

Effectiveness of Magnesium Sulphate Fomentation vs Potato Juice Application on Phlebitis among Sick Children Between 1-3 years Receiving Parenteral Medicine in the Pediatric Ward at Burdwan Medical College and Hospital, Burdwan, West Bengal

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Abstract

Context: The Protease inhibitors in Potato juice have anti-inflammatory effect which are help to reduce the pathological changes of tissue caused by phlebitis in sick children.

Aims: The study aims to compare the effectiveness of MgSO₄ fomentation vs potato juice application on phlebitis.

Setting and Design: Paediatric Medicine ward in Burdwan Medical College and Hospital, Burdwan. Quasi-experimental equivalent time series design was used for the study.

Material and Methods: Non -probability purposive sampling was used the sample comprised of 50 sick children 1-3 years of age were getting intravenous medication and develop phlebitis. Pretested reliable tool had introduced. Data were collected through interview schedule, observation and assessment method.

Statistical analysis used: Collected data were tabulated, analyzed and statistically calculated by descriptive and inferential statistics. Inferential statistics had used both dependent and independent t test by using ANOVA.

Results: In total. Out of 50 children, the incidence of grade II Phlebitis was 40% and grade III Phlebitis was 60%. The mean reduction score was less in experimental group II was treated with potato juice (.22,0) than experimental group I treated with MgSO₄ fomentation (1.3 and 0.04) in subsequent 12th, 24th, 36th, 48th and 60th hour with mean difference 1.8 and 0.04, which statistically significant at .05 level with df 48 as seen by t value 2.01.

Conclusions: The study result shows that potato juice was better than 50% magnesium sulphate fomentation in reduction of phlebitis in less time and also effective for tissue regeneration.

Keywords: Effectiveness; Sick children; Magnesium Sulphate Formentation; Potato juice application; Phlebitis; Pain.

Key messages: In nursing practice, potato juice is very cost effective and needed less time in reduction of phlebitis. Health education can be given on the use of potato juice an ideal first aid for pain, swelling, redness and burn. On the basis of the findings, the researcher strongly recommends that generalised the study on adult and large population.

Introduction

Phlebitis or inflammation of the vessel wall, may also develop in children who require intravenous therapy, according to Lamagna and Macphee (2004)¹. Protease inhibitors from potato juice have an anti inflammatory effect.¹⁴

As there were no Indian study, so researcher felt need to establish the most effective method in treatment of phlebitis among sick children with following aims and objectives, that were -to determine the effect of MgSO₄ fomentation, to assess the effectiveness of potato juice application on phlebitis and to compare the effectiveness of MgSO₄ fomentation and Potato juice application on phlebitis in sick children along with others objectives.

Objective 2-To assess the effectiveness of Magnesium sulphate fomentation on the phlebitis in sick children.

Hypothesis 1

H₁ There is significant difference in mean phlebitis measurement score after application of magnesium sulphate fomentation is significantly less than that of the mean score before the application at 0.05 level of significance.

HO₁ There is no significant difference in phlebitis measurement score of 12th, 24th, 48th and 72th hour, after magnesium sulphate fomentation as measured by phlebitis measurement chart at 0.05 level of significance.

Objective 3- To assess the effectiveness of potato juice on phlebitis in sick children in term of reduction of sign of phlebitis.

H₂ There is significant difference in mean phlebitis measurement score after the application of potato juice is significantly less than that of the mean score before the application at 0.05 level of significance.

HO₂ There is no significant difference in mean phlebitis measurement score after the application of potato juice is significantly less than that of the mean score before the application at 0.05 level of significance

Objective 4 - To compare the effectiveness between Magnesium sulphate fomentation and Potato juice application on phlebitis in sick children.

Hypothesis

H₃ The reduction of phlebitis measurement score is significantly higher among children receiving potato juice than receiving MgSO₄ (at 12th, 24th, 36th, 48th and 60th hour) at .05 level of significance.

HO₃ The reduction of phlebitis measurement score is not significantly higher among children receiving potato juice than those receiving MgSO₄ at .05 level of significance.

Methods and Materials

Study site was Department of Pediatric Medicine, Burdwan Medical College and Hospital, Burdwan, West Bengal.

Study duration was one year. Ethical clearance obtained. Study sample were 50 cases fulfilling the following inclusion criteria with children in the age group of 1-3 years having phlebitis due to parenteral medication Experimental group I-magnesium sulphate fomentation for 25 sample Experimental Group II-potato juice application for 25 sample with phlebitis. All the tools had pretested and introduced after made their reliability. Standardized phlebitis measurement chart had used.

Data collection procedure

The final study was conducted at Burdwan Medical College and Hospital in Pediatric Medicine ward. The data collection was done from November 1st week to 4th week. Ethical permission was taken from Ethical Committee of Burdwan Medical College and Hospital. Administrative permission was sought from DDHS Nursing. Written permission taken from MSVP, NS and HOD of Pediatric Medicine Ward BMCH. Informed consent will be taken from the mothers of those children. Self introduction given to the mother of the subject. Purpose of the study was stated and explanation of the procedure was given, thus a rapport was established. Written consent was taken from subject. The sample was selected room wise and this was based on selection criteria. In this study, the selection of sample was done by purposive sampling technique. During data collection period the sick children age between 1-3 years with phlebitis were selected purposively and then randomly assigned to experimental group I and experimental group II by tossing a coin. Head of the coin was indicated as experimental group I and tail of the coin was indicated as experimental group II. In this way 25 sick children in the experimental group I were selected and coded as M₁, M₂, M₂₅ and another 25 sick children are experimental group P₁, P₂, P₂₅ respectively on their bed head ticket. M for magnesium sulphate and P for potato juice application. Administer phlebitis grading scale in single time for assessment of severity. Phlebitis score was separately assessed by phlebitis measurement chart then administer the 50% magnesium sulphate fomentation by 5/5'' gauze piece for 15 minutes

duration and temperature between 100°F to 103°F. Potato juice prepared by grating and squeezing the juice, and soaked 5/5" gauze piece with extract juice apply on phlebitis. It was done twice a day in 3 consecutive day. After each application of magnesium sulphate fomentation and potato juice application the phlebitis score was measured at 12th hour by phlebitis measurement chart.

Results

It has cleared from table 7 that the mean reduction score is less in experimental group II was treated with potato juice (.22, 0) than experimental group I treated with magnesium sulphate fomentation (1.3 and 0.04) in subsequent 12th, 24th, 36th, 48th and 60th hour with mean difference 1.8 and 0.04, which statistically significant at .05 level with df 48 as seen by t value 2.01, and that means the potato juice application on reduction of phlebitis is more effective than magnesium sulphate fomentation.

Tables

Table 2: Sex wise percentage distribution of the children with phlebitis according to sex

Variable	Experimental-I		Experimental-II		Total f
	f	%	f	%	
Male	12	48	17	68	29(58)
Female	13	52	8	32	21(42)

n= 50(25+25)

Data depicted in table 2 that in experimental group I maximum 13 (52%) female children receiving magnesium sulphate fomentation and maximum male children 17 (68%) was in experimental group II receiving potato juice application. Over all male children are more (58%) than that of female children(42%).

Table 3: Percentage distribution of causes of hospitalization among sick children with phlebitis In experimental I and II group.

Variable Cause of the disease	Experim- ental I		Experim- ental II		Total (%) f
	f	Perce- ntage %	f	Percent age %	
W.A.L.R.T.I	5	20	5	20	10(20)
Diarrhoea	1	4	0	0	1(2)
Heart disease	1	4	1	4	2(4)
Fever	1	4	3	12	4(8)
Rh. fever	1	4	-	-	1(2)
A.G.E	4	16	6	24	10(20)
Bronchopneu- monia	7	28	7	28	14(28)
Seizure disorder	4	16	3	12	7(14)
Electric shock	1	4	-	-	1(2)

n= 50(25+25)

Table 3 depicted that in both experimental group I and II most of the children suffer from Bronchopneumonia(28%). The next common condition was W.A.L.R.T.I (wheeze associated lower respiratory tract infection) 20% in both groups. AGE (acute gas-

troenteritis) was(24%) present in group II and 16% in group I. Seizure disorder was observed 16% in experimental I 12% in experimental group II. In the total group bronchopneumonia was most common in 28% of children. There was no subject with electric shock, Rheumatic fever in experimental group.

Table 4: Mean median SDE of mean deviation, 't' value of phlebitis score with 1st and 12th, 36th, 60th hour observation for Ex I.

Observation	Mean	M _D	SD _D	SE _{MD}	't'
1 st hr observation	3.88				
12 th hr observation	3.16	.72	1.07	0.15	4.8*
1 st hr observation	3.88				
36 th hr observation	2.02	1.86	1.97	0.27	6.81**
1 st hr observation	3.88				
60 th hr observation	0.46	3.42	2.48	0.35	13.37**

df(24)= 2.06 p * < 0.05 , 2.8p* < 0.01

Data presented in table 5 show that mean difference of phlebitis score in experimental group I between 1st & 12th hour after application of MgSO₄ is .72. The obtained mean difference in reduction of phlebitis score between 1st with 12th hour was found to be statistically significant as evident from 't' value of 2.8 at 0.01 level of significance. The other mean difference of reduction of phlebitis score in following 36th, and 60th hour of observation after application of treatment, are 1.86, 3.42. The obtained mean difference in phlebitis reduction score in subsequent hour (1st, 36th, 60th) after application of treatment, was also found to be statistically significant as evident from 't' value of 4.8, 6.81 and 13.37 for df (24) at 0.05 level. Therefore, it can be concluded that obtained mean differences between 1st with subsequent 12th, 36th, and 60th hour of observations in experimental group I are true differences not by chance.

That means null hypothesis HO₁ is rejected and research hypothesis H₁ is accepted. This indicates that the magnesium sulphate fomentation was effective in reduction of phlebitis for 12th hour after application, among sick children between 1-3 years getting intravenous medication.

Table 6: Mean median SDE of mean deviation, 't' value of phlebitis score with 1st and 12th, 36th, 60th hour observation for Ex II.

Observation	Mean	M _D	SD _D	SE _{MD}	't'
1 st hour	4.2				
12 th hour	2.78	1.42	1.34	0.18	7.8 **
1 st hour	4.2				
36 th hour	.94	3.26	2.34	0.33	9.81**
1 st hour	4.2				
60 th hour	0	4.2	2.76	0.39	10.76**

df(24)= 2.06 p* < 0.05 and 2.8p* < 0.01

Data depicted in table 6 show that mean difference of phlebitis score in experimental group II between 1st and 12th, 36th, and 60th hour. Observation after application of treatment the obtained mean difference 1.42 in reduction of phlebitis score between 1st with 12th hour was found to be statistically significant as evident from 't' value of 7.8 at 0.1 level of significance. The other mean difference of reduction of phlebitis score in following 36th, and 60th hour after application of treatment, are 3.26 and 4.2 with mean phlebitis score was .94 and 0. The obtained mean difference in reduction of phlebitis score in 36th, and 60th after application of treatment, was also found to be statically significant as evident from 't' value of 9.81 and 10.76 for df (24) at 0.01 level. Therefore it can be concluded that obtained mean difference between 1st and 12th, 36th and 60th hour of observations in experimental group II are true difference not by chance. That means null hypothesis HO₂ is rejected and research hypothesis H₂ is accepted.

Table 7: Mean, mean difference, SDE of mean difference, 't' value of comparisons between effectiveness of MgSO₄ compress and potato juice application with reduction of phlebitis score in 1st, 12th, 24th and 36th hour of observation.

	Mean	M _D	S _D	SE _{MD}	't'
1 st hour EX I	3.88				
EX-II		-0.32	4.49	.53	.63
12 th hour EX-I	3.16				
EX-II		0.38	1.8	0.2	0.76
24 th hour EX-I	2.26				
EX-II		0.32	2.97	0.23	3.21*
36 th hour EX-I	2.02				
EX-II		1.08	2.09	0.58	1.83
EX-II	.94				

df (48)=2.01 p* < 0.05

Data depicted in the table 7 show that t test 't' value between means of phlebitis score on the 1st hour shows that value (t₄₈= .60) is not statistically significant at .05 level. In the 1st observation mean phlebitis score is apparently more in Experimental group II (4.22) than the Experimental group I(3.88).

In subsequent evaluation mean phlebitis is apparently more in Experimental group I is higher(3.16, 2.26, 2.02) in 12th to 36th hour of observation than experimental group II (2.26, 1.94, 0.94) with a mean difference 0.38, 0.32, 1.08. The t value computed between phlebitis mean score of Experimental group I and II show that t value 3.21 between on 24th hour, is significant when as t values of 12th hour (t₄₈= 0.76) and 36th hour (t₄₈= 1.83) not significant at .05 level.

Table- 8 Mean, mean difference, SDE of mean difference, 't' value of comparisons between effectiveness of MgSO₄ compress and potato juice application with reduction of phlebitis score in 48th with 60th hour of observation.

	Mean	M _D	S _D	SE _{MD}	t
48th hour EX I	1.3				
EX II	.22	1.08	1.70	.48	2.25*
60th hour EX I	0.04				
EX II	0	0.04	.59	0.16	104.5**

df (48)=2.01 p* < 0.05

Data depicted in table 8 that the mean reduction score is more less in experimental group II (.22, 0) than that of experimental group I(1.3 and 0.04) in subsequent 48th and 60th hour with mean difference 1.8 and 0.04, which statistically significant at .05 level with df 48 as seen by t value is 2.01.

Thus it can be concluded that obtained mean difference between 24th, 48th, and 60th hour of observations in experimental group I and II is true difference not by chance.

That means null hypothesis is rejected and research hypothesis is accepted. The potato juice application on reduction of phlebitis is more effective than magnesium sulphate fomentation.

Summary

This chapter has dealt with analysis and interpretation of the data collected from 50 sick children with phlebitis by applying both descriptive and inferential statistics. The statistical test employed were frequency and percentage distribution, dependent and independent t test with mean, M_D, SE_{MD}, S_D and 't' test.

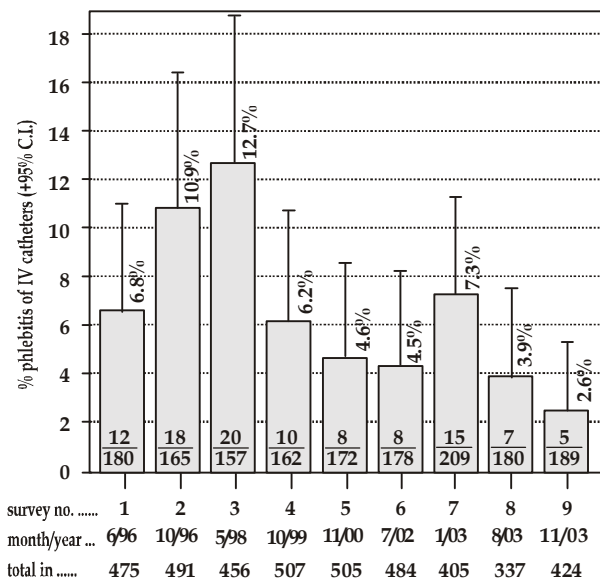


Fig. 1: Overview of all 9 point-prevalence, hospital-wide surveys of peripheral intravenous catheter-associated phlebitis. The number above the column indicates the percentage of detected cases of phlebitis. (Infusion nurses society)

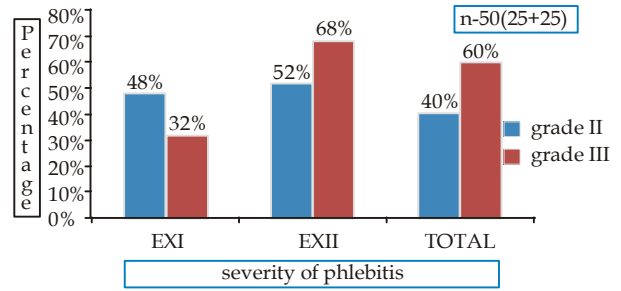


Fig. 2: Bar graph Showing the severity of phlebitis according to grade.

The data depict in fig. 2 that out of 25 children in Experimental group I maximum 52 % had grade III severity and 48% with grade II severity ; whereas out of 25 children in Experimental group II maximum 68 had grade III severity and 32 % have grade II severity of phlebitis. In total group of experimental I and Experimental II majority (60%) had grade III phlebitis.

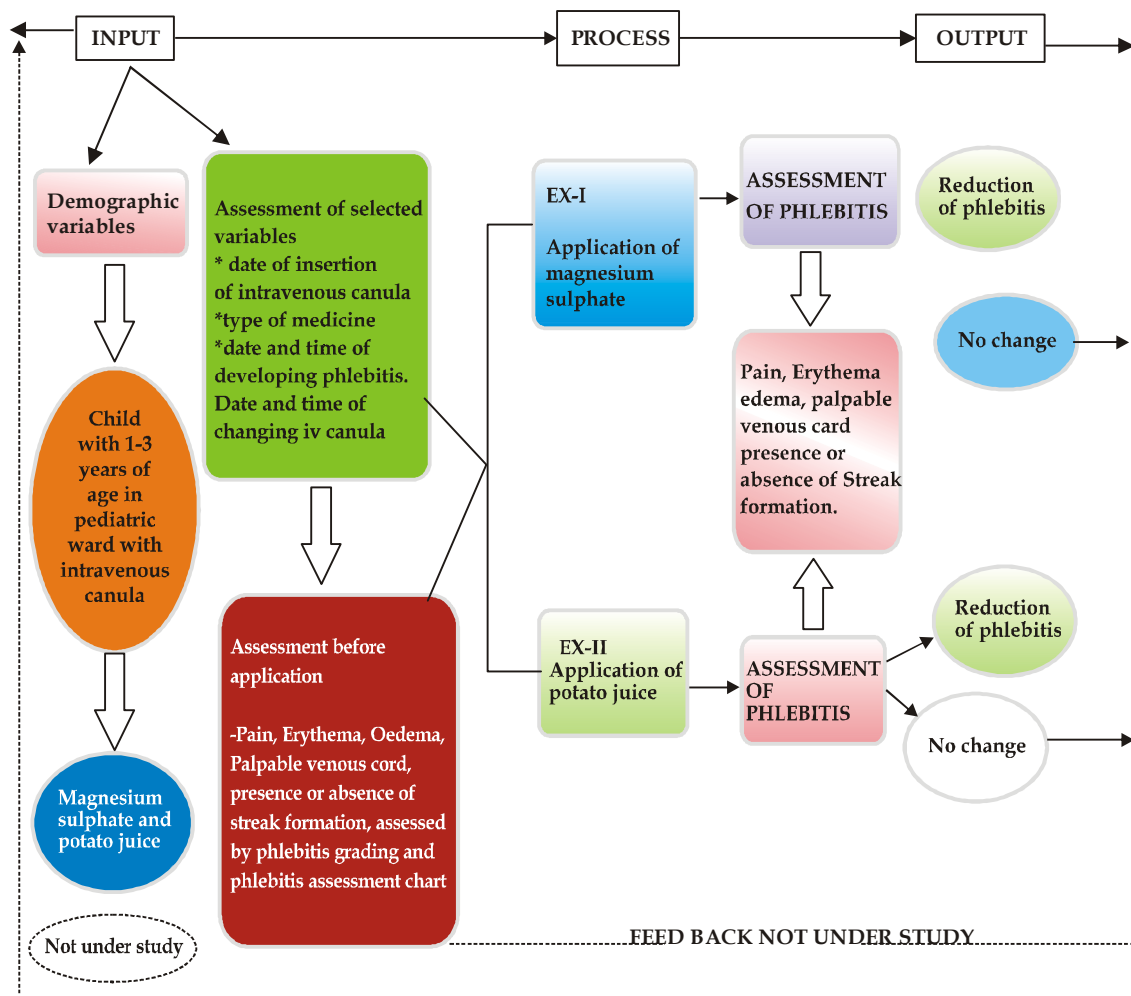


Fig. 3: Schematic representation of Conceptual framework of the study based on Ludwig V on Bertalanffy's general system.

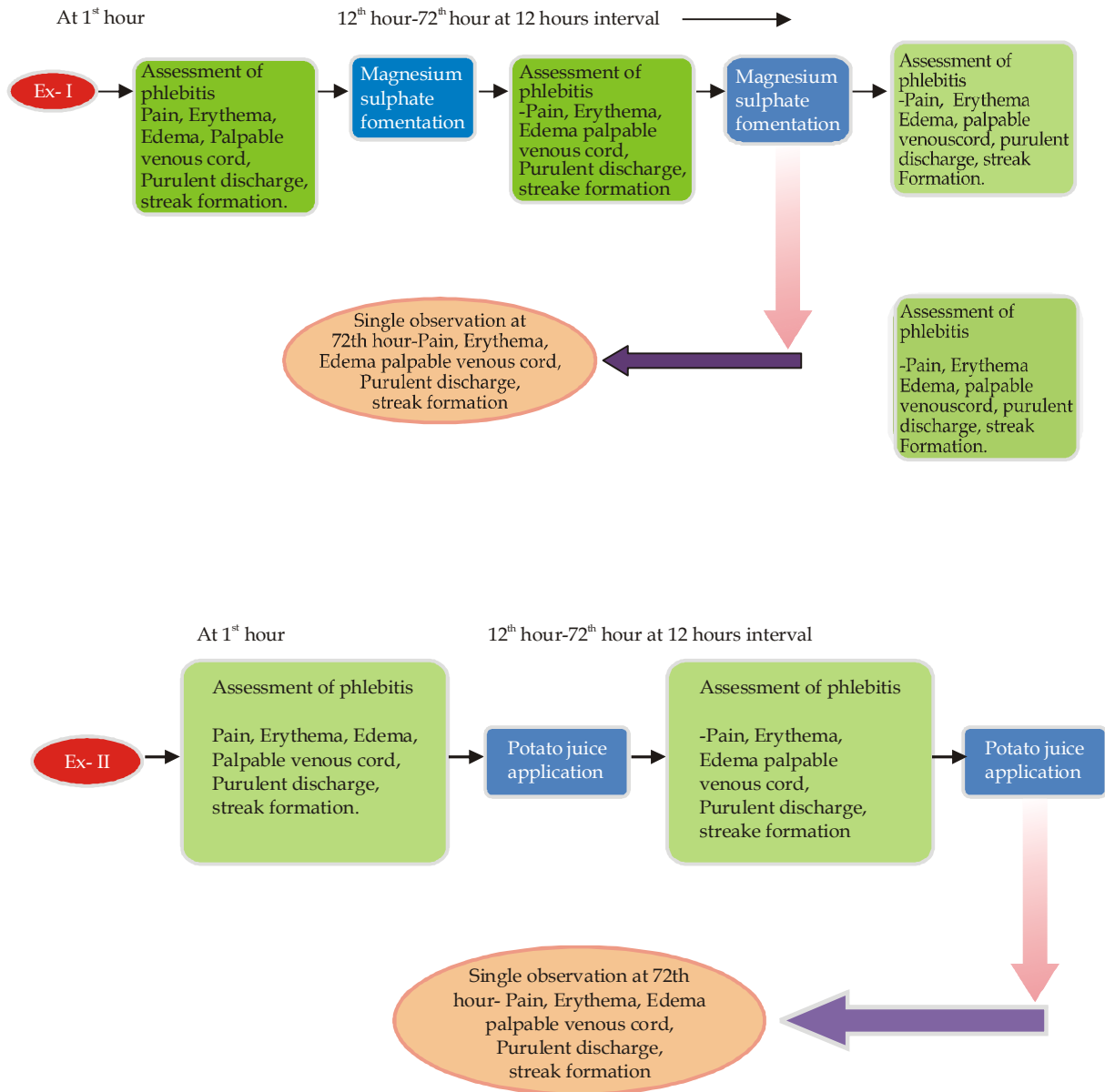


Fig. 4: Schematic representation of research design.

Appendix: 1 Procedure Tray for potato juice application



Fig. 5: Tray for potato juice application.



Fig. 8: Potato Juice.



Fig. 6: Method of squeezing potato.

- grated potato
- 4 gauze pieces.
- wet sterile swab for clean the area
- kidney dish
- treatment towel as a bed protector.



Fig. 9: 5'' x 5'' Gauze Piece.

Appendix: 2

Tray for magnesium sulphate fomentation



Fig. 7: Squeezed Grated Potato.



Fig. 10: 20 Gms Magnesium Sulphate .



Fig. 11: 5x5'' Gauze Pad.



Fig. 12: Lotion thermometer.

Appendix: 3

Photo graph Phlebitis



Fig. 13: IV lines with grade II phlebitis.



Fig. 14: IV lines with grade III phlebitis.

Appendix: 4

Phlebitis measurement



Fig.15: Measurement of Edema, Erythema, palpablecord After Removal of IV Canula.

Discussion

Protease inhibitors from potato juice have an anti-inflammatory effect. The protease inhibitors represent 50% of the total soluble proteins in potato juice. The protease inhibitors were classified into seven different families: potato inhibitor I (PI-1), potato inhibitor II (PI-2), potato cysteine protease inhibitor (PCPI), potato aspartate protease inhibitor (PAPI), potato Kunitz-type protease inhibitor (PKPI), potato carboxypeptidase inhibitor (PCI), and "other serine protease inhibitors". The most abundant families were the PI-2 and PCPI families, representing 22 and 12% of all proteins in potato juice, respectively. Potato protease inhibitors show a broad spectrum of enzyme inhibition. All the families (except PCI) inhibited trypsin and/or chymotrypsin. PI-2 isoforms exhibit 82 and 50% of the total trypsin and chymotrypsin inhibiting activity, respectively¹⁴.

That means the protease inhibitors are anti-inflammatory agent which are reducing the pathological changes of tissue caused by inflammation. Potato juice also improves circulation in general. Potato juice also has a cortico-steroid effect. By this way potato juice reduces peripheral vein inflammation.

Findings related to severity of phlebitis were out of 25 children in Experimental group I 52% had grade III severity of Phlebitis, which was characterized by pain at access site, with erythema and/or edema, palpable venous cord and streak formation and 48% with grade II severity characterized by pain at access site with erythema and/or edema, whereas out of 25 children in Experimental group II 68% had grade III severity.

Findings related to effectiveness of magnesium sulphate fomentation were mean difference of phlebitis score in experimental group I between 1st & 12th hour after application of MgSO₄ are .72, 1.86, 3.42. The obtained mean difference in reduction of phlebitis score between 1st and 12th, 36th, and 60th hour was found to be statistically (4.8, 6.81 and 13.37 for df 49 at 0.05 level.) significant as evident from 't' value of 2.68 at 0.01 level of significance. The obtained mean differences between 1st with subsequent 12th, 36th, and 60th hour of observations in experimental group I are true differences not by chance.

Findings related to effectiveness of potato juice application were observation after application of treatment the obtained mean difference 1.42, 3.26 and 4.2 in reduction of phlebitis score between 1st with 12th, 36th, and 60th hour was found to be statistically significant as evident from 't' value of 7.8, 9.81 and 10.76 for df (49) at 0.1 level of significance. Therefore it can be concluded that obtained mean

difference between 1st with 12th, 36th and 60th hour of observations in experimental group II are true difference not by chance.

Findings related to comparison between effectiveness of magnesium sulphate fomentation and potato juice application-The 't' test computed between means of phlebitis score on the 1st hour shows that value (t₄₈= 60) is not statistically significant at .05 level. The t value computed between phlebitis mean score of Experimental group I and II shows that t value 3.21 on 24th hour, is significant where as t values of 12th hour (t₄₈= 0.76) and 36th hour (t₄₈= 1.83) not significant at .05 level.

The mean reduction score is less in experimental group II (.22,0) than that of experimental group I (1.3 and 0.04) in subsequent 48th and 60th hour with mean difference 1.8 and 0.04, which statistically significant at .05 level with df 48 as seen by t value is 2.01

The findings of this present studies reveals that, Potato juice enhances reduction of phlebitis rate which is much faster than that attained by magnesium sulphate wet fomentation. The same findings are reported by Li Sicui, Liao Huijuan (2009)⁵. There was statistical significant difference in terms of recovery rate by Potato external application which was better than 50% magnesium sulphate wet compress to treat patients with drug induced phlebitis.

In this study none of the subjects developed any kind of adverse skin reaction in the potato juice application.

The present study reveals that significant difference was found with the hot wet Magnesium sulphate fomentation in term of reduction of pain edema, erythema, and palpable venous cord, within 72th hour compare to the baseline values. Xulean (2000)⁶ reported same different methods in managing tissue damage caused by extravasation. Magnesium sulphate should be chosen according to different characteristics of tissue damage for healing. So it is concluded that magnesium sulphate has a better effect on reducing congestion and edema of local tissue.

In the present study shows that the potato application on phlebitis was effective in relation to faster recovery rate than that of MgSO₄ wet fomentation as evidence by mean score of phlebitis by potato juice was 0 at 60th hour and mean score of phlebitis by MgSO₄ hot wet fomentation was 0.04. Lagma (2012)⁴ Potato external application can effectively prevent venous infusion of amiodarone-induced phlebitis was better in term of feaster recovery than 50% magnesium sulphate solution, wet compress, can effectively reduce vein damage.

In the present study the subject does not develop any kind of skin reaction in potato juice treated group. Tomizawa (2001)¹⁶ wrote in his book "The Way to Healthy Life: wrote that fresh potato juice has no danger of any side effects at all and it enables the patient to restore his physical strength as well as enhance his natural rehabilitative power. The study reveals that there was no side effect occurs in subjects getting potato juice application.

Phlebitis (inflammation of vein) reduction score decreases in term of pain, swelling, edema, erythema, palpable venous cord score faster in subsequent hour by potato juice application than magnesium sulphate wet fomentation. Dr. Lam (2011)⁴ reported that anti-inflammatory effect of potato reduces the phlebitis caused by venous inflammation.

The other findings of the study are

Other than erythema, pain, palpable venous cord, the reduction rate of edema due to phlebitis was occurs more rapidly after application of potato juice.

Conclusion

There is further need to conduct extensive study for more evidence based information regarding this aspect. The result of this study, tool and methodology may provide guideline for further research.

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Conflict of Interest

This article was the outcome of original research work undertaken and carried out by me, I also declare that there was no financial interest and any conflict of interest.

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