in magnesium sulphate group.

In present study most of the samples were receiving crystalloids, *i.e.* 14 (46.66%) in cold applications group and 12(40%) in magnesium sulphate group respectively. Least number of samples were receiving parenteral nutrition that include 0% in cold applications group and 1 (3.33%) in magnesium sulphate group. The no. of samples receiving blood based products is

5 (16.66%) and 6 (20%) in cold applications group and magnesium sulphate group respectively. No. of samples infused with other medications is slightly higher than the blood based products *i.e.* 8 (26.66%) and 9 (30%) in both groups respectively.

Above table reveals that in cold applications group maximum samples *i.e.*

12 (40%) received 3 pricks. Sample with one and two pricks slightly vary *i.e.* 6 (20%) and 7 (23%) respectively while 5 (16.66%) samples got 4 and more pricks. On the other hand in magnesium sulphate group maximum sample *i.e.* 11 (36.66%) received 1 prick. No. of samples is similar for 2 and 3 pricks *i.e.* 8 (26.66%). Minimum samples 3 (10%) received 4 and more pricks.

Table: 2 Assess the pre-test degree of superficial thrombophlebitis among clients receiving IV therapy.

VIP score	Degree of superficial thrombophlebitis	Cold applications group		Magnesium sulphate group	
		Frequency	Percentage	Frequency	Percentage
1	Mild	0	0%	0	0%
2	Moderate	3	10%	3	10%
3	Severe	17	56.66%	15	50%
4	Very severe	10	33.33%	12	40%

The above table shows that 56% of clients in cold applications group and 50% in magnesium sulphate group have severe degree of superficial thrombophlebitis, clients having moderate degree of superficial thrombophlebitis are 10% in

both groups, while 33.33% in cold applications group and 40% in magnesium sulphate group have very severe degree of superficial thrombophlebitis. No. of clients with mild degree is nil.

Table: 3 Assess the post-test degree of superficial thrombophlebitis clients receiving IV therapy.

VIP score	Degree of superficial thrombophlebitis	Cold applications group		Magnesium sulphate group	
		Frequency	Percentage	Frequency	Percentage
1	Mild	5	16.66%	9	30.00%
2	Moderate	12	40.00%	11	36.66%
3	Severe	13	43.33%	10	33.33%
4	Very severe	0	0.00%	0	0.00%

The above table shows that 43.33% of clients in cold applications group and 33.33% in magnesium sulphate group have severe degree of superficial thrombophlebitis; clients having moderate degree of superficial thrombophlebitis are 40% in cold applications group and

36.66% in magnesium sulphate group.

While 16.66% in cold applications group and 30% in magnesium sulphate group have mild degree of superficial thrombophlebitis. No. of clients with very severe degree is nil.

Table: 4 Assess the effectiveness of cold applications on superficial thrombophlebitis among clients receiving IV therapy.

Aspects	Sum of VIP Scores	Mean Score	S.D.	Paired T test
Pre test	97	3.2	0.52	5.23*
Post test	68	2.3	0.73	

* Significant at 0.05 Level

Overall scores of pre-test and post-test on superficial thrombophlebitis in cold applications group is established in Table 3. It can be seen from the findings that the overall pre-test mean VIP score found to be 3.2 with SD 0.52 as compared to overall post-test mean VIP score noticed as 2.3 with SD 0.73.

The data subjected for statistical paired t-test showed a highly significant difference ($p < 0.05$) existing between pre-test and post-test over all VIP score ($t = 5.23^*$).

Table: 5 Assess the effectiveness of magnesium sulphate applications on superficial thrombophlebitis among clients receiving IV therapy.

Aspects	Sum of VIP cores	Mean Score	S.D.	Paired T test
Pre test	99	3.3	0.65	7.86*
Post test	58	1.9	0.98	

*Significant at 0.05 Level

Overall scores of pre-test and post-test on superficial thrombophlebitis in magnesium sulphate group is established in Table 3.

It can be seen from the findings that the overall pre-test mean VIP score found to be 3.3 with SD 0.65 as compared to overall post-test mean VIP score noticed as 1.9 with SD 0.98.

The data subjected for statistical paired t-test showed a highly significant difference ($p < 0.05$) existing between pre-test and post-test over all VIP score ($t = 7.86^*$).

Overall post test scores on superficial thrombophlebitis in cold applications group and magnesium sulphate group are established in Table 3.

It can be seen from the findings that the post test mean VIP score found to be 2.3

with SD 0.73 in cold applications group as compared to post test mean VIP score noticed as 1.9 with SD 0.98 in magnesium sulphate group.

Table: 6 Compare effectiveness of cold applications and magnesium sulphate applications on superficial thrombophlebitis among clients receiving IV therapy.

Aspects	Sum of VIP Scores	Mean Score	S.D.	Unpaired t test
Post test score of cold applications group	68	2.3	0.73	8.51*
Post test score of magnesium sulphate group	58	1.9	0.98	

*Significant at 0.05 Level

The data subjected for statistical unpaired t-test showed a highly significant difference ($p < 0.05$) existing between post-test VIP score ($t = 8.51^*$).

Table 4 (b) presents the association of degree of superficial thrombophlebitis of the total sample after Post-test with selected demographic variables.

The impact of age on degree of superficial thrombophlebitis found to be non-significant as the calculated value is less than tabulated value at 0.05 level of significance.

Chi square-test result depicts no significant impact of gender, site of cannula, type of fluid infused, size of cannula on the degree of superficial thrombophlebitis and effectiveness of cold applications. The result on impact of no. of pricks reveals significant findings as performed by Chi-test.

Table: 7 Association Between the post-test VIP scores of clients having superficial thrombophlebitis in cold applications group with selected demographic variables.

Demographic variables	Degree of superficial thrombophlebitis based on VIP scores				Calculated Value p 0.05 level	df	Table Value
	Mild (1)	Moderate (2)	Severe (3)	Very severe (4)			
	Effectiveness of cold applications on superficial thrombophlebitis based on VIPS						
	Highly effective (1)	Moderate effective (2)	Mild effective (3)	No effect (4)			
1. Age					11.51 NS	9	16.92
25-30	2	3	3	0			
31-35	1	4	2	0			
36-40	2	3	0	0			
40 and above	0	2	8	0			
2. Gender					3.22 NS	3	7.82
Male	2	7	3	0			
Female	3	5	10	0			
3. Size of cannula							
18 gauze	2	0	3	0			
20 gauze	0	5	2	0	7.2NS	6	12.59
22 gauze	3	7	8	0			
4.Site of cannula							
Basalic	1	4	1	0			
Cephalic	1	1	5	0			
cubital	0	1	2	0			
Antebrachial	1	3	4	0	7.63 NS	15	24.99
Metacarpal veins	1	3	1	0			
Saphenous veins	1	0	0	0			
5. Duration of cannula					8.18 NS	9	16.92
1-2 days	0	1	5	0			
3-4 days	2	3	4	0			
5-6 days	3	5	2	0			
7 or more	0	3	2	0			
6. Type of fluids infused					8.81 NS	12	21.03
Colloids	0	3	0	0			
Crystalloids	3	3	8	0			
Blood based products	0	2	3	0			
Parental nutrition	0	0	0	0			
Other Medications	2	4	2	0			
7. No. of pricks							
1	4	2	0	0			
2	0	5	2	0			
3	1	5	6	0	21.44 S	9	16.92
4 and more	0	0	5	0			

NS = Non-Significant S=Significant df = degrees of freedom

Table: 8 Association Between the post-test VIP scores of clients having superficial thrombophlebitis in magnesium sulphate applications group with selected demographic variables.

Demographic variables	Degree of superficial thrombophlebitis based on VIP scores				Calculated Value p 0.05 level	df	Table Value	
	Mild (1)	Moderate (2)	Severe (3)	Very Severe (4)				
	Effectiveness of magnesium sulphate applications on superficial thrombophlebitis based on VIPS							
	Highly effective (1)	Moderate effective (2)	Mild effect (3)	No effect (4)				
1. Age					12.32 NS	9	16.92	
25-30	6		3	0	0			
31-35	0		5	5	0			
36-40	0		1	1	0			
40 and above	3		2	4	0			
2. Gender					1.96 NS	3	7.82	
Male	6		4	6	0			
Female	3		7	4	0			
3. Size of cannula					11.72 NS	6	12.59	
18 gauze	0		1	5	0			
20 gauze	5		2	2	0			
22 gauze	4		8	3	0			
4.Site of cannula								
Basalic	3		2	3	0	8.53 NS	15	24.99
Cephalic	2		5	1	0			
Cubital	2		0	0	0			
Antebrachial	1		3	3	0			
Metacarpal veins	1		0	2	0			
Saphenous veins	0		1	1	0			
5.Duration of cannula					24.1 S	9	16.92	
1–2 days	6		0	0	0			
3–4 days	1		7	2	0			
5–6 days	3		2	6	0			
7 or more	0		2	2	0			
6. Type of fluids infused					7.01 NS	12	21.03	
Colloids	0		1	1	0			
Crystalloids	3		3	6	0			
Blood Based Products	1		3	2	0			
Parental Nutrition	1		0	0	0			
Other Medications	4		4	1	0			

LIMITATIONS OF THE STUDY

- This study is limited to the patients who are receiving continuous IV therapy.
- Study is limited to hospitals of only one district of Punjab.
- Study is concise to small sample size.

CONCLUSION

The major goal of nursing practice is to identify the nursing practices that makes a difference in health care status of individuals and are cost effective. The study was conducted to evaluate effectiveness of cold applications and magnesium sulphate applications on superficial thrombophlebitis among clients receiving IV therapy in selected hospitals Amritsar.

On the basis of the study the following conclusions were made. The result of the study include that the overall pre-test mean VIP score found to be 3.2 with SD 0.62 as compared to overall post-test mean VIP score noticed as 2.3 with SD 0.73 in cold applications group, thereby it is proved that cold application has significant effect on superficial thrombophlebitis. In magnesium sulphate group, overall pre-test mean VIP score found to be 3.3 with SD 0.65 as compared to overall post-test mean VIP score noticed as 1.9 with SD 0.98. Thus it is inferred that magnesium sulphate applications has a significant effect on superficial thrombophlebitis among clients receiving IV therapy. It is revealed from the findings that the post test mean VIP score found to be 2.3 with SD 0.73 in cold applications group as compared to post test mean VIP score noticed as 1.9 with SD 0.98 in magnesium sulphate group. Thus it is inferred that cold applications and magnesium sulphate applications has a significant difference in reducing superficial thrombophlebitis among clients receiving IV therapy, while magnesium sulphate is more effective as compared to cold applications.

The research hypotheses of study were:

H₁ - There will be a significant effect of cold application on superficial thrombophlebitis.

H₂- There will be a significant effect of magnesium sulphate application on superficial thrombophlebitis.

H₃- There will be a significant difference among cold application and magnesium-sulphate application in reducing the signs and symptoms of superficial thrombophlebitis.

Hence, the research hypotheses were accepted regarding infusion phlebitis

- The research work can be used in community health nursing to teach nursing students regarding home based therapies for infusion phlebitis.
- The findings can be used to teach the students regarding infusion phlebitis and effective nursing care.
- The findings can be used for co-curricular activities like seminars, panel discussion and debate etc.
- The nurse educator can teach the students and clients related to the research topic.

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