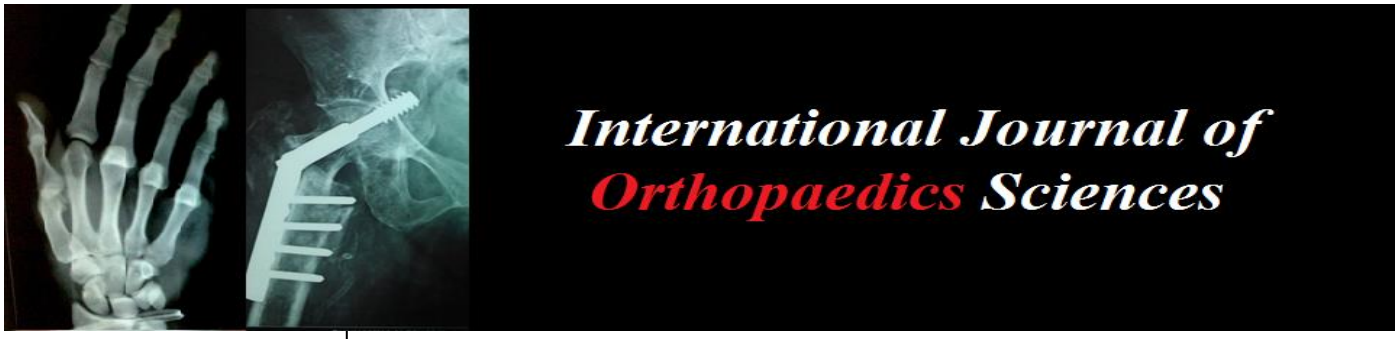

E-ISSN: 2395-1958
P-ISSN: 2706-6630
IJOS 2023; 9(1): 90-93

https://www.orthopaper.com
Received: 21-10-2022
Accepted: 30-11-2022

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A prospective study on role of tranexemic acid in reducing post-operative blood loss in TKR

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DOI: https://doi.org/10.22271/ortho.2023.v9.i1b.3279

Abstract
Introduction: In total knee arthroplasty's 2 types of blood loss will be seen one which is visible in surgical field other being blood loss into tissues (hidden). Use of tourniquet limits the perioperative bleeding it increases fibrinolysis activity and post operatively due to tissue trauma fibrinolytic system is activated contributing to post-operative blood loss. Tranexamic acid {TEA} is a synthetic fibrinolysis inhibitor. Studies show that Tranexamic acid given intravenously acts for up to 3 hours. The aim of this study is to determine the efficacy of Tranexamic acid given in single bolus to decrease post-operative blood loss.
Materials and Methods: Prospective study from January 2021 to November 2021 over a period of 1 year with 40 patients diagnosed with bilateral osteoarthritis of knee. All surgeries were performed by same surgeon using same surgical technique. DT (drain tube) used postoperatively to record the post-operative blood loss on POD 0 AND POD 1.
Results: A total of 40 patients with mean age of 57 yrs. Mean duration of surgery was 93min (ranging from 100 to 120 min)mean tourniquet time being 83.6 min, mean post-operative blood loss was 188 on POD 0 38 ml on POD 1 showing significant decrease in blood loss after Tranexamic acid injection ($p<0.05$)
Conclusion: This study concludes that Tranexamic acid injection given postoperatively significantly reduces post-operative blood loss in total knee replacements with lesser complications.

Keywords: A knee, arthroplasty, blood loss, tranexamic acid

Introduction
Total knee replacement is one of the most effective methods advised in end stage osteoarthritis. This procedure is notching up due to increased geriatric population over the past decades [1, 2]. However, the most common complication associated with the surgery being blood loss. Blood loss can be both perioperative and postoperative accounting for about 1.5 L to 2 L.
However, this blood loss is dealt by introduction of tourniquet, however tourniquet might decrease perioperative blood loss but it activates fibrinolytic system increasing postoperative blood loss. Several methods were employed aiming to reduce post-operative blood loss such as hypotensive anaesthesia, post-operative blood transfusions, antifibrinolytic agents.
Tranexamic acid is synthetic derivative of lysine (amino acid), it acts by inhibiting fibrinolysis. TEA inhibits fibrinolysis by competitively blocking lysine binding site of plasminogen. This complex prevents plasmin binding to fibrinogen or fibrin [3, 4]. Hence lysis is delayed. If given at higher concentrations TEA can also act as noncompetitive inhibitor of plasmin itself. Previous studies suggest intravenous administration of TEA suppresses fibrinolytic system so as to reduce post-operative blood loss. Use of TEA also reduces risk of post-operative anemia and transfusion rate. Tranexamic acid is comparatively inexpensive and easily accessible [5, 6].
In this study we propose to evaluate the efficacy of Tranexamic acid in TKR using 2 boluses of TEA before the tourniquet is tied and 1 post operatively.

Materials and Methods

This is a prospective study from January 2021 to November 2021 over a period of 1 year with 40 patients diagnosed with bilateral osteoarthritis of knee conducted at a tertiary center (Table 1). All surgeries were performed by same surgeon using same surgical technique using same design prosthesis (depuy). Tourniquet was used to decrease the intraoperative blood lost. All cases were included except for high-risk cases which were described in exclusion criteria as follows, hypersensitivity to TEA, bleeding disorders, hypercoagulability states, sub arachnoid hemorrhage, coronary or vascular stenting done within 6 months, history of DVT/PE/MI within 6 months, concomitant use of clotting factor concentrates. In our study 2 doses of tranexamic acid were given one dose before the tourniquet inflation followed by 2nd dose 6-8hrs later. TEA was given at a dose of 10-15 mg/kg BW given intravenously. Post operatively patients were mobilized based on the pain tolerance. Ankle pump exercises were started along with isometric quadriceps strengthening exercises. They serve in early mobilization and as a part of thromboprophylaxis postoperatively. DT (drain tube) used postoperatively to record the post-operative blood loss on POD 0 AND POD 1. Parametric tests were performed for statistical analysis data collected was analyzed using SPSS version 22.0 and chi square test was used for comparing categorical variables value of <0.05 was taken as statistically significant.

Results

This study includes 40 patients conducted at tertiary Centre in Chennai from November 2020 to November 2021 over a period of 1 year (Table 1). This study included 16 male and 24 female with mean age being 57 yrs. (Figure 1) and right side being most commonly affected side as seen in 27 patients (Figure 2). Surgery was performed by the same surgeon well trained in surgical procedure using the standard operative technique with mean surgery time being 93min ranging from 74 to 120 min. Average tourniquet time being 83.65min. Patients were followed up for 48hrs and blood loss is calculated mean blood loss on POD O was 188.67 ml and on POD 1 was 38 ml, there was significant decrease in blood loss after Tranexamic acid injection (p<0.05), (Figure 3). No complications were noted with in the monitored time such as nausea, vomiting, hypersensitivity. None of the patients were lost follow up.

Table 1: Patients demographic data

S. No	Age	Sex	Side	Hemoglobin		Blood Loss (Ml)		Total Blood Loss(Ml)	Surgery Time(Min)	Tourniquet Time
				Preop (Gm/Dl)	POST Op	POD 0	POD 1			
1	51	F	L	13.3	12.8	300	40	340	101	90
2	69	M	R	12.9	12	272	35	307	97	90
3	67	F	R	12	11.4	260	42	320	90	90
4	63	F	L	13	12.6	250	65	315	112	90
5	66	M	R	14.4	14	300	25	325	120	90
6	65	F	R	13.6	13	174	70	244	100	90
7	57	F	L	14.1	13.8	275	20	295	97	90
8	60	F	R	13.3	13	310	15	325	86	70
9	66	M	L	14.8	14	200	36	236	89	70
10	60	F	R	11.7	11.4	215	62	277	98	90
11	61	F	R	13.4	13	309	53	362	90	88
12	57	F	L	14.1	14	100	19	119	90	90
13	61	M	R	12.2	12	124	62	186	88	85
14	50	F	R	11.9	11.5	187	32	219	97	90
15	60	M	L	14	13.8	210	80	290	110	90
16	53	F	L	12.5	12.2	165	76	241	109	90
17	59	F	R	13.2	13	102	63	165	79	70
18	60	M	R	12.3	11.9	163	25	188	105	90
19	49	F	R	13	12.5	143	43	186	82	80
20	62	F	L	14	13.8	229	32	261	93	90
21	68	M	R	14.1	14	69	12	81	98	90
22	48	F	R	12.5	12	219	24	243	103	90
23	45	F	L	12.7	12.5	123	74	197	100	90
24	50	F	R	13.2	13	111	12	123	119	90
25	53	F	R	12.4	12	139	34	173	97	90
26	42	F	L	13.6	13.3	215	32	247	93	88
27	47	F	R	13.9	13.2	340	45	385	83	78
28	52	M	R	14	13.7	196	24	220	86	80
29	60	M	R	14.9	14.7	145	88	233	74	70
30	63	F	R	11.5	11.2	127	36	163	87	80
31	54	F	L	12	11.7	229	27	256	89	80
32	55	F	R	12.6	12	136	23	159	79	70
33	56	F	R	11	10.5	153	34	187	86	80
34	58	M	R	13.5	13	164	43	207	82	77
35	54	M	R	15.5	15	173	12	185	87	80
36	47	F	R	14	14	75	43	118	76	70
37	56	M	L	13	12.9	113	31	144	87	80
38	55	F	L	12.7	12.6	124	14	138	87	80
39	60	M	R	13.8	13.1	256	9	265	78	70
40	67	M	R	15.2	14.7	152	15	167	98	90

M-Male, F-Female, L-Left, R-Right

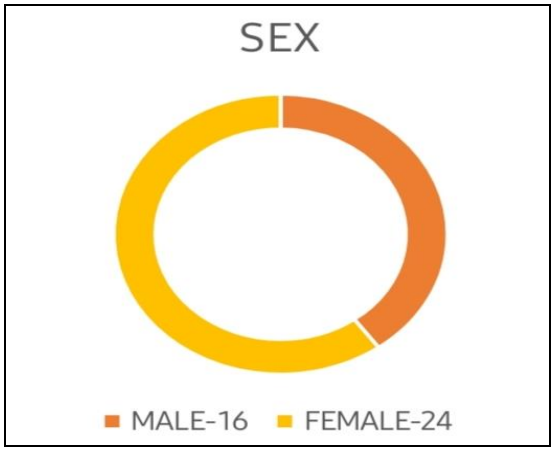

Fig 1: Gender distribution

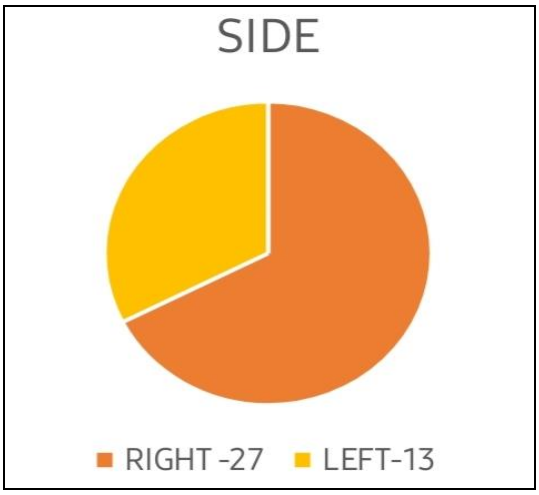

Fig 2: Side distribution:

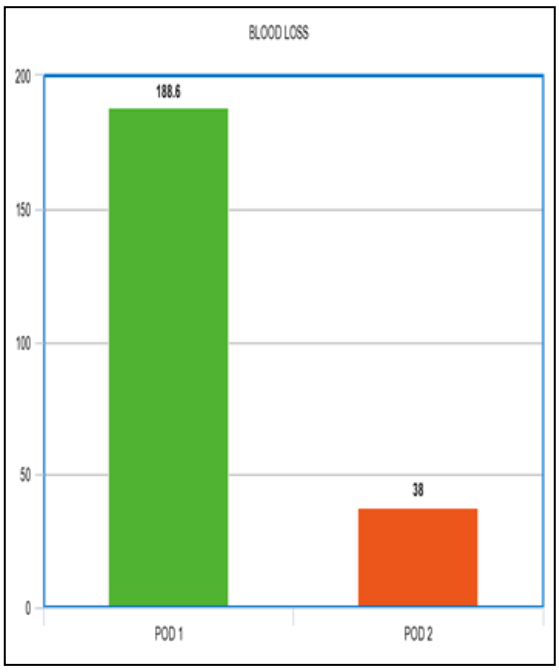

Fig 3: Blood loss postoperatively

Discussion

Total knee arthroplasty causes injury prompting hyper fibrinolytic state. Postoperative draining happens because of this state, anti-fibrinolytic medications will be more effective. Tranexamic acid is exceptionally successful to control bleeding. We concur with most reports in literature a decrease of 40% blood loss on postoperative day 1 [7-9]. Tranexamic acid diminishes blood loss and thereby blood transfusions. The blood-saving impact of tranexamic acid was generally obvious during the first 24hrs.The most significant finding of the current review is that intravenous tranexamic acid diminishes the perioperative blood loss and total blood loss and need for transfusion [10-12]. Moreover, this strategy didn't cause an expansion in the rate of thromboembolic events. In our study, TEA was given before expansion of the tourniquet at a portion of 15mg/kg BW [13, 14] and 1 more portion post operatively 6 on 8hrs later. Application of pneumatic tourniquet increases fibrinolysis because of plasminogen activator let out of the vascular endothelium, set off by hypoxia or venous stasis [13, 14]. Recent meta-examinations affirm that administration of TA lessens perioperative blood loss in TKR without expanding the frequency of thromboembolic occasions or infectious complications. However, in a meta-analysis study, it is expressed that five of the patients were diagnosed as pulmonary embolism (PE) and two of them were in TEA patients [13, 14]. Additional meta-analysis and systematic reviews dissecting the adequacy of TEA in TKA and THA have been published."Hippala, *et al.* [15] first published the utilization of TEA as an antifibrinolytic agent to diminish blood loss after TKR. TEA is generally utilized in different applications, however as of late it has started to be utilized in TKR. TEA is controlled as various techniques. Following iv application, TEA is quickly scattered into synovial fluid". "Zhang, *et al.* [16] and Yang, *et al*. published meta-analyses analyzing blood loss, transfusion rates and rates of DVT with TEA in TKA". Limitation of our review being not having a benchmark group to think about with. In our review we haven't experienced any entanglements, for example, hypersensitivity, thrombo-embolism, vomiting and so forth.

Conclusion

To conclude our study showed that tranexamic acid injection given as 1 dose preoperatively and 1 dose postoperatively could be effective in reducing total blood loss and need for blood transfusions after TKA with less thromboembolic events.

Conflict of Interest

Not available

Financial Support

Not available

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How to Cite This Article
Ganesh GS, Babu HJ, Chandrsekharan N, Vishnu M, Subash Y. A prospective study on role of tranexemic acid in reducing post-operative blood loss in TKR. International Journal of Orthopaedics Sciences. 2023;9(1):90-93.