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Retrospective Study Of Intra Articular Administration Of Tranexamic Acid For Controlling Blood Loss Post Total Knee Replacement.

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Abstract*: Intraarticular administration of tranexamic acid (TEA) reduces blood loss in post total knee arthroplasty (TKA).We carried out a case control study evaluating the effect of intraarticular tranexamic acid on postoperative hemoglobin, blood units transfused, total drain output on day1, day2 in 50 patients (25 study group and 25 control group) undergoing unilateral/bilateral TKA. Significant reduction in total drain output was found in study group as compared to the control group. Postoperative hemoglobin was found to be low in control group.So the intraarticular use of tranexamic acid reduces postoperative blood loss and the need for blood transfusion is minimized.*

Key words: *Intraarticular,Tranexamic acid, Knee replacement,Blood loss*

I. Introduction

Progressive aging of populations has led to an increase in the incidence of degenerative joint diseases. So the number of prosthetic surgeries has increased considerably in advanced ages.[1]Furthermore , in last decade there has been a significant increase in prosthetic surgery procedures performed on young patients due to the acquisition of greater surgical experience by the surgeons and health care personnel involved as well as improvement in the techniques employed and an increase in the survival of prosthetic implants .[2]Total knee arthroplasty is associated with marked post operative blood loss .[3] The use of a pneumatic tourniquet ensures dry surgical field and minimal intra operative bleeding but it augments fibrinolysis stimulated by surgical trauma .[4-9] Post operative blood loss is due to the activation of fibrinolytic system. The increased requirement of blood transfusion predisposes these patient to high post operative morbidities .Implantation of total knee arthroplasty may cause a post operative loss of up to 2000ml of blood [10],requiring transfusion in very high percentage of patients .[11] Although the current trend among medical experts is towards restricting the number of transfusion.[12] Currently the preference is to individualize the patient care and minimize the indication of allogenic blood transfusion in orthopedic surgery , what is known as "patient blood management".[13] One of the possible pharmacological options to prevent surgical bleeding is the use of tranexamic acid

Tranexamic acid is a synthetic analogue of amino acid lysine and inhibits fibrinolysis locally without any effect on the fibrinolysis in the plasma from peripheral venous circulation .[14] Multiple previous studies have shown a reduction in blood loss and postoperative transfusion requirements with the use of tranexamic acid in patients undergoing unilateral total knee arthroplasty.[15-21]

Here we compared the blood loss after the use of intra articular administration of tranexamic acid and without use of tranexamic acid post total knee arthroplasty.

II. Material And Method:

The case control study was carried out in our institution from January 1st 2013 to December 31st 2014. Total arthroplasty performed on 50 knees were included in the study. Bilateral total knee arthroplasty was done as a staged procedure with a gap of 7 days between the two procedures. Patient with documented history of thrombo-embolic disease, cerebrovascular disease, chronic renal failure, liver disease, allergic to tranexamic acid were excluded from the study. For the study group our protocol included the administration of 250mg of tranexamic acid intra-articularly.[22-24]All the surgeries were performed by the senior author using standardized surgical technique .After fascia closure tranexamic acid was injected by the surgeon to the joint. Subcutaneous tissue and skin closure was performed subsequently. Compressive dressing was applied before tourniquet is deflated.

Preoperative investigation included hemoglobin and complete coagulogram. Post-operative hemoglobin levels were measured six hours after the surgery. The drain was clamped for 1hour before and then fully opened, drain output recorded at day 1 and day 2.Blood transfusion in the form of whole blood was given to all patients with postoperative hemoglobin less than 9mg/dl. Postoperative use of DVT stockings, ankle pump exercise, and early mobilization was ensured as a part of thromboprophylaxis.

Statistical analysis was carried out with SPSS software version 20.Parameter tests of significance (student T-test) were used for statistical analysis .P value less than 0.05 was taken as statistically significant.

III. Results

25 patients who received intra-articular tranexamic acid were included in the study group, while control group included 25 patients without tranexamic acid administration .Both the group were found to be age matched on statistical analysis {table-1}. In both the group the mean pre operative hemoglobin was found to be similar. Post-operative hemoglobin was found to be however lower in control group {table-2} . The postoperative drain output {table-4} was low in case group and was found to be statistically significant on day 1(243ml vs 353) (P=0.024) and day 2(100ml vs 148ml)(P=0.048){table-3}. This implied a decrease in total blood loss in patient who received tranexamic acid.

Patient who received tranexamic acid did not show any adverse effect like nausea, vomiting, diarrhea, or hypersensitivity.

Two of the patients in control group had post operative wound soakage. Wound soakage was minimal and settled in one day. No patients developed complications like superficial infection, deep infection, DVT, pulmonary embolism.

IV. Discussion

Total knee arthroplasty is always associated with average reported post operative blood loss in unilateral total knee arthroplasty ranging from 761ml to1784ml.[16, 25 -30] Blood transfusion increases in bilateral total knee arthroplasty as blood loss is expected to be high in such case. Intra-operative blood salvage using cell savers and preoperative autologous blood transfusion with or without erythropoietin are ways to decrease the requirements of autogenic blood transfusion .In developing countries these are rarely used

Anti-fibrinolytic agents such as, aprotinin, e-aminocaproic acid and tranexamic acid help in reducing blood loss in total knee arthroplasty. Of these tranexamic acid is cheaper and less allergenic than aprotinin and more potent than e-aminocaproic acid .Tranexamic acid acts by inhibiting the activation of plasminogen to plasmin ,it also blocks the binding of plasminogen to fibrin , which retards fibrinolysis thus reducing blood loss by clot stabilization rather than promotion of clot formation.[31]

Here we administered tranexamic acid (250mg/5ml) intra articularly to minimize the side effects. No episodes of thromboembolism was reported which was consistent with earlier studies. [25-30, 32-34]We thus believe that the protocol adopted by us,using minimally effective dosage was safe as far as thromboembolic complications are concerned .

We did not evaluate the intraoperative blood loss in two groups which is a limitation of our study. By measuring the drain output we compared only the postoperative blood loss .So total blood loss in the two groups could not be exactly calculated .We got fairly good idea about the total blood loss in two groups, as we have taken records of preoperative and postoperative hemoglobin of study group and control group. Postoperative blood loss was significantly less in case group when compared to control group. This shows a positive impact in administration of tranexamic acid in blood loss. In cases where tranexamic acid was used, the total drain output was significantly low and there by showing the effectiveness of tranexamic acid in controlling blood loss during total knee arthroplasty.

The drain output on day 2 was less compared to the first day .The drain output was reduced up to 48 hours after administration of tranexamic acid makes us believe that some residual effect of tranexamic acid may persist.

Same surgeon has done the surgery for both the group so the possibility of surgeon dependent factors affecting the results can be excluded and this in turn added strength to our study. In our study the sample size was large and this gives strength to our statistics.

V. Conclusion

It is found that average blood loss in patients were intra articular tranexamic acid is used is less compared to average blood loss in patients without tranexamic acid

Thus we conclude that intra articular use of tranexamic acid helps in reducing blood loss and requirement for blood transfusion is also reduced

Independent T Test

Table-1	TRANEXAMIC ACID	N	Mean	Std. Deviation	T	Df	P VALUE
Age	USED	25	62.24	9.107	-1.816	48	0.076
	NOT USED	25	66.76	8.482			

Table-2	TRANEXAMIC ACID	N	Mean	Std. Deviation	T	Df	P VALUE
Pre operative Hb (g/dl)	USED	25	12.14	1.38353	0.029	48	0.977
	NOT USED	25	12.128	1.56432			
Post operative Hb (g/dl)	USED	25	11.828	1.27067	-0.729	48	0.469
	NOT USED	25	10.092	1.28968			

Table-4	TRANEXAMIC ACID	N	Mean	Std. Deviation	T	Df	P VALUE
Drain output -day 1 (ml)	USED	25	242.6	168.431	-2.325	48	**0.024**
	NOT USED	25	352.64	166.297			
Drain output -day 2 (ml)	USED	25	99.64	72.107	-2.031	48	**0.048**
	NOT USED	25	147.68	93.761			

Table-3	TRANEXAMIC ACID	N	Mean	Std. Deviation	T	Df	P VALUE
Total drain output (ml)	USED	25	342.24	199.925	-2.82	48	**0.007**
	NOT USED	25	495.92	185.168			

Drain Associated Variables Are Higher When Not Used.

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