

Line Thrombosis in Patient on Maintenance Hemodialysis with use of Trisodium Citrate 4% V/S Heparin at Sheikh Zayed Hospital Rahim Yar Khan

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ABSTRACT

Background: Conventional Heparin and Tri-sodium citrate 4% are used for locking double lumen catheter after dialysis to prevent line thrombosis.

Objectives: To compare the line thrombosis after use of heparin and tri-sodium citrate 4%.

Methodology: Randomized controlled trial study involving patient who develop line thrombosis after use of heparin and tri-sodium citrate 4% from February 2020 to August 2020. The study was done on a group of 200 patients who had poor blood flow in double lumen catheter during dialysis. After informed consent first detailed clinical history was taken from patient. Inclusion criteria was patient of age 14 year of above either gender who presented with renal failure, whom dialysis was performed via temporary catheter or permanent catheter. Conventional heparin and tri-sodium citrate are used as line blocking agents and line thrombosis was observed in patients. The data was entered and analyzed SPSS 20.

Results: During this research work 200 double lumen were paced in patients. Out of these, in 100 patients heparin was used as locking solution and locking period was 45-60 days. In remaining 100 patients tri-sodium citrate was used as locking solution in the locking period was 45-60 days. There was no difference in patient's comorbid conditions in both groups of the patients (Figure1). The catheter change rate was greater in patients whose catheter were locked with heparin (52 patients) as compared to tri-sodium citrate (42 patients). The proportion of the patient who needs replacement of the double lumen were 81% in conventional heparin sulphate and 65% with 4% tri-sodium citrate groups. There was longer insertion time for requiring double lumen for line thrombosis related poor blood flow in patients in which 4% tri-sodium citrate were used for catheter locked with comparison to the group in which heparin sulphate were used for locking (Figure2). The average hospitalization for line related thrombosis was longer in heparin group (10.5 days) as compared to citrate group 3.2 days. (P=0.02) The hospitalization rate was 6% in heparin group as compared to 2.5% in tri-sodium citrate group (P=0.45%).

Conclusion: Tri-sodium citrate 4% is equally effective cheap and beneficial with comparison to heparin sulphate. It showed good outcome as far as change of double lumen or double lumen related infection or hospital admission when compared with heparin sulphate. Randomized trials while using tri-sodium citrate with other anti-coagulant would definitely will decide the better double lumen catheter locking agent.

Key Words: End stage kidney failure, Advanced renal disease, Dialysis, double lumen blood flow.

INTRODUCTION

Kidneys are bean shaped organs present in retro-peritoneally. The kidneys secrete the toxic material from the body. When kidneys fail to secrete the toxic materials the patient are labeled as end-stage patients. Chronic renal disease is a global burden now. 10% of the population in Pakistan is having renal problems. In past few decades chronic renal failure has emerged as serious public health issue. It is estimated that there are 100-150 new patients/million population/year in Pakistan who suffer from this condition¹. With the passage of time the incidence of this condition is increasing because of more awareness as well as increase in incidence of certain comorbid disease like diabetic nephropathy². In many patients Due to poor follow-up and progressive nature of disease most patients land to advanced renal failure and need Haemodialysis or renal transplant³. Such patients who are candidate of renal

replacement therapy will need Haemodialysis before they undergo renal transplant⁴. The incidence of advanced renal failure and need of Haemodialysis or renal transplant is different around the world⁵. The health system of Pakistan is in developing phase and is not sufficient to take care of these critically ill patients. Only .9 % of Pakistan gross National product is spent on healthcare as compared to 18 % of gross national product in US. The blockage of the double lumen catheter will need to replace the catheter which is very costly in Pakistan. The price of dialysis or kidney transplantation is beard by patient and families who are not in position to afford health insurance⁶.

The kidney patients in Pakistan reported a need for better dialysis decision make end of life care and better excess to palliative care services. These findings under estimate the need for kidney care training in Pakistani Physicians and in other areas of world to help address communication and end of life needs of their dialysis patients⁷. For those who require Haemodialysis adequate vascular access is main factor of access. Vascular

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accesses in form of temporary catheter are arterio-venous-fistulae are taken as major vascular access for Haemodialysis in children and adults. The patients in home thrice weekly Haemodialysis are initiated. Achieving good blood flow is important factor to achieve adequate doze of Haemodialysis. Poor blood flow through double lumen catheter after thrombosis is major factor responsible for inadequate Haemodialysis. The National Kidney Foundation’s Kidney Disease Outcomes Quality Initiative (KDOQI) guideline recommends a target single pool Kt/V of 1.4 per session is required. With a minimum single pool Kt/V of 1.2⁸.

Conventionally heparin is used as prophylactic anti-coagulant. Heparin is composed of sulfated polysaccharide and it inhibits anti-thrombin III. It inhibits factor Xa and thrombin II. The blockage are infection of double lumen catheter leads to poor Haemodialysis and when catheter is to be changed it puts financial constraints on patient⁹. Tri-sodium citrate is alternatively used in Dialysis and plasmapheresis since 1914¹⁰⁻¹¹. It acts by chelating ionized calcium which lead to blockage of calcium based clotting path way. The tri-sodium citrate blocking has been reported in literature since many years¹²⁻¹³⁻¹⁴.

To maintain day to day life activities in end stage renal disease to maintain life to life activities thrice weekly Haemodialysis is started. As a temporary source central venous catheter are used. These catheters are usually blocked with thrombosis or get infected. Prophylactic locking of these catheters is routine practice although it is associated with bleeding and allergic reactions. To avoid these side effects try sodium citrate 4% is used as an alternative remedy.

METHODOLOGY

A Randomized controlled trial study enrolling patient who were on thrice weekly Haemodialysis in whom heparin and tri-sodium citrate 4% was used as anticoagulant from February 2020 to August 2020. This randomized control trial was done at Dialysis Centre, Department of Nephrology, Sheikh Zayed Hospital, Rahim Yar Khan. Including 200 patients; 100 patients in each group were taken on non-probability consecutive sampling. The patients were allotted two groups randomly. In group-A the patient were given Heparin lock and in group B sodium citrate was used. After informed consent first detailed clinical history was taken from patient. Inclusion criteria was patient of age 14 year of above either gender who presented with renal failure, whom dialysis was performed via temporary catheter or permanent catheter. At the start of each dialysis blood flow in double lumen catheter was checked. Data was recorded on proforma. Data was analyzed by using SPSS version 21.0. Mean changed in blood flow was compared in both blood groups by using independent samples T-test. P value less than .05 was considered as significant.

RESULTS

During research work 200 double lumen were placed for Dialysis in patients. Out of these, in 100 patients heparin was used as locking solution and locking period was 45-60 days. In remaining 100 patients trisodium citrate was used as locking solution in the locking period was 45-60 days.

There was no difference in patient’s comorbid conditions in both groups of the patients (Figure1). The catheter change rate was greater in patients whose catheter were locked with heparin (52 patients) as compared to tri-sodium citrate (42 patients) Figure 2. The section of the patients who need double lumen catheter replacement was 81% in conventional heparin sulphate section and 65% in tri-sodium citrate groups. There was longer insertion time for requiring double lumen replacement for line thrombosis related poor blood flow in which 4% tri-sodium citrate was used as locking agent as comparison to heparin sulphate locking section (Figure 2). The average hospitalization for line related thrombosis was longer in heparin group (10.5 days) as compared to citrate group 3.2 days. (P=0.02) The hospitalization rate was 6% in heparin group as compared to 2.5% in tri-sodium citrate group (P=045%) (Figure 3).

Table 1: Comorbid conditions of the patients

Variable	Heparin	Citrate
<i>Etiology</i>		
Diabetes	21	23
Hypertension	19	18
Glomerulonephritis	33	34
Interstitial nephritis	4	3
Stone Disease	15	16
Unknown	8	6
<i>Comorbidities</i>		
DM	42	38
HTN	38	36
CAD	12	16
Hyperlipidaemia	8	10

Figure 2 (Double Lumen Catheter replacement for Thrombosis)

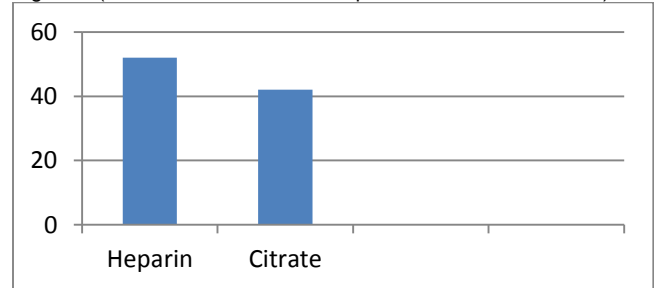
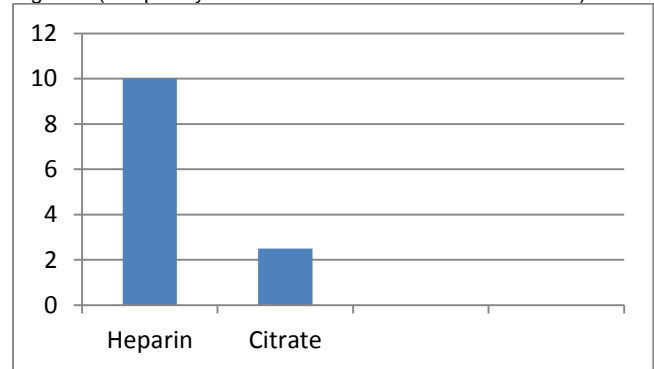


Figure 3 (Frequency of Double Lumen Catheter Thrombosis)



DISCUSSION

In our study we found that locking the temporary double lumen dialysis catheter and tunneled permanent catheter

with 4% trisodium citrate were equally effective safe and comparatively cheap as compared with conventional heparin sulphate (5000IU per dialysis) with regards to line thrombosis requiring catheter change and line related hospitalization.

The results of our research work are similar to with previous studies in which citrate was used as locking agent as compared to heparin as locking solution in double lumen catheter which were inserted in subclavian or internal jugular vein¹⁵⁻¹⁶ Henricaxat all study 4% tri-sodium citrate was used in 10 patients for locking double lumen catheter while heparin sulphate 5000IU/ml was used in 10 patients for locking double lumen catheter for six months. Total six hundred Dialysis were done, 4% tri-sodium citrate was comparable with conventional heparin. The total double lumen catheter clots occlusive or non-occlusive per session of dialysis were less with citrate, 6% vs heparin group 13%. In other research work in which 4% tri-sodium citrate was used as anti-coagulant claimed lesser number of blood clots 7.8% as compared to heparin which had clots 13% but lead to few unimportant cessation of dialysis 1.48%¹⁷.

Buturovic et¹⁸ evaluated thirty ESRD patients with double lumen catheter in whom either tri-sodium citrate 4% (10 patients), or heparin sulphate 5000IU/ml (10 patients). There was no difference in aspiration of the clots and exchange of the double lumen catheter into insufficient blood flow which was similar to our study that section also has prolonged time of utilization more than 25 days compared with heparin. In our center we use citrate locking agent which costs less than heparin locking agent. The cost of citrate locking agent was two hundred rupees per session as compared to heparin in which cost four hundred and fifty rupees per session. So 4% trisodium citrate was found more cost effective and efficacious. This research work has many clinical implications. The most common problem with double lumen catheter malfunctioning, the medical intervention during dialysis is logical. Heparin sulphate appears to be good choice to lock double lumen catheter but sub clinical doses are usually given to avoid bleeding diathesis in previous studies it was observed that there was more hemorrhagic complication when heparin solution was used in comparison to citrate. Even in critical ill patient who were on the maintenance haemodialysis who received high concentration of tri-sodium citrate had less hemorrhagic complications as compared to heparin¹⁹. The less chances of bleeding diathesis due to less half-life of citrate as compared to heparin sulphate. Tri-sodium citrate is rapidly broken down by the liver into sodium bicarbonate if it enters into blood²⁰⁻²¹ which causes less bleeding complication. In normal individuals the half-life is 35 minutes which increases with the liver disease. Heparin sulphate has a prolonged excretion time of 60 to 90 minutes which causes more hemorrhagic complications. In our study we do not find any alteration in serum calcium, magnesium or adverse effects with 4% tri-sodium citrate lock.

CONCLUSION

We found that when 4% tri-sodium citrate was used to lock double lumen catheter during dialysis as locking solution has equivalent or better outcome than heparin, safe, cost effective and more efficacious. A large double blind

randomized trial including heparin sulphate and tri-sodium citrate 4% that comprises of a normal saline control group is required to definitely settle the matter of better locking agent for temporary double lumen catheters.

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