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Effect of Normal Saline Flush on Patency of Peripheral Intravenous Cannula.

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ABSTRACT

INTRODUCTION: Intravenous cannulation is insertion of cannula into the vein, so that infusion can be directly infused into the blood stream. They are primarily used for therapeutic purposes such as administration of medications, intra venous fluids, blood and blood products. More than 85% of patients admitted in the hospital need peripheral intravenous cannulation for administration of medications. **Objectives**: 1.To determine the patency of peripheral intravenous cannula within 72 hours, 2.To assess the effect of normal saline flush and routine care on patency of peripheral intravenous cannula, 3. To find out the association between the patency of peripheral intravenous cannula with selected background variables in experimental group.

Material And Methods: True experimental design was used in this study. After obtaining IRB approval the study was registered in clinical trial registry – India as per ethical committee suggestion. The trail was registered on 20/7/2017 and trail number was obtained (CTRI Number – CTRI/2017/07/009085). Study was conducted among 30 participants who had newly inserted peripheral intravenous cannula and received intravenous medication twice daily. 30 study participants were separated into two groups using computer generated random table as experimental group and control group. Experimental group participants received 2ml (0.9%) normal saline flush after administering medication. Control group participants did not receive the normal saline flush, only medication was administered and cannula was locked as per the routine practice. The background variables of study participants were collected from the participant's case record and the peripheral intravenous cannula blocks were assessed twice daily from 0 – 72 hours using the observational checklist for assessing the patency of peripheral intravenous cannula. Descriptive Statistics (Frequency & Percentage) and Inferential Statistics (fisher exact test) were used to analyze the data. **Results**: The study result revealed that, in experimental group, among 15 study participants all of them had their peripheral intravenous cannula patent for first 24 hours, 13 (86.7%) study participants had their peripheral intravenous cannula patent upto 48 hours and 8 (53.4%) study participants had their peripheral intravenous cannula patent upto 72 hours. In control group, among 15 study participants 13 (86.7%) of them had their peripheral intravenous cannula patent for first 24 hours, 7 (46.7%) study participants had their peripheral intravenous cannula patent up to 48 hours and 1 (6.7%) study participant had peripheral intravenous cannula patent up to 72 hours. There is a statistically significant difference between experimental and control group ($p = 0.03$) in maintaining the patency of peripheral intravenous cannula There was no association found between the patency of PIVC with selected background variables in the experimental group.

Conclusion: The findings of the study revealed that there is a significant difference between the experimental and control group in maintaining the patency of peripheral intravenous cannula by using the (0.9%) normal saline flush after medication administration. Hence it is proved that flushing and locking the peripheral intravenous cannula with 2ml of (0.9%) normal saline is effective method to maintain the patency of peripheral intravenous cannula.

Key words: Peripheral intravenous cannula–Flush–Blockage–Patency

1 INTRODUCTION

Intravenous cannulation is inserting a cannula into the vein. The intravenous cannula is used in administration of medications, fluids and blood products.1 It is commonly used in the hospitals. More than 85% of hospitalized patients need peripheral intravenous cannula for administration of medications.2,3,4 Insertion of Peripheral intravenous cannula is usually considered very low risk, but it can cause complications such as hematoma, phlebitis, pain and infection.1 So maintaining the patency of peripheral intravenous cannula is very important to prevent the complications and minimize the patients discomfort and expenses associated with cannula replacement.2 Blockage of intravenous cannula is one of the major discomforts faced by the patients. The common causes of blockage of peripheral intravenous cannula by blood clots in the chamber after inserting the peripheral intravenous line. Nurses not only administer the medication to the patients but also experience the difficulty while administering the medication through non- patent cannula.5 To maintain the patency of peripheral intravenous cannula flushing and locking are the two methods used. Heparin and normal saline solutions have been commonly used for peripheral intravenous cannula lock. Adequate flushing with 0.9% of normal saline reduces incidence of blockages.6 According to CDC (2011) the peripheral intravenous cannula should be replaced after 72-96 hours to prevent catheter related infections.4 According to the Infusion nurses society standards (2016) peripheral intravenous catheters shall be flushed with 0.9% of normal saline after giving medication, it will help to maintain patency of cannula.6 The patient and care giver's were finding it difficult due to frequent change of peripheral intravenous cannula.7 Intermittent flushing of cannula is more helpful in maintain the patency of cannula than giving continuous infusion. 8 So this study is undertaken to assess the effect of intermittent normal saline flush on patency of peripheral intravenous cannula and assess the survival time, reduction of pain, discomfort, and it is also cost effective by preventing the need for recannulation.

2 OBJECTIVES

1.To determine the patency of peripheral intravenous cannula within 72 hours among the participants in the experimental and control group.

2. To assess the effect of normal saline flush and routine care on patency of peripheral intravenous cannula in experimental group and control group.

3. To find out the association between the patency of peripheral intravenous cannula with selected background variables in experimental group.

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3 MATERIAL AND METHODS

This randomized control trial was conducted in a selected hospital at Puducherry. The estimated sample size was 30 participants (i.e.) 15 in experimental group and 15 in control group. The calculated sample size is 26 (13 in experimental group and 13 in control group), with the expectation of 10 % non compliance 30 samples were selected. The samples are participants, who are admitted in general medical wards, Orthopedics, Pulmonary medicine and ENT ward.

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3.1.1.1.1 Inclusion Criteria
Participants who are,

1. From 18 – 60 years of age.

- Both male and female patients admitted in the general medical wards.
- Receiving intravenous injection twice a day through peripheral intravenous cannula.
- Conscious and oriented.

3.1.1.1.2 Exclusion Criteria
Participants who are

- Receiving continuous intravenous infusion

1. Receiving peripheral intravenous injections more than 2 times a day
2. Peripheral intravenous cannula is removed within 72 hours for any reasons like change of intravenous injection to oral medications, discharge of participants.

- On fluid restriction.
- Shifted to Operation Theater or transferred to critical care unit.

The study participants were selected by using simple random technique. Computer generated numbers were used to assign the participants in experimental and control group. Sterile (0.9%) normal saline was used to flush and lock the peripheral intravenous cannula and the cannula patency was assessed twice a day from 0 - 72 hours. The experimental group participants received 2ml (0.9%) normal saline flush intravenously twice a day for 72 hours after the insertion of peripheral intravenous cannulation. Subsequently the medication was administered following that 2ml of (0.9%) normal saline was flushed and the cannula was locked. The control group participants did not receive (0.9%) normal saline flush, only medication was administered and cannula was locked. The patency was assessed 2 minutes before administering medication and during administration of medication. The patency of peripheral intravenous cannula was assessed in both the groups using the observational checklist.

The level of pain was assessed using modified 11- point numeric rating scale. Apart from this normal saline flush routine care like change of soiled dressing, labeling the date and time of peripheral intravenous cannula inserted, was followed in both the groups.

The tool consists of a) observational checklist to assess the patency of intravenous cannula. The check list consists of six criteria such as observation of palpable vein, erythema, swelling before the medication administration, resistance, and leaking, moderate or severe pain along the site / path of the cannula during the medication administration. Score of 0 indicates that peripheral intravenous cannula is patent, Score of $\geq$ 1 indicates that peripheral intravenous cannula is not patent. b) Modified 11- point numeric rating scale for assessing pain at peripheral intravenous cannula site. The modified 11- point numeric rating scale for assessing pain consists 0 to 10 divisions.

The validity of the tool was established by consulting six experts in the field. The suggestions given by the experts were incorporated in the tool. IRB approval was obtained from Institutional Review Board, College of Nursing, Pondicherry Institute of Medical Sciences. After obtaining IRB approval the study was registered in clinical trial registry – India as per ethical committee suggestion. The trail was registered on 20/7/2017 and trail number was obtained (CTRI Number – CTRI/2017/07/009085). Participant information sheet was given to the participants, queries were clarified and written consent was taken from the participants before data collection. The patients were informed that the confidentiality of the data will be maintained.

STATISTICAL ANALYSIS

All data were recorded and entered in Microsoft Excel sheet. Frequency and percentage distribution were used to assess the background variables of the participants. Inferential statistics, non parametric test (Fisher Exact test) was used to determine the effect of 0.9% normal saline flush between experimental and control group. Association between the patency of intravenous cannula and the selected background variables in the experimental group was assessed using inferential statistics, non parametric test (Fisher Exact test).

4 OBSERVATION AND RESULTS

Socio demographic variables:

In the present study 30 participants were included. With regard to age 46.7% of study participants in experimental group belong to the age group of 18 - 40 yrs and 66.7% of control group participants belong to the age group of 41-60 yrs. According to vein 73.3% of study participants in experimental group had peripheral intravenous cannula in the cephalic vein and 53.3% of study participants in control group had peripheral intravenous cannula in the basilic vein. With regard to size of peripheral intravenous cannula 80% of study participants had 20G peripheral intravenous cannula in experimental group and 26.7% of study participants had 18G peripheral intravenous cannula in control group. According to number of drugs administered through peripheral intravenous cannula 66.7% and 53.3% of study participants were receiving only one drug in experimental and control group respectively. (Table 1)

Table 1. Background variables of study participants (n= 30)

Variables	Experimental group No. (%)	Control group No. (%)
Age in years		
1. a)	7 (47%)	5 (33%)
1. b)	8 (54%)	10(67%)
Name of the vein		
• a)	11 (73%)	7(47%)
• b)	4(27%)	8(53%)
Size of the peripheral intravenous cannula		
a. 18 G	3 (20%)	4 (27%)
b. 20 G	12(80%)	11 (73%)
Number of drugs administered through PIVC		
• a.	10(67%)	8(53%)
b. More than one drug	5(33%)	7(47%)

Patency of peripheral intravenous cannula:

In experimental group, among 15 study participants all of them had their peripheral intravenous cannula patent for first 24 hours, 86.7% (13) of study participant had their peripheral intravenous cannula patent from 25 to 48 hours and 53.4% (8) of study participant had their peripheral intravenous cannula patent from 49 to 72 hours. In control group, among 15 study participants 86.7% (13) of them had their peripheral intravenous cannula patent for first 24 hours, 46.7% (7) of study participant had their peripheral intravenous cannula patent from 25 to 48 hours and 6.7% (1) of study participants had their peripheral intravenous cannula patent form 49 to 72 hours. (Table 2, Figure 1)

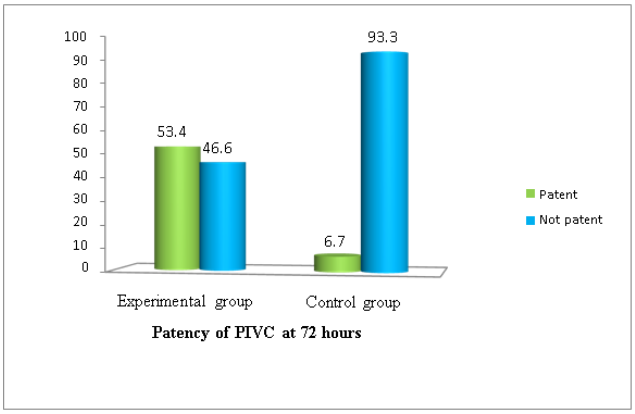

Figure 1. Patency of PIVC at 72 hours

Effect of Normal saline flush on peripherally inserted intravenous cannula

Table 2. Patency of peripheral intravenous cannula (n = 30)

Duration	Experimental group		Control group	
	Patent No. (%)	Not Patent No. (%)	Patent No. (%)	Not Patent No. (%)
0- 24 hrs	15 (100%)	0	13 (87%)	2 (13%)
25 – 48 hrs	13 (87%)	2 (13%)	7 (47%)	8 (53%)
49 – 72 hrs	8 (53%)	7 (47%)	1 (7%)	14 (93%)

There is statistically significant difference between experimental and control group on patency of peripheral intravenous cannula with p value 0.03. So the administration of normal saline flush is effective in maintaining the patency of peripheral intravenous cannula.

Table 3. Effect of normal saline flush and routine care on patency of peripheral intravenous cannula (PIVC) n = 30

Variables	Experimental group No. (%)	Control Group No. (%)	Fisher Ex-value act test value
PIVC Patent	8 (53%)	1 (7%)	10.90
PIVC not Patent	7 (47%)	14 (93%)	

Association of patency of peripheral intravenous cannula with variables:

There was no statistically significant association observed between the patency of peripheral intravenous cannula with selected variables like age, name of the vein, size of peripheral intravenous cannula and number of drugs administered through peripheral intravenous cannula in experimental group.

Table 4. Association of patency of peripheral intravenous cannula with variables in experimental group n = 15

Variables	PIVC Patent (f)	PIVC Not patent (f)	Total (f)	p – value
Age in years				
1. a)	4	3	7	1.00
1. b)	4	4	8	
Name of the vein				
• a)	3	1	4	0.57
• b)	5	6	11	
Size of peripheral intravenous cannula				
a. 18 G	2	1	3	1.00
b. 20 G	6	6	12	
Number of drugs administered through PIVC				
• a.	6	4	10	0.60
b. More than one drug	2	3	5	

NS = statistically not significant, p > 0.05

5 DISCUSSION

In the present study 57% of the participants are in experimental group and 67 % in control group belongs to the age group of 41 to 60 years, 80% of the participants in experimental group and 73% of the participants in control group had 20g cannula inserted for the medication administration. In a study done by Patil et al also 40% of the participants in experimental group belong to 41 to 50 years and60% of the participants in experimental group and 85 % of the control group participants had 20 G size cannula inserted for the treatment. 9, 10

In experimental group, among 15 study participants all of them had their peripheral intravenous cannula patent for first 24 hours, 86.7% (13) of study participant had their peripheral intravenous cannula patent from 25 to 48 hours and 53.4% (8) of study participant had their peripheral intravenous cannula patent from 49 to 72 hours. In control group, among 15 study participants 86.7% (13) of them had their peripheral intravenous cannula patent for first 24 hours, 46.7% (7) of study participant had their peripheral intravenous cannula patent from 25 to 48 hours and 6.7% (1) of study participants had their peripheral intravenous cannula patent form 49 to 72 hours. Finally the present study states that, 53.4% (8) and 6.7% (1) had their PIVC patent for 0 – 72 hours, in experimental and control group respectively and 46.6% (7) and 93.3% (14) study participants PIVC were not patent between 0 – 72 hours in experimental group and control group respectively.

The present study supported by, a similar study conducted in China, by Wang to compare the effectiveness of heparin saline flush versus normal saline flush on maintaining the duration PIVC patency. The result showed that, the maintained duration of the PIVC patency between the heparin saline group and normal saline group was 80.27±26.27 and 84.19 ± 29 respectively (p = 0.39). The blockage rate was 6.2% and 5.6% in the heparin group and normal saline group respectively. So the result was concluded as normal saline can be used as effective and safe method than conventional heparin saline flushing and locking the peripheral intravenous cannula.11

A randomized control trail was conducted in Punjab to compare the efficacy of normal saline with heparin saline flush in keeping intravenous lines patent. The participants are divided into three groups i.e. control group, normal saline group and heparin saline group. The participants in saline group received 1ml of normal saline flush before and after medication administration, and heparin group participants receives 1ml normal saline flush before medication administration followed by medication administration then again saline flush proceeded by heparin saline flush and control group with no intervention. The participants are observed for 72 hours. The study revealed that there are significant difference between control group and heparin group. But there were no significant difference between normal saline and heparin group. So normal saline flush can be used in the peripheral intravenous cannula.12

In this present study in experimental group among 15 study participants, 53% (8) of them had their PIVC patent

from 0 to 72 hours and 47% (7) of study participants had their PIVC non patent between 0-72 hours. In control group among 15 study participants 7% (1) of study participant had their PIVC patent from 0 to 72 hours and 93% (14) of study participants had their PIVC non patent between 0-72 hours. Association between these two groups was done based on patency maintained for study participants between 0-72 hours among experimental and control group. The result shows that there was a statistically significant difference between experimental and control group ($p = 0.03$). So the saline flush has effect on patency of peripheral intravenous cannula. The findings of the present study support by the findings of the study conducted by Babadi, in his study the saline lock in the intervention group compared with control group, which did not have saline lock. The intervention group had significant impact in reducing the incidence of blocks in PIVC ($p = 0.001$). 12 Study done by Choudhary among 1000 participants to evaluate the impact of normal saline infusion to maintain patency of the peripheral venous catheter shows that normal saline is enough to maintain the patency of intravenous cannula and heparinized saline is not needed and also saline is less cost to patients and save nursing time.13 Saline flush also reduces the incidence of phlebitis. 14

In the present study there is no statistically significant association observed between the patency of peripheral intravenous cannula with selected background variables such as age, name of the vein, size of peripheral intravenous cannula and number of drugs administered through peripheral intravenous cannula in experimental group. The present study was supported by the study conducted by Uma et al, the association findings showed no significant association between the patency of intravenous cannula and the selected extraneous variables like age, intravenous medication, size of cannula and site of cannulation at 0.05 level of significance.2 The study findings contradicted with the study findings of Kaur and Thakur, in their study it was found that there was significant relationship between the number of blocks and number of drugs administered through PIVC. 15

6 CONCLUSION

From the finding of this study it can be concluded that, 0.9% normal saline flush is effective in maintaining the patency of peripheral intravenous cannula by preventing the occlusion formation in PIVC. There was no significant association between number of blocks and selected background variables in experimental group.

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