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Original Article

Effect of Haemodialysis on Mean Prothrombin Time and Activated Partial Thromboplastin Time in Patients of End Stage Renal Disease

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Abstract

Background: To determine mean prothrombin time and activated partial thromboplastin time in patients of end stage renal disease having normal baseline coagulation parameters after hemodialysis.

Methods: In this cross sectional study 84 patients ,16-70 years of age, with end stage renal disease were selected. Prothrombin Time (PT) and Activated Partial Thromboplastin Time (APTT) were performed pre and post dialysis on venous blood samples of these patients.

Results: Mean predialysis PT and APTT 13.33± 0.96 and 32.45± 1.87 seconds respectively A significant increase in the haemostatic parameters post dialysis was observed with mean PT and APTT 15.64±3.18 and 46.54±24.68 seconds respectively with a p-value of <0.001 for both parameters.

Conclusion: Haemostatic parameters i.e prothrombin time and activated partial thromboplastin time are prolonged after haemodialysis in patients with end stage renal disease.

Key Words: Chronic Renal Failure, Hemodialysis, Prothrombin time, activated partial thromboplastin time.

Introduction

Chronic renal failure (CRF) is a growing problem worldwide leading to increasing incidence of life threatening complications or death.[1]In Pakistan it has a prevalence rate of14%.[2] CRF requiring dialysis or end stage renal disease is defined as a state of low G.F.R. i.e.: 15ml/min per 1.73 meter square.[1] The mainstay of treatment in this condition is renal replacement therapy which includes both kidney transplantation and dialysis.[3] Kidney transplantation remains the gold standard for the treatment of this condition, but dialysis (both hemo and peritoneal) is the most common and most practiced modality of treatment because of high cost of renal transplantation.[3,4] Out of the two types of dialysis, hemodialysis is most commonly practiced.[3,5] This process involves removal of all the toxic substances from the plasma like urea and it also corrects the electrolytic disturbances in the body.[4]There is a large population of patients maintained on dialysis all over the world.[4] Although beneficial, both types i.e. hemo and peritoneal dialysis have their undesirable effects on various blood components.[4]Dialysis can lead to increase in the bleeding tendency in the patient.[6,7] Unlike CRF in which the bleeding tendency is due to platelet functional defects, the patients on dialysis particularly hemodialysis tend to have bleeding or thrombotic tendency due to disturbances in the function of platelets as well as coagulation and fibrinolytic systems.[6-8]The bleeding tendency can also be attributed to the use of anticoagulants in the procedure.[9] This is observed by measuring coagulation parameters after dialysis.[4] Coagulation parameters i.e.: prothrombin time (PT) and activated partial thromboplastin time (APTT) are screening tests for extrinsic, intrinsic and common pathway clotting factors.[4] Both PT and APTT tend to increase post dialysis.[4] According to a previous study activated partial thromboplastin time and prothrombin time are deranged in 16% and 5%of patients of respectively with mean PT of 15.8 ± 2.09 and mean APTT derangement 35.4 ± 2.4.[3] Therefore monitoring of coagulation parameters may help in determining the risk of development of bleeding complications and the consequent increasing morbidity rate and therefore may be used as a guide for further management of the patients.[4]

Patients and Methods

It was a cross sectional study carried out at Pathology department (haematology section), Fauji Foundation Hospital Rawalpindi. Consecutive (non probability) sampling was done and the sample size calculated using W.H.O sample size calculator was 84.All the patients with end stage renal disease undergoing dialysis having normal PT and APTT, with an age group of 16-70 years were included. Patients on anticoagulant drugs and known cases of liver disease or other bleeding disorders were excluded. Controls

for prothrombin time and partial thromboplastin time were prepared by taking pooled plasma of twenty apparently healthy adults. A total of 168 venous blood samples (2.5ml each) of 84 patients with ESRD were collected. The blood samples were collected one before starting the dialysis procedure and within two hours after the dialysis session. The blood samples were transferred without delay (within 2 hours of collection) to the coagulation laboratory. The samples were centrifuged for fifteen minutes and platelet poor plasma was separated. Prothrombin time and activated partial thromboplastin time were performed on coagulation analyzer within six hours of collection in the laboratory. The tests were performed according to the standard protocol of test recommended by W.H.O.

Results

There were 23 (27.4%) males and 61 (72.6%) females.The age range at the time of study was from 16 years to 70 years with the mean age of patients was 47.5 .Seventy five patients had hemodialysis as part of their routine treatment protocol while only 09 patients were admitted for dialysis because of exacerbation of their uremic symptoms. The mean number of previous dialysis was 39.6 while the maximum number of previous dialysis by any patient in our study were 283. Mean predialysis PT and APTT were 13.33± 0.96 and 32.45± 1.87 seconds respectively. A significant increase in the haemostatic parameters post dialysis was observed with mean PT and APTT14.64±3.18 and 46.54±24.68 seconds respectively with a p-value of <0.001 (Figure 1&2).

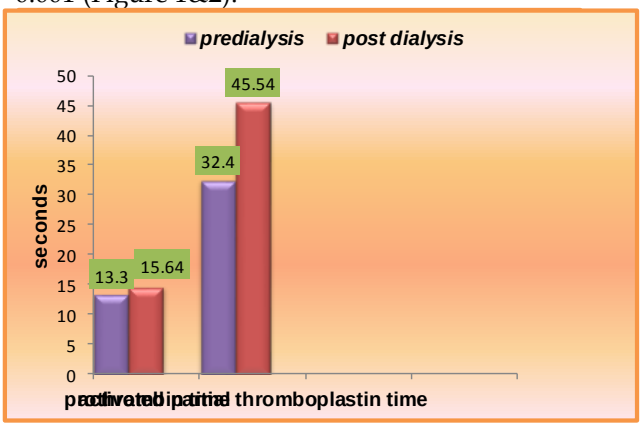

Figure 1:Difference between mean of PT and APTT in renal failure patients before and after haemodylasis procedure.

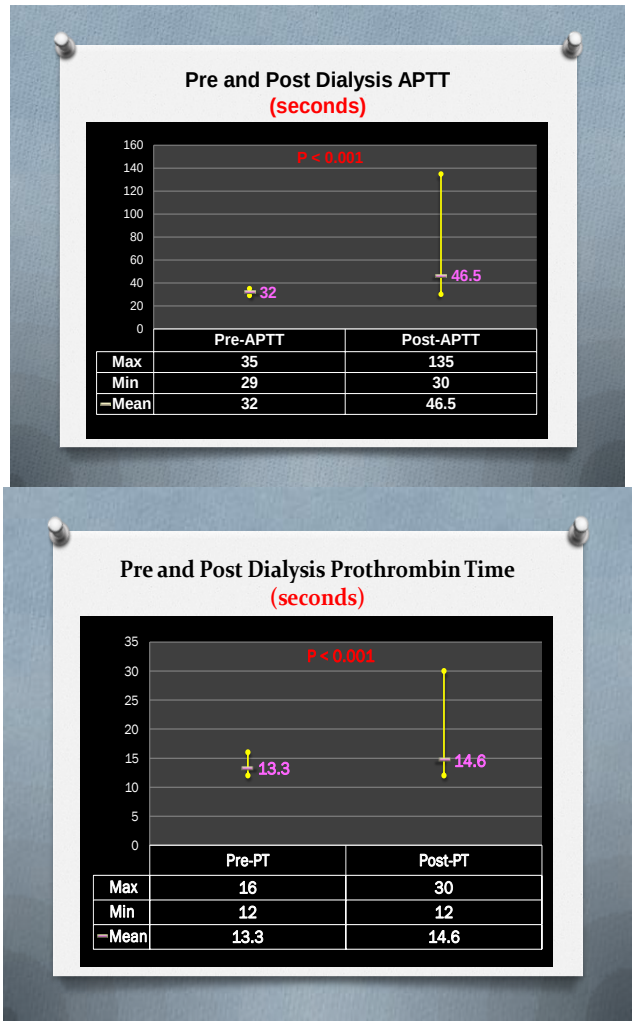

***Fig*2:Differance between PT and APTT in renal failure patients before and after HD procedure.**

Discussion

Present study results show a comparable trend in mean PT and APTT to a regional study done by Shoaib M et al at SIUT Karachi on 61 patients receiving renal replacement therapy .The study suggested mean PT and APTT to be 15.8±2.09 and 35.4±2.4 respectively.[3] Although comparable to this study in terms of the trend of change, there is a significant difference in the mean APTT value post dialysis. Mean APTT in our study was prolonged as compared to this study. This difference may be because of inclusion of patients with all the three types of renal replacement therapies including renal transplant and peritoneal dialysis in their study while our study included only haemodialysis patients with no prior renal transplant which generally tends to improve the bleeding tendency.

Ulusoy et al, in 2004, measured the APTT, PT, D-dimer and fibrinogen level in ESRD patients undergoing conventional HD, before and after HD sessions on 15 end stage renal disease (ESRD) patients. They found increased APTT values and D-dimer, while there was a decrease in fibrinogen levels in HD patients' post-HD sessions,however insignificant differences in the PT levels were seen in HD patients Post-HD sessions when compared to pre-HD levels.[10] The trends seen in this study are comparable to our study.

Româo JE Jr,in 1997 analyzed post Hemodialysis mean PT and APTT to be 15.0±0.81 and 87.30±27.96 respectively.[11] The prominent increase in mean APTT in these patients is probably because of the inclusion of patients with already prolonged APTT in pre dialysis samples with a mean pre dialysis APTT of 39.70±4.30 in contrast to our study where pre dialysis mean APTT was 32.45±1.87 which is within reference range. Alghythan A et al studied 100 patients pre and post Hemodialysis for conventional haemostasis parameters i.e.PT and APTT. The reported mean PT was found to be 23.10±5.69 whereas mean APTT was 64.64±13.61.[12]Mohammad MS et al (2008) showed mean PT and APTT post dialysis as 23.2sec and 69.8 sec respectively.[4]

The results of the studies mentioned above are analogous to the results of our study in terms of general tendency of increase in mean PT and APTT after dialysis. The striking difference in the post dialysis mean of both parameters which are higher from our study may be explained by the difference in the type and dose of anticoagulant used as different anticoagulants in different dosage are preferred in various setups and have a significant effect on the bleeding tendency and change in coagulation parameter post dialysis. In addition the PT and APTT in study reported by Mohammad et al was performed manually which is subject to observational bias.Similarly the individual variation in the condition of the patient, reduction in the time duration of the dialysis session and decreased number of previous dialysis may have caused the discrepancy.

It has been reported byMaderna et al and Naumnik et al that another possible factor that could account for the increased haemostasis parameters is the increase in the level of tissue factor pathway inhibitor (TFPI))which results in the reduced activity of several coagulation factors during HD.[13,14]

Different results were reported by Malyszko J et al in their study in 2001.The dissimilarity could be explained by the difference in the dose of heparin as well as the reduction of the number of HD sessions. The difference can also be attributed to the use of more sophisticated and detail set of coagulation parameters.[15]

Conclusion

Coagulation parameters;prothrombin and activated partial thromboplastin time are prolonged after hemodialysis in patients with end stage renal disease. Therefore monitoring of coagulation (prothrombin and activated partial thromboplastin time) parameters may help in determining the risk of development of bleeding complications and the consequent increasing morbidity rate and therefore may be used as a guide for further management of their patients.[4]

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