

Effect of the Tranexamic Acid in Reducing the Blood Loss in the Orthopaedic Surgery

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Abstract:

Background: we investigated the effect of a single preoperative bolus dose of tranexamic acid (15 mg/kg) on perioperative blood losses and packed cell transfusion requirements in patients scheduled for hemiarthroplasty surgery for fracture neck of femur.

Patients and methods: Total of 36 patients taken in study . In 17 pts –(Tranexamic acid group)a single bolus dose of 15 mg/kg tranexamic acid was given preoperatively 15 min before the surgery. Data are collected from previously operated patients(19 pts-control group) where tranexamic acid was not given . We recorded per- and postoperative blood losses and transfusion requirements postoperatively.

Results:There was significant difference in the intraoperative blood loss between the two treatment groups(Mean-TA=264.88 ml, C= 330.52 ml) .Postoperative blood loss were significantly less in the TA group (Mean-T=207.05 ml, C=329.68ml). Packed red blood cell transfusion requirements were significantly lower in the TA group compared with the control group.

Conclusion: Tranexamic acid 15 mg/kg given as a single preoperative bolus dose reduces intra operative and post operative blood loss, and packed cell transfusion requirements in hemiarthroplasty surgery.

Keywords: Tranexamic acid, blood loss, hemiarthroplasty

I. Introduction

Hip fractures and arthritis are the common causes for replacement surgeries of the hip. Hemiarthroplasty is the preferred surgical option for femoral neck fractures in elderly people (17). The outcomes of the hemiarthroplasty procedures are good but associated with blood loss and blood transfusions. On the other hand transfusion of blood is associated with the transmission of the infectious diseases and risk of infections. Various methods have been adopted for the control of bleeding in the replacement procedures like hypotensive anaesthesia, thromboplastic agents etc(18).

Anti-fibrinolytics improve hemostasis and reduce the blood loss in orthopaedic surgery. Tranexamic acid is a synthetic derivative of the amino acid lysine. It inhibits fibrinolysis by blocking the lysine binding sites on plasminogen. Studies have shown that 15mg/kg single preoperative doses reduces the intraoperative blood loss and the post operative blood loss. So the aim of the present study is to show reduction of the blood loss with the single bolus dose of the tranexamic acid given preoperatively 15 min before surgery.

II. Material And Methods

This study is done between year of 2011 and 2012 with the approval of the ethics committee of the hospital. The study is both a retrospective and prospective type. Data are collected from previously operated patients i.e. hemiarthroplasty procedures where tranexamic acid is not given. The second group is the tranexamic acid group where a single bolus dose 15mg/kg of Tranexamic acid is given to pts 15 min before the Hemiarthroplasty procedure. The amount of the blood loss both in the tranexamic acid group and the control group is analyzed by taking in to consideration the preop hb, post op hb, intraoperative blood loss and post operative blood loss. Intraoperative blood loss is analysed from the the suction apparatus and pads used during surgical procedure and postoperative loss is analysed from the suction drain placed in the operated site.

All the operative procedures were done under spinal anesthesia. Blood transfusions were given to the patients whose post operative HB is less than 9.

The values are expressed in mean, standard deviation .Statistical analysis are performed with spss software. SPSS is a computer program used for survey authoring, data mining, text analytics, statistical analysis, and collaboration and deployment. It is used by market researchers, health researchers, survey companies, government, education researchers, marketing organizations. The values are tabulated in X-L sheet and entered in the software .Comparison of the results between groups was carried out by independent sample t test for each normally distributed variable. p value less than 0.05 was considered to indicate a significant difference.

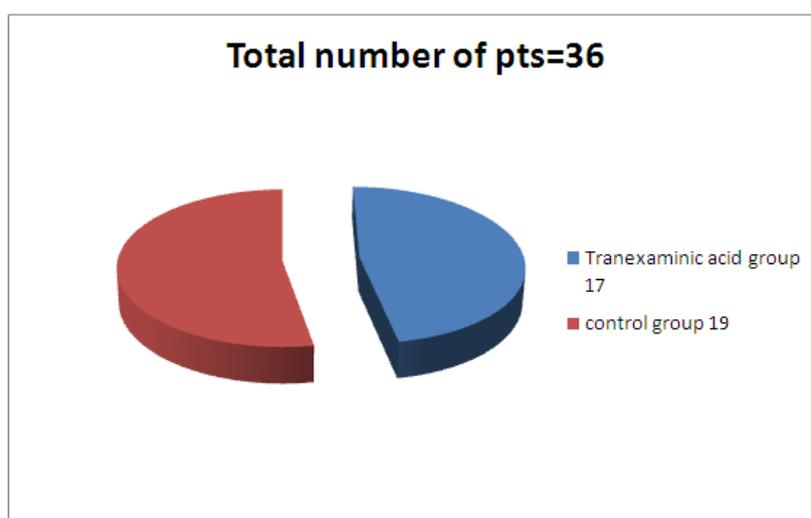
III. Results

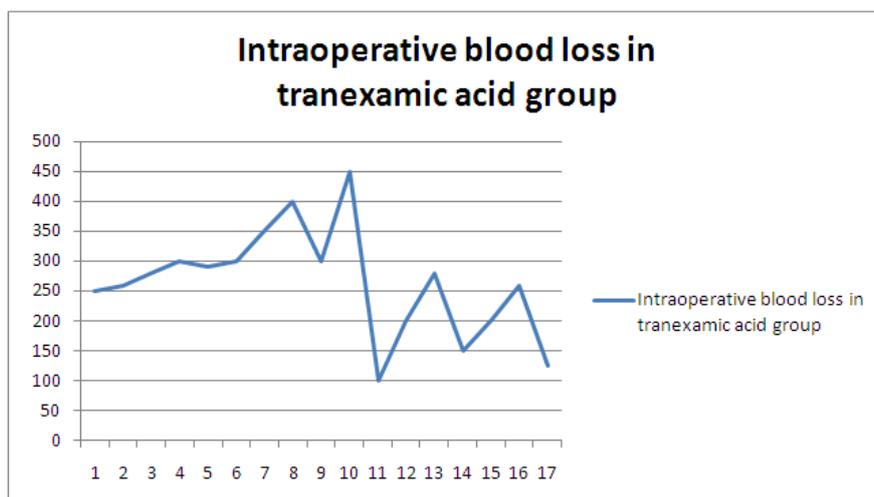
Total numbers of patients taken in to consideration for the study are 36pts. 19 pts as a control group and 17 pts as tranexamic acid group. All the patients Age, preoperative haemoglobin, post operative haemoglobin, intraoperative blood loss, post operative drain in ml and number of blood transfusions are shown in table 1.

Table 1

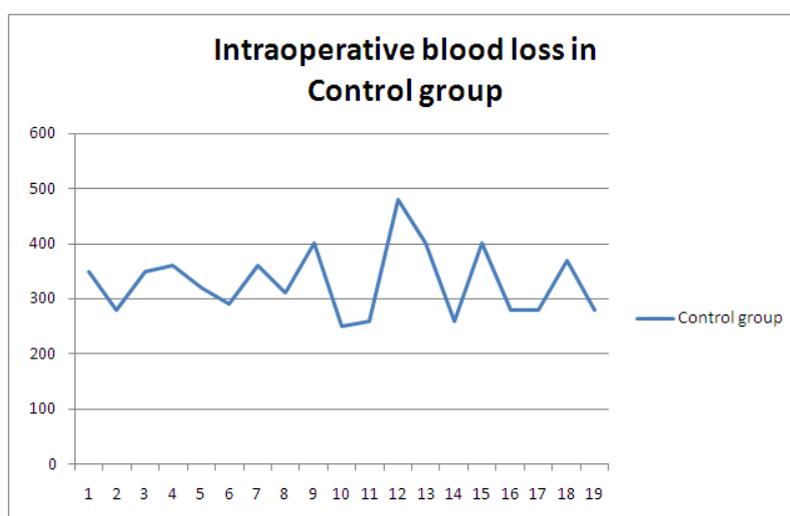
T,c	Age	Pr Hb	Pt Hb	Int BL	Pt D in ml	NBT	DOS
T	64	11.1	10.5	250	150	0	88
T	65	12.5	11.6	260	80	0	92
T	58	9.3	8.4	280	120	1	90
T	70	11.8	10.9	300	202	0	88
T	62	9.7	8.8	290	180	1	86
T	76	14.1	13.6	300	200	0	90
T	60	14.9	14.2	350	250	0	100
T	75	9.1	7.6	400	170	2	95
T	58	12.6	11.5	300	210	0	90
T	71	11.8	10	450	320	0	92
T	57	11.4	10.9	100	402	0	80
T	58	12.2	11	200	188	0	92
T	65	13.1	12.9	280	208	0	90
T	65	13.4	12.7	150	210	0	96
T	70	10.9	10.5	208	280	0	90
T	65	11.8	10.7	260	210	0	96
T	72	12.5	11.9	125	140	0	100
C	57	9.8	7.2	350	200	2	98
C	60	10.9	8.2	280	460	1	84
C	62	11.7	10	350	350	0	92
C	58	12.6	10.5	360	180	0	86
C	60	11.8	9.8	320	220	0	88
C	56	12.6	10.8	290	280	0	90
C	58	14.8	10.3	360	290	0	96
C	60	15	12	310	250	0	88
C	59	12.2	9.8	400	360	0	90
C	56	10.6	8.8	250	398	1	98
C	60	10.4	8.4	260	200	2	100
C	72	10.4	9	480	218	0	92
C	56	12.8	10.9	400	650	0	90
C	70	12.9	11	260	510	0	102
C	72	12.4	10.5	400	410	0	98
C	68	11	9.4	280	380	0	100
C	70	11.3	8.5	280	328	1	92
C	62	13	11.2	370	280	0	88
C	66	12.8	10.1	280	300	0	98

T=tranexamic acid,C=control group,pre hb-preoperative hb,pt hb-post operative hb,int BL-intraoperative blood loss,pt D-post operative drain,NBT-number of blood transfusions,DOS –duration of surgery.





Y axis-Blood loss in ml, X axis-No of patients



Y-axis –Blood loss in ml, x axis-No of patients

The two groups (i.e. tranexamic and control) were similar in terms of age and the preoperative hemoglobin values. The mean duration of the surgery between two groups were almost same. There is difference in the post op HB between tranexamic acid group and control group with p value of <0.05. Similarly there is significant difference between the intra operative blood loss and post operative drain between the tranexamic acid group and the control group with p value of <0.05. The number of blood transfusion is more in the control group than the tranexamic acid group. The mean, standard deviation and p value are shown in table 2.

Table 2

Variable	Mean	SD	T value	P Value
Age			NS	NS
Preoperative Hb	T=11.8059 C=12.0526	T=1.69170 C=1.40529	0.478	0.136
Post operative Hb	T=10.9941 C=9.81	T=1.76 C=1.21	2.372	0.023
Intraoperative blood loss	T=264.8824 C=330.5263	T=90.9064 C=62.2248	2.552	0.015
Post operative blood loss	T=207.058 C=329.68	T=75.8159 C=120.501	3.603	0.001
No of blood transfusion	T=0.2353 C=0.2632	T=0.56195 C=0.56230	NS	NS

T-Tranexamic acid group C=control group

IV. Discussion

Tranexamic Acid (TA) is an anti-fibrinolytic. It competitively inhibits the activation of plasminogen to plasmin which is responsible for the degradation of fibrin. Fibrin is the basic framework for the formation of a blood clot in haemostasis. Tissue plasminogen activator is a major enzyme responsible for conversion of plasminogen into active plasmin. Surgery and venous stasis increase the release of tissue plasminogen activator and activate the fibrinolytic system. Binding of TA to plasminogen prevents the breakdown of fibrin even though plasmin is generated (19).

Hip and knee replacement surgeries are associated with the blood loss and blood transfusions. Hemiarthroplasty surgeries are done mostly in the elderly people secondary to hip fractures (17). Blood loss during surgery in elderly lead to cardiovascular complications. Various methods have been adopted to reduce the amount of the blood transfusions (18). Studies have shown that tranexamic acid reduces the amount of blood loss and blood transfusions. It is useful in a wide range of conditions such as cardiac surgery, acute upper gastrointestinal bleeding, oral surgery, liver transplantations and gynecologic bleedings.

Blood loss in hemiarthroplasty procedure is reduced with single dose 15mg/kg dose of tranexamic acid. Our results show that there is significant reduction in the blood loss following administration of tranexamic acid. There is 30 to 40 % of reduction of blood loss i.e considering the intraoperative blood loss and the amount of post operative drain. The number of blood transfusions is also reduced in the tranexamic acid group. The mean duration of the surgery was same between the two groups

Ido K et al have shown significant amount of reduction of blood loss in the total knee replacement and total hip arthroplasty procedures (1). Yamasaki, Masuhara and Fuji reported lower blood loss in a TEA group than in a control group in total hip replacement, but only up to four hours post-operatively (9) but our results show that post operative blood loss is more than 4 hrs. In total hip replacement surgery some authors found a significant reduction of red blood cell transfusion requirements in TA treated patients (15, 16). BENONI et al. (6) found no significant reduction in postoperative blood loss in total hip arthroplasty when TA was given towards the end of surgery and 3 hours later. Moez S Ballal et al and others have shown that single dose 15mg/kg reduces the amount of the blood loss in the total hip replacements. Ekbäck et al (20) showed that the per operative blood loss was significantly lower in the tranexamic acid-treated group than in the control group. In conclusion, we have experienced a significant reduction of total blood loss and reduction in number of blood transfusion in hemiarthroplasty surgery using single 15mg/kg dose of tranexamic acid compared with control group.

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