Original Article

Topical heparin for infusion associated superficial thrombophlebitis : A preventive approach

Rajat Charan[1], Tushar Chaurasia[2]

Maintaining a single indwelling intravenour (IV) catheter for a long duration is limited mainly due to the development of superficial thrombophlebitis. This, we decided to evaluate the efficacy and safety of heparin sodium topical solution (1000 IU/ml) in preventing infusion associated superficial thrombophlebitis. An open label, single arm clinical study was conducted. Patients undergoing elective surgery and planned to remain in situ with intravenous cannulation for at least 48 hours indoor, period were screened for the eligibility. In 47 enrolled patients were cannulated on back of the hand with IV cannula no 18. Treatment with 6 to 8 drops of Heparin Sodium Topical Solution (1000 IU/ml) was initiated immediately after the cannulation and baseline reading followed by reading every 8 hours for the treatment period of 48 hours (total 7 doses) was recorded. Patients were observed for sign and sympotoms of phlebitis developed and Graded as per Visual Infusion Phlebitis Scale. None of the patients progressed to Grade II from baseline phlebitis Grade during the study period and no application site reaction was observed in the patients. A trend towards pervention of infusion related superficial thrombophlebiotis was observed with heparin sodium topical solution (100 IU/ml)

[*J Indian Med Assoc* 2018; **116:** 15-6]

Key words **: Superficial thrombophlebitis, prevention, heparin, topical, infusion, catheter.**

Intravenous cannulation is an integral part of hospital based patient management. Venous access allows the medical professionals to get blood sample, as well as infuse fluids to the patient to avoid dehydration and at the same time, providing vital nutrients, medications, chemotherapy and other transfusions etc. Venous access, at times, is also associated with adverse events not limited to extravasation, ecchymosis, hematoma, infection or phelebits, which as also reported earlier[1], may impair the quality-of-life and health of patients.

Maintaining a single indwelling intravenous (IV) catheter for a long duration is limited mainly due to the development of superficial thrombophlebitis[2], which based on severity is characterized by inflammatory reaction to its wall and adjacent tissue, followed by the development of thrombus in the lumen of the superficial vein[3]. Superficial thrombophlebitis (also referred to as thrombophlebitis) is expressed by the degree of pain, redness and the extent of abnormality and if not re-solved or treated, may complicate by extension to the deep venous system, pulmonary embolism and recurrent episodes of venous thromboembolism. Saji *et al*, re-evaluated the incidence rate of infusion associated thrombophlebitis, which is reported in literature to vary between 3.7% to 67.24%, and found a prevalence of 50% which was comparable to the rates reported at the other centers of the world[4,5].

Therapy is generally symptomatic and includes the use of analgesics, anti-inflammatory agents, exercise & ambulation, and, in some cases, local or systemic anticoagulants. Positive effects were seen on pain and the reduction in thrombus size by locally acting anti-coagulants[6]. The current standard practice for treating superficial thrombophlebitis is topical heparin application for 7 days. Heparin acts by its anti-inflammatory actions and preventing coagulation rather than lysing a formed clot. So, if topical heparin is started prophylactically, even before thrombophlebitis sets in, ie, from day 1 of intravenous cannula insertion it can prevent or postpone thrombophlebitis more effectively. Furthermore, under HIC 2(d) for NABH accreditation, monitoring and prevention of infusion associated phlebitis is recommended via adherence to safe injection and infusion practices[7].

A novel topical Quick Penetrating Solution (QPS) of heparin sodium 1000 IU/ml is marketed as Phlebotroy QPS, by Troikaa Pharmaceuticals Ltd. It contains non-aqueous and non-volatile solvents with added permeability enhancers to facilitate the permeation across the skin for desired effect. Thus, we decided to evaluate efficacy and safety of heparin sodium topical solution (1000 IU/ml) in preventing infusion associated thrombophlebitis.

Department of Orthopaedics, Nalanda Medical College & Hospital, Patna 800007
[1]MS (Orthopaedics), Assistant Professor
[2]MBBS, Persuing, MS (Orthopaedics) (Final Year Postgraduate Student) and Corresponding author

Materials and Methods

An open label, single arm clinical study was conducted after approval from Institutional Ethics Committee. The patients of either gender, aged between 18 to 65 years, undergoing elective surgery and planned to remain in situ with intravenous cannulation for at least 48 hours indoor period. were screened for the eligibility. All enrolled patients were cannulated on back of the hand with IV cannula no 18. Treatment with 6 to 8 drops of Heparin Sodium Topical Solution (1000 IU/ ml) was initiated immediately after the cannulation and baseline reading was recorded in the CRFs. Treatment was applied on the skin over the cannulated vein approximately every 8 hours for the treatment period of 48 hours (total 7 doses). Study period was of 3 days for enrolled patients and they were observed for sign and symptoms of phlebitis developed from every 08 hour till 48 hours, for phlebitis Grade as per Visual Infusion Phlebitis Scale[8] and observed for application site reaction, if any. Patient with infusion phlebitis Grade II or above, as per visual infusion phlebitis scale, will be discontinued from the study.

Efficacy endpoint was proportion of patients who developed infusion phlebitis Grade II & above during 48 hours of treatment period and mean time to reach infusion phlebitis Grade II (or above) in hours. Proportion of patients with application site reaction and incidence of each application site reaction, if any, was the safety endpoint of the study.

Results

Total 47 patients satisfied the inclusion criteria and were enrolled in the study. All enrolled patients completed the study, and were included for analysis. Out of 47 patients none of them progressed to Grade II from baseline phlebitis Grade during the study period and no application site reaction was observed in the patients. No unexpected or serious adverse events were reported during the study period.

Discussion

Superficial thrombophlebitis is a common complication in which peripheral vein is traumatized which stimulates the inflammatory responses predisposing to the development of thrombus along with pain, erythema and tenderness along the venous cord. Topical heparin is the current standard therapy for superficial thromophlebitis and its anti-coagulant activity is well reported.

The present study assessed the safety and efficacy of topical solution of heparin sodium (Phlebotroy QPS, 1000 IU/ml, manufactured by Troikaa Pharmaceuticals Ltd.) in preventing infusion-associated superficial thrombophlebitis when applied on the skin over the cannulated vein three times a day over a period of 48 hours after cannulation. Phlebotroy QPS is a novel innovative product having higher strength and quick penetration through the skin, compared to conventional gel. Efficacy and safety profile of heparin topical solution is well documented by Supe *et al*[9].

Heparin topical solution was found to have a preventive role in the development of the thrombophlebitis. Out of 47 patients none of patient had developed Grade II phlebitis from Grade 0/Grade I during the study period and hence none of the patient was discontinued during the study which signified that not a single patient had developed superficial thrombophlebitis and showed significant preventive effect in progression and development of infusion related phlebitis. Favorable results were found may be due to novel patented QPS technology used in formulation which allows higher penetration of heparin through the skin. Heparin topical solution was found to be safe and well tolerated in the patients.

Conclusion

A trend towards prevention of infusion related superficial thrombophlebitis was observed with heparin sodium topical solution (1000 IU/ml). The intervention was found to be safe and effective, and its place in clinical practice needs to be established with larger, appropriately designed clinical studies.

References

1 Pasalioglu KB, Kaya H — Catheter indwell time and phlebitis development during peripheral intravenous catheter administration. *Pak J Med Sci* 2014; **30:** 725-30.

2 Ray-Barruel G, Polit DF, Murfield JE, Rickard CM — Infusion phlebitis assessment measures: a systematic review. *J Eval Clin Pract* 2014; **20:** 191-202.

3 Di Nisio M, Peinemann F, Porreca E, Rutjes AW — Treatment for superficial infusion thrombophlebitis of the upper extremity. *Cochrane Database Syst Rev* 2015; **20:** CD011015.

4 Saji J, Korula SV, Mathew A, Lakhsmi M — The Incidence of Thrombophlebitis Following the Use of Peripheral Intravenous Cannula in Post-Operative Patients A Prospective Observational Study. *IOSR Journal of Dental and Medical Sciences* 2015; **14:** 1-4.

5 Malm D, Rolander B, Ebefors EM, Conlon L, Nygardh A — Reducing the prevalence of catheter-related infections by quality improvement: Six-year follow-up study. *Open Journal of Nursing* 2016; **6:** 79-87.

6 Cesarone MR, Belcaro G, Agus G, Georgiev M, Errichi BM, Marinucci R, Errichi S, Filippini A, Pellegrini L, Ledda A, Vinciguerra G — Management of superficial vein thrombosis and thrombophlebitis: status and expert opinion document. Angiology 2007; **58:** 7S-14S.

7 Self-Assessment Toolkit for National Accreditation Board of Hospitals (NABH) Accreditation. Available at URL: http://nabh.co/Images/PDF/Self_Assessment_Toolkit.xls".

8 Gallant P and Schultz AA — Evaluation of a visual infusion phlebitis scale for determining appropriate discontinuation of peripheral intravenous catheters. *Journal of Infusion Nursing* 2006; **29:** 338-45.

9 Supe, Subnis BM, Rao MR, Panchal VH, Lakhani RJ, Mehtalia B, Maroo SKH, Patel KR, Ojha RU, Patel DD — Novel topical quick penetrating solution of Heparin in management of superficial thrombophlebitis: Results of randomized active controlled trial. *Int J Pharm Sci Res* 2013; **4:** 4442-7.