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Efficacy of Tranexamic Acid in Conservation of Blood Loss in Total Knee Arthroplasty Patients.

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ABSTRACT

A lot of post-operative blood loss is usually associated with total knee arthroplasty .However, intra operative blood loss is minimal. Our study aims to evaluate the efficacy of tranexamic acid in reducing the blood loss.We conducted a randomised double blinded placebo study involving 36 patients (18 subjects and 18 control).Patients were administered either tranexamic acid or normal saline 30 minutes prior to the surgery and then 8th hourly for 3 days. Blood loss and blood units given before after the procedure was noted. Coagulation profile was noted. D Dimer values were also noted to evaluate fibrinolysis.The blood loss in patients who were administered Tranexamic acid was 635 ml and the placebo had 1325 ml with 24 hours after the surgical procedure.11 patients in the control received 1 -4 units of packed cells and 3 patients in the other group. The packed cell volume in the patients who received tranexamic acid was higher though they received lesser blood transfusion. Plasminogen was decreased in the same group. All the other parameters such as bleeding time, Fibrinogen degradation product, platelet count, Prothrombin time, apTT were the same in both the groups. However d dimer concentrations were increased in the control group. There was no thrombo embolic complications in the tranexamic acid group compared to 3 patients in the control group.

Keywords: Blood loss, Tranexamic acid, Total knee arthroplasty

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INTRODUCTION

Blood transfusion by itself carries a lot of risk. Hence a lot of methods to reduce intra operative and post-operative bleeding have been stressed upon. There are pharmacological methods to achieve this reduction. (Hunt 1991; Royston 1993).

The fibrinolytic system of the body is temporarily activated after any surgery (Risberg 1985), Coupled with the use of tourniquets (Fahmy and Patel 1981). These increase the post-operative blood loss in many surgeries such as total knee arthroplasty. The conversion of plasminogen to fibrin is blocked by tranexamic acid by binding to the lysine sites (Nilsson 1980). Tranexamic acid has been used by many other departments to reduce blood loss during their surgeries (Verstraete 1985; Horrow et al 1990; Åstedt, Sheppard and Soma 1991).

Tranexamic acid has been used to reduce blood loss since earlier times. Many studies have indicated that they reduce both the amount of blood need intra operatively and post operatively (Benoni et al 1994, 1995). Our study aims to further evaluate the use of tranexamic acid in total knee arthroplasty.

PATIENT AND METHODS

We conducted a randomised double blinded, prospective, placebo controlled study. An informed consent was obtained from all the patients. We had a total study population of 36 out of which 18 were the study and 18 were control. We used cemented total knee arthroplasty on all the patients.

Randomisation of the subjects was done by the pharmacologist. He was not part of the study. The Drug (Cyclokapron 100 mg/ml; Pharmacia, Stockholm, Sweden) or normal saline were packed in covers which were opened by the anaesthetist only at the time of the surgery. They were numbered and the number along with its randomisation code could be identified only by the pharmacologist. The coding system was followed right till the end of the study and was not broken.

Inclusion criteria:

- 1) no prior history of haemophilias or warfarin intake
- 2) not a case of rheumatoid arthritis
- 3) unilaterally compartmental arthroplasty
- 4) cemented arthroplasty
- 5) Balanced electrolyte solutions for fluid resuscitation.

exclusion criteria:

1. Patients aged less than 60 years
2. History of haemoglobinopathies /haemophilia/sickle cell disease or with minor or major coagulopathies were all excluded.
3. Those on medications on thyroid were excluded.
4. Those on immunomodulators and long term steroid intake.

There were no drop outs from this study. Vacuum drains were used in all the patients. All the study patients were asked to stop the intake of NSAIDs for a minimum of two weeks before the surgery. All the patients took thrombo prophylaxis in the form of low molecular weight heparin for six to eight days starting from the day of surgery. All the patients were given a dose of cefaperazone sulbactam prior to the surgery and also six and twelve hours after. Patients received analgesia with an indwelling epidural catheter. It was removed on the second post-operative day. The operating fields were blood less with the use of a tourniquet with pressures between 350-400mm Hg. The tourniquet was deflated during the end of the surgery and complete haemostasis was achieved.

PFC prosthesis was used in all the 36 patients. PMMA cement was used in all the cases to fix the prosthesis. The surgeries were carried out by 3 different surgeons in our department.

Each case post operatively was connected to a sub cutaneous drain which was connected to a vacuum drain. The blood coagulated in the drain in one patient and hence there was seepage from the drainage hole. Three patients removed the drain before the specified time period. The records of the blood loss that occurred were measured without breaking the randomisation code

The subjects were given tranexamic acid or equivalent volume of normal saline prior to the surgery and was repeated 8 th hourly for the next three days. The same was done for the placebo group.

The cut off for the blood loss was kept at >500 ml within one hour of post op. This patient had belonged to the placebo group.

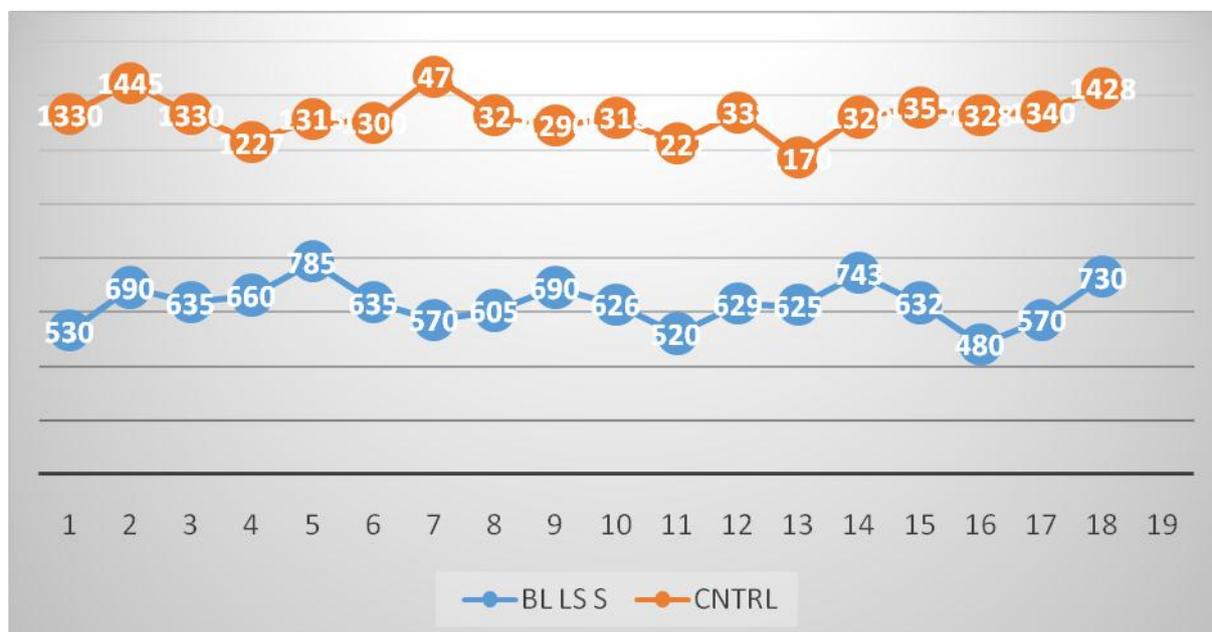
The total amount of blood loss that occurred was measured by measuring the blood volume in the suction and in the swabs. They were measured periodically at the first, fourth, eighth and twenty four hours after surgery. The drain removal was done at the second post op day.

The Haemoglobin concentrations were monitored at the time of admission at the end of the procedure. The blood Hb concentrations were determined at admission, at the end of the operation, one hour postoperatively and on the mornings of the first, second, fourth and seventh postoperative days. On admission, the platelet count, the activated partial thromboplastin time (APTT) and the pro- thrombin complex test (PT) were also determined and found to be within normal values in all cases. As we did not set up a specific cut off value for blood transfusion we had transfused blood according to the cardio vascular status of the patient and on the present health status of the patient.

As a rule we had set the blood transfusion limit of the patients with a Haemoglobin concentration of less than 10mg/dl. The amount of blood units that were transfused were also noted in sagman units. The wound complications were also noted.

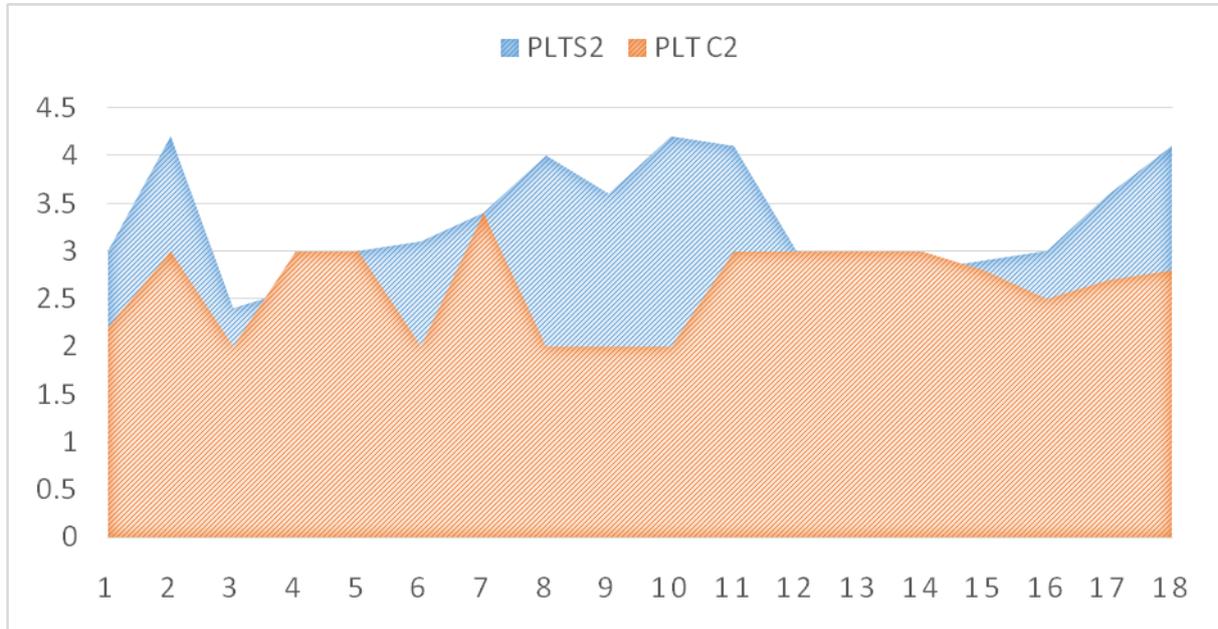
RESULTS

The blood loss in patients who were administered Tranexamic acid was 635 ml and the placebo had 1325 ml with 24 hours after the surgical procedure.

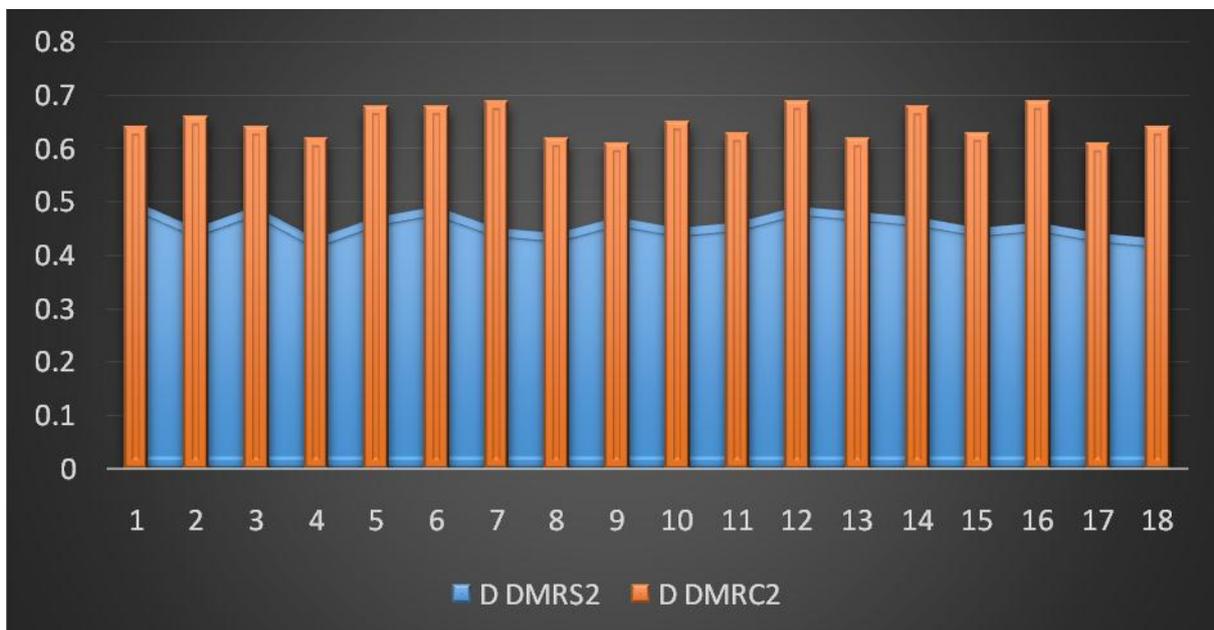


11 patients in the control received 1 -4 units of packed cells and 3 patients in the other group.

The packed cell volume in the patients who received tranexamic acid was higher though they received lesser blood transfusion. All the other parameters such as bleeding time, Fibrinogen degradation product, platelet count, Prothrombin time, aPTT were the same in both the groups.



However D- dimer concentrations were increased in the control group.



There was no thrombo embolic complications in the tranexamic acid group compared to 3 patients in the control group.

DISCUSSION

A lot of previous studies had found many factors such as the mode of anaesthesia or the number of components to influence the blood loss. All efforts were made to control these factors. All patients underwent epidural spinal anaesthesia and were also subjected to cemented arthroplasty only. The additional dose of tranexamic acid can be postulated as a cause for the decreased blood loss. The intake of NSAIDs was

stopped a minimum of two weeks prior to the surgery.

Our results have shown that there is a reduction in blood loss with the use of tranexamic acid. The blood loss that is reduced is mainly the post-operative blood loss. The action of tranexamic acid on intra operative blood loss was minimal. Our study also shows that the use of tranexamic acid in given as a treatment for heavy blood loss in minimal. The theories of action of tranexamic acid are Ali and Landymore (1994) have said it is probably because of the activation of the fibrinolytic Horrow, Strong and Van Riper (1994) had postulated an action on the plasmin receptors or on the platelets directly. The time of removal of the drains were also carefully monitored and they were removed at the second post-operative day. Many of the previous studies had suggested the time of removal of the drain had no effect on the amount of blood loss. Our study did not conduct any specific screening for the thrombosis as many other studies had proved that the effect of tranexamic on thrombosis was found to be very minimal (Becker and Borgström 1968; Gordon-Smith, Hickman and El Masri 1972; Hedlund 1975; Bekassy and Åstedt 1990). This is may be due to the lack of effect on the veins (Åstedt, Liedholm and Wingerup 1978) or because the effect of thromboprophylaxis which acts for a minimum of 5 days post-operative (Eriksson et al (1988)). Many studies have shown the fibrinolysis after trauma is a bi phasic phenomenon (Risberg 1985; Eriksson 1991). This is further increased by the use of a tourniquet (Fahmy and Patel 1981). Our study has shown that most of the blood loss in both the groups occurred in the first eight hours thereby showing that the dosage we have used in adequate to reduce the amount of post-operative blood loss.

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