Original Article

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Role of Topical Heparin in the prevention of Superficial Thrombophlebitis

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Abstract

Background: Sometimes the use of an intravenous (IV) catheter is associated with superficial thrombophlebitis. The efficacy of the topical Heparin solution was compared with placebo for the prevention of thrombophlebitis related to IV catheter. **Subjects and Methods :** Patients who were 18-45 years of age with an intravenous catheter for at least 72 h were registered and randomized to receive 3-6 drops of topical solution of heparin (Group H) over the 18G catheterized vein every 8^{th} hourly for a total of 6 doses and another group (Group N) did not receive any topical solution over 18G catheterisation. Patients enrolled were examined every 12 h for phlebitis using the phlebitis visual infusion scale. **Result:** Usage of the phlebitis visual infusion scale to examine phlebitis every 12 hours. In group H mean Phlebitic scale was 0.08 ± 0.27, 0.12 ± 0.33, 0.24 ± 0.43, 0.28 ± 0.45, 0.36 ± 0.56 and 0.52 ± 0.77 at 12, 24, 36, 48, 60 and 72 hours respectively. The mean phlebitic scale in group N was 0.60 ± 0.50, 0.72 ± 0.61, 1.04 ± 0.67, 1.08 ± 0.64, 1.16 ± 0.55 and 1.72 ± 0.89 respectively at 12, 24, 36, 48, 60 and 72 hours. In group H mean phlebitic scale was significantly lesser as compare to group N. **Conclusion:** After peripheral intravenous catheterisation, prophylactic topical application of heparin was effective in preventing the development of superficial thrombophlebitis.

Keywords: Topical, Heparin, Thrombophlebitis, Intravenous cannulation, Quick Penetrating Solution (QPS).

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Introduction

Intravenous catheterization in a hospital setting is one of the most commonly done procedures. Superficial thrombophlebitis, defined as an acute inflammation of the superficial veins due to the presence of a blood clot within the veins, is one of the most common complications of peripheral intravenous catheterisation. [1] It is marked by pain and tenderness along the length of the vein. [2] It presents through a superficial vein, with a palpable, sticky, painful and hyperemic thread. The magnitude of this thrombosis varies from small tributaries to large extensions. Superficial thrombophlebitis [ST] typically develops within 72h of catheterisation and factors associated with developing ST include catheterization length, catheter content, catheter size, a form of infuscate, and catheter site infection. Treatment is needed for the local symptoms and to avoid systemic complications (deep venous thrombosis) that threaten life. Anticoagulant heparin primarily acts by inhibiting coagulation and further development but has a very small effect on preformed clots. The application of prophylactic topical heparin before thrombophlebitis, i.e. from day 1 of the insertion of IV catheter, may be more effective in preventing or delaying thrombophlebitis. [3]

Subjects and Methods

The Department of Anesthesiology at the Khaja Banda Nawaz Institute of Medical Sciences, Kalaburgi, Karnataka, conducted this research. The study was conducted from May to July 2020. The current study is a prospective, interventional study carried out after gaining Institutional Ethics Committee approval. The research was performed on 50 surgical patients, in whom IV antibiotics and fluids are required to be provided for more than 72 hours, belonging to the physical status (I and II) of the American Society of Anesthesiologists (ASA) and age groups of 18 to 45 years. After taking informed consent, Patients were randomly divided into two groups, Group H consisted of 25 patients receiving topical heparin, and group

N consisted of 25 patients who did not receive topical heparin. Randomization was done by Simple random technique using computer-generated random numbers.

Patients with a healthy peripheral vein on the forearm away from the joints in the OT or ward have been selected. The site chosen was cleaned and aseptic precautions were used to insert 18 Gauge catheter (B Braun Vasofix). Six drops of topical heparin 1000 IU / ml (Phlebotomy QPS, Troika Pharmaceuticals) were applied to the chosen site along the length of the catheter after insertion of the catheter and before securing the catheter. The catheter insertion site was covered with adhesive tape (3M micropore) and that time was marked as '0' hours. The site was examined every 12 hours using a visual infusion Phlebitis scale and 6 drops of 1000 IU of topical Heparin were applied every 8^{th} hour of total 6 doses and the site was again covered by adhesive tape. Hand washing was discouraged. [4]

Exclusion criteria:

1. Patient's refusal,
2. Patients with known hypersensitivity to heparin,
3. Coagulation disorders and patients on anticoagulants,
4. Sepsis,
5. Deep vein thrombosis,
6. Carcinoma,
7. Diabetes mellitus, and
8. Contraindication to heparin.

Statistical Analysis

Standard Deviation (SD) was used for continuous variables. For categorical data, the number and percentage were used and Chi-square test was used for correlation. If the p-value was < 0.055, the results were considered statistically significant. Using SPSS programmer v.23.0 and Microsoft Office 2007, the data was analyzed.

Results

This study was conducted with 50 patients. Patients were randomly divided into two groups with 25 patients in each group, Group H and Group N. In the H group, patients received topical heparin and in group N patients didn't receive topical heparin. The patients were studied for outcomes at 0 hours, 12 hours, 24 hours, 48 hours, 60 hours and 72 hours as per the Phlebitic scale (Annex I).

There was no statistically significant difference between Group H and Group N in the mean age groups (P = 0.366). The mean and SD age of the group H patients was 25.88± 5.32, and the mean and SD age of the group N patients was 27.40± 6.15. Overall patients mean and SD of age was 26.64 ± 5.73 [Figure 1].

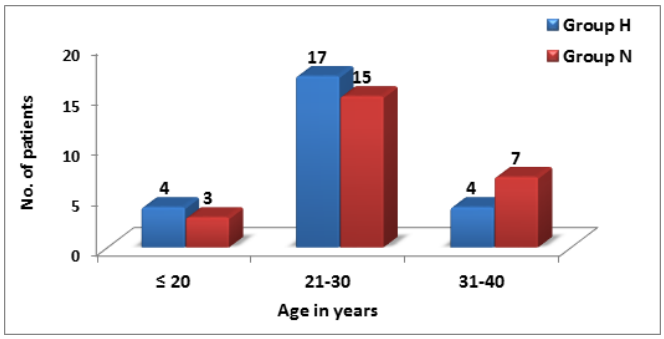

Figure 1: Age wise distribution of patients is categorised by a multiple bar diagram.

Gender-wise distribution of patients in both groups (H and N) was statistically insignificant (P>0.05) [Table 1].

The type of anaesthesia, either General anaesthesia (GA) or Spinal anaesthesia (SA) given to the patients in both the groups were compared in Table 2.

The distribution of anaesthesia types between the Groups (H and N) was statistically insignificant (P>0.05) [Table 2].

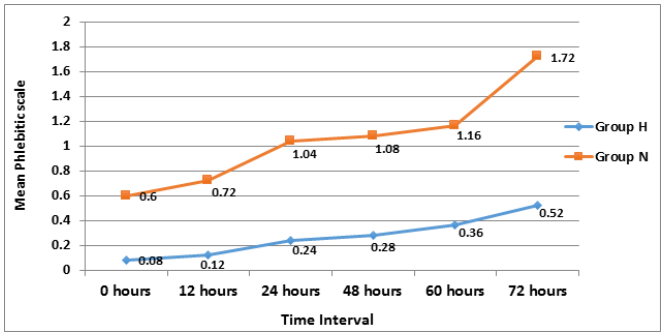

Figure 2: Comparing Phlebitic scale at 0 hour, 12 hour, 24 hour, 48 hour, 72 hour intervals

The analysis shows that the mean Phlebitic scale at the time intervals of 12 hours, 24 hours, 36 hours, 48 hours and 72 hours, between Group H and Group N (P>0.001) was statistically very highly significant. The mean phlebitic scale in group H was substantially lower than that of group N at 12 hours, 24 hours, 36 hours, 48 hours and 72 hours. Therefore topical heparin was effective in lowering the phlebitic scale. [Table 3, Figure 2].

Discussion

Thrombophlebitis is the most common intravenous catheter-related complication, which may lead to several problems

Table 1: Gender wise distribution of patients.

Sex	Group H		Group N		Total	
	No.	%	No.	%	No.	%
Male	9	16.0	10	12.0	7	14.0
Female	16	68.0	15	60.0	32	64.0
Total	25	100.0	25	100	50	100.0
X^2-test, P-value, Significance X^2 = 0.084 P = 0.892 NS						

NS= not significant, S=significant, HS=highly significant, VHS=very highly significant

Table 2: Types of Anesthesia wise distribution of patients

Sex	Group H		Group N		Total	
	No.	%	No.	%	No.	%
GA	8	32.0	7	28	15	30.0
SA	17	68.0	18	72	35	70.0
Total	25	100.0	25	100	50	100.0
X^2-test, P-value, Significance X^2 = 0.095 P = 0.873 NS						

NS= not significant, S=significant, HS=highly significant, VHS=very highly significant

Table 3: ComparisonPhlebitic scale at the 12 hours interval

Time Interval	Phlebitic scale		t-test, P-value
	Group H	Group N	
	Mean ± SD	Mean ± SD	
12 hours	0.08 ± 0.27	0.60 ± 0.50	t = 4.54, P = 0.000, VHS
24 hours	0.12 ± 0.33	0.72 ± 0.61	t = 4.30, P = 0.000, VHS
36 hours	0.24 ± 0.43	1.04 ± 0.67	t = 4.97, P = 0.000, VHS
48 hours	0.28 ± 0.45	1.08 ± 0.64	t = 5.08, P = 0.000, VHS
60 hours	0.36 ± 0.56	1.16 ± 0.55	t = 5.06, P = 0.000, VHS
72 hours	0.52 ± 0.77	1.72 ± 0.89	t = 5.09, P = 0.000, VHS

NS= not significant, S=significant, HS=highly significant, VHS=very highly significant

with multiple catheterisation.[5] We used topical heparin solution for the prevention of thrombophlebitis. "The incidence of superficial thrombophlebitis is around 5%-70% of hospitalized patients".[5] The intravenous catheter behaves like a foreign entity, inducing endothelial damage once fixed in the vein. Virchow's thrombosis triad components are blood flow stasis, endothelial damage, and hypercoagulability. The inflammation may be due to mechanical, chemical and infectious causes. Inflammation in tunica intima of superficial veins leads to Phlebitis.

Friction while insertion, size of the catheter, site of insertion (close to joint or valve) play a major role in the development of inflammation which eventually results in thrombophlebitis.

PH and osmolarity of the drugs and fluids that are injected into the catheter are a major cause of chemical phlebitis. Antibiotics have low pH and thus increase chemical phlebitis rates. Hypertonic fluids induce more inflammatory responses as compared to isotonic fluids.

Poor hygiene while inserting a peripheral venous catheter increases the incidence of infective phlebitis which may progress to sepsis.

Redness, swelling and palpable venous cords are commonly noted in thrombophlebitis. Discomfort or pain while injecting a drug could be a sign of superficial thrombophlebitis.

Preventing phlebitis is important because its development leads to acute inflammation that causes redness, swelling, increased surrounding temperature and palpable venous cords. When not treated in time, deep venous thrombophlebitis can result in a sudden pulmonary embolism.

"Study conducted by Beigh QA et al showed a significantly higher incidence of phlebitis in the control group".[2] Consequently, the results suggest that the appli-

cation of topical heparin at the IV insertion site may decrease the risk of phlebitis.

"Another study conducted by Saini V et al comparing the effectiveness of topical QPS heparin and QPS diclofenac for superficial thrombophlebitis prevention, showed that heparin QPS 100% effective in the prevention of superficial thrombophlebitis caused by peripheral intravenous catheterisation proving to be superior to diclofenac QPS, as 23% of patients developed grade I thrombophlebitis in this group". [3]

"Study conducted by Saji J et al where no prophylaxis was administered, 50% of patients were reported with thrombophlebitis, with grade I being 61% and grade II being 39%". [6]

In our study, we found that there was a statistically very significant difference in mean phlebitic scale between Group H and Group N (P>0.001) at 12-hour, 24-hour, 36-hour, 48-hour and 72-hour intervals. In group H mean Phlebitic scale was 0.08 ± 0.27, 0.12 ± 0.33, 0.24 ± 0.43, 0.28 ± 0.45, 0.36 ± 0.56 and 0.52 ± 0.77 at 12, 24, 36, 48, 60 and 72 hours respectively. In group N mean Phlebitic scale was 0.60 ± 0.50, 0.72 ± 0.61, 1.04 ± 0.67, 1.08 ± 0.64, 1.16 ± 0.55 and 1.72 ± 0.89 at 12, 24, 36, 48, 60 and 72 hours respectively. In group H mean Phlebitic scale was significantly lesser as compare to group N.

The application of topical heparin solution is quite easy. It doesn't have many side effects. The cost of the heparin solution is low and it also saves the problems of frequent changes in the I V catheter, lowering the cost. The hospital stay is reduced.

Conclusion

We conclude that prophylactic use of topical heparin decreases the elevated frequency of intravenous catheterization-related thrombophlebitis.

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