



1. MBBS, FCPS (Orthopedics)
Senior Registrar Orthopedics
Dept. of Orthopedics & Spine
Surgery, Government Teaching
Hospital Shahdara, Lahore.
2. MBBS, MPH, FCPS
(Resident Orthopaedics Surgeon)
Department of Orthopaedics,
Ghurki trust teaching hospital,
Pakistan.
3. MBBS, FCPS (Senior Registrar)
Department of Orthopaedics,
Ghurki Trust Teaching Hospital,
Pakistan.
4. MBBS, FCPS, MSC
Department of Orthopaedics,
Ghurki Trust Teaching Hospital,
Pakistan.
5. MBBS, FCPS, Senior Registrar
Department of Orthopaedics,
Ghurki Trust Teaching Hospital,
Pakistan.
6. MBBS, FCPS,
(Orthopaedics Surgeon) Professor
Department of Orthopaedics,
Ghurki Trust Teaching Hospital,
Pakistan.
7. MBBS, FCPS (Professor)
Department of Orthopaedics,
Ghurki Trust Teaching Hospital,
Pakistan.
8. FRCS (Ed), FRCS (Glas), FCSP
(Orth), Msc (London), DCPS HPE
Ghurki Trust Teaching hospital,
Lahore.

Correspondence Address:
Dr. Ashfaq Ahmed
MBBS, MPH, FCPS
(Resident Orthopaedics Surgeon)
Department of Orthopaedics,
Ghurki trust teaching hospital,
Pakistan.
ashfaqjadoon40@yahoo.com

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INTRODUCTION

Blood loss is the normal phenomenon in total knee replacement surgeries and many patients require blood transfusions.¹ The transfusion rate in it is about of 11–21%² Several factors affect the intra operative and post-operative blood loss like factors related to patient itself etc. Intraoperative tourniquet release for haemostasis causes more blood loss as compared to release after wound closure. Similarly cementing of total knee replacements has a better haemostatic role compared to non-cemented prosthesis.³ The use of tranexamic acid play a significant and effective

TOTAL KNEE ARTHROPLASTY?;

POST OPERATIVE MEAN BLOOD LOSS WITH TRANEXAMIC ACID, IS TRANEXAMIC ACID EFFECTIVE IN REDUCING BLOOD LOSS. A RANDOMIZED CONTROLLED TRIAL IN TERTIARY CARE HOSPITAL, PAKISTAN.

Mehran Khan¹, Ashfaq Ahmed², Fraz Umer³, Atiq uz zaman⁴, Saeed Ahmad⁵, Naeem Ahmed⁶, Shahzad Javed⁷, Amer Aziz⁸

ABSTRACT... The treatment of choice for osteoarthritic knee is Total knee arthroplasty (TKA) and the most important problem in it is the blood loss. **Objectives:** To compare the post-operative mean blood loss with Tranexamic acid versus control after Total Knee Arthroplasty. **Study Design:** Randomized controlled trial. **Setting:** Ghurki Trust Teaching Hospital Lahore. **Period:** 01 year. **Methodology:** 100 patients were included and divided in 2 groups, selected by non-probability purposive sampling, fulfilling inclusion and exclusion criteria. Group T (Tranexamic) received 15mg/kg IV Tranexamic acid 10 minutes before inflating tourniquet and the same dose intravenously 3 hours post-operatively. Group C (control) received placebo (normal saline) intravenously. Blood loss collected in a container was measured with syringe/jar after 24 hours of surgery. **Results:** In group C there were 23(46%) males and 27(54%) females with male to female ratio 1:1.7 with mean age of 64yrs ± 6.3 yrs. In group T there were 28(56%) males and 22 (44%) females with male to female ratio 1.2:1 with mean age of 65yrs ± 7.4 yrs. After 24 hours Mean blood loss in Group C were 694 ±151 ml with 74 % patient in range of 600-900ml while Mean blood loss in Group T were 388 ml ±105 ml with 76 % patient in range of 300-600ml. Mean decrease in blood loss with the use of tranexamic acid { mean blood loss in T group – mean blood loss in C group } were 306 ml which were statistically significant(p< 0.05) using t Test. **Conclusion:** Tranexamic acid is a potent anti-fibrinolytic agent and its use in total knee arthroplasty results in decrease in post-operative blood loss thereby decreasing the need of blood transfusion.

Key words: Total knee arthroplasty (TKA), Tranexamic Acid (TXA), blood loss, Post-operative.

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role in overcoming the hurdle of blood loss after total knee replacements. Tranexamic acid (TXA) is an antifibrinolytic drug used as a blood-sparing technique in many surgical specialties⁴ Meta-analysis indicates that TXA may reduce post-operative, total blood loss and transfusion in patients undergoing TKA. TXA led to a significant reduction in the proportion of patients requiring blood transfusion.⁵ Wind TC et al in their study found that there were no transfusions with topical TXA.⁶ Sa-ngasoongsong P et al found that the clamping of drain along with tranexamic acid reduce the post-operative blood loss more than

the clamping of drain and tranexamic acid alone⁷ Soni A et al found that intra-articular tranexamic acid is equally effective as three dose intravenous regimen in reducing blood loss during total knee arthroplasty surgery.⁸

Different approaches had been used for the use of tranexamic acid in reducing blood loss but still debates exists. The main aim of our study was to determine the decrease in blood loss after three doses of tranexamic acid in total knee replacement.

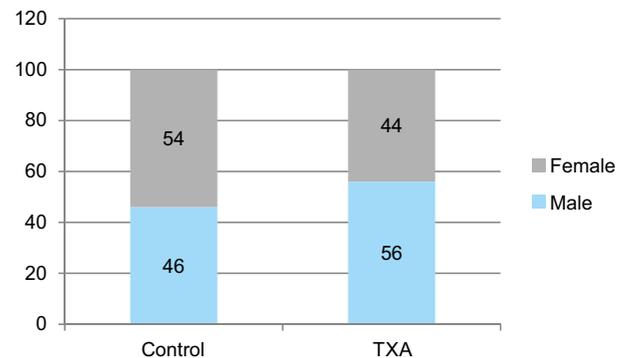
MATERIALS AND METHODS

This randomized controlled trial were conducted on 100 individuals using non probability sampling technique at Department of Orthopaedics and Spine Surgery, Ghurki Trust Teaching Hospital / Lahore Medical and Dental College, Pakistan from Jan 2016 to Dec. 2016. Patients of either sex or age between 40-80 years with osteoarthritis or rheumatoid arthritis undergoing unilateral TKA and given consent to be a part of research process were included in the study after approval from the hospital ethical committee. The patients having history of coagulopathy (INR>2), thrombosis or embolism (through medical record), or using aspirin or any other anti-platelet agent 1 week before surgery (through medical record), patients with deranged RFT (serum creatinine>1.2gm/dl) and LFTs (AST>40IU, ALT>40IU) were excluded from the study. Demographic information (name, age, sex, contact) were obtained and kept in record. They were randomly divided in 2 groups by using lottery method. Group T received 15mg/kg Tranexamic acid intravenously 10 minutes before inflating tourniquet and the same dose intravenously 3 hours post-operatively. Group C (control) was given placebo (normal saline) 10 minutes before inflating tourniquet and the same dose intravenously 3 hours post-operatively. All the patients operated by a single surgical team. The tourniquet were released before closure and hemostasis secured in all patient. All the patients were kept in ICU post operatively and monitored closely. Blood loss was collected in a container and measured with syringe/jar after 24 hours of the surgery. All the information were kept in

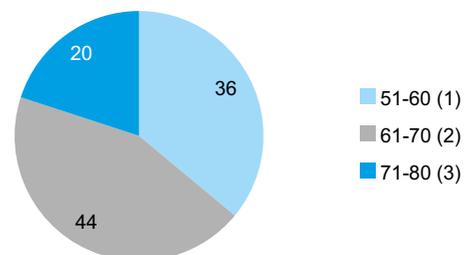
record. The collected data was entered and analyzed by using SPSS version 16. Quantitative variables like age (years) and total blood loss (ml) are expressed as mean and standard deviation. The qualitative variable like gender are presented in the form of frequency and percentage. T-test applied to compare the mean blood loss in both groups. P-value < 0.05 were considered as significant.

RESULTS

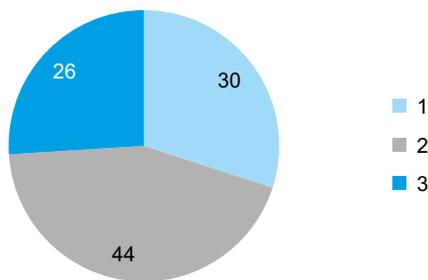
A total of 100 patients were included in the study and were divided in two groups with 50 patients in each group. In group C there were 23(46%) males and 27(54%) females with male to female ratio 1:1.7. In group T there were 28(56%) males and 22 (44%) females with male to female ratio 1.2:1. In Group C mean age was 64yrs \pm 6.3 yrs with 18 (36%) patients in age group 51-60 years, 22 (44%) of patients in age group 61-70 years and 10(20%) in age group 71-80yrs. In Group T mean age was 65yrs \pm 7.4 yrs with 15 (30%) patients in age group 51-60 years, 22 (44%) of patients in age group 61-70 years and 13(26%) in age group 71-80yrs.



Age distribution Control group



Age distribution in TXA group



Mean blood loss in Group c were 694 ± 151 ml (table 4) with 74 % patient in range of 600-900ml. Mean blood loss in Group T were $388 \text{ ml} \pm 105 \text{ ml}$ (table 4) with 76 % patient in rang of 300-600ml

Mean Blood Loss Volume & Standard Deviation in Control & TXA Groups		
	CONTROL	TXA
MEAN	694	388
SD	151	105

Mean blood loss in Control group is 694 ± 151 ml and in TXA group is 388 ± 105 ml.

t Test was applied to compare the means of the blood loss volume of Control group and TXA group using SPSS 16.0, which concluded P-value $0.000 < 0.05$ (at 95% confidence). This highlights the difference on comparing means is significant. There were no significant difference in wound infection and thromboembolic phenomenon.

DISCUSSION

Every surgical procedure in any field having the risk of blood loss, from minor to major bleed. In orthopedics the major surgeries having extensive blood loss due to more dissections and if tourniquet present due to fibrinolysis.⁹ With time different trials were made to reduce the blood loss in major orthopedics surgeries. The application and role of tranexamic acid is among one of them, this drug can be administered through four routes in TKA i-e : oral, intramuscular, intravenous, and intra-articular. In one study it has been reported that the maximum concentration in blood is 2 hours for oral, 30 minutes for intramuscular and

5–15 minutes for intravenous administration¹⁰ The main culprit behind so much blood loss in knee arthroplasty is the fibrinolysis phenomenon which has been stimulated by surgical trauma i-e dissection and increase by the use of tourniquet. To overcome this effect, tranexamic acid has been use. This synthetic drug is anti fibrinolytic and used to prevent bleeding.¹⁰ The most important role of this drug is the prevention of fibrinolysis in the wounds sparing the peripheral venous blood.¹¹ Now after the introduction of this drug, different trials had been made in different surgical procedures about the its role in reducing blood loss and most of the studies went in favour of using tranexamic acid because of its efficacy in reducing total blood loss after total knee replacement. In this study, we found that preoperative and post operative administration of tranexamic acid significantly reduces the postoperative blood loss in knee replacement surgery. Zhi-Gao Yang et all conducted a meta analysis and found that not only the blood loss is reduced with this drug but the frequency of blood transfusions were also significantly decreased.¹² The tranexamic acid can be given in different doses. According to a study of Robin G et all the mean blood loss was 462 mL with dose of 15 mL/kg group, 678 mL in 10 mg/kg group, and 918 mL in controls ($P < .01$ vs 15 mg/kg).¹³ While on other side ,the Orpen et all study having similar results that it reduces the blood loss in early post operative day but there is significant decrease in total blood loss as well as the transfusion rate.¹ The main objection with the use of this drug is because of its complications like thromboembolism etc,but the Wrong et all found that there is no increase frequency of complications with this drug.They used tranexamic acid locally in the wound and found it as significant as orally or intravenous.¹⁴ Alshryda S et all found that the evidence from trials does not support an increased risk of deep-vein thrombosis or pulmonary embolism due to TXA administration.¹⁶ Ishida et all did similar study but the significant findings beyond the reduction in blood loss after knee arthroplasty is the reduction in knee swelling,which are often the chief complaint in follow up of patients after knee arthroplasty.¹⁵

Sa-ngasoongsong P et al did another strategy, they beside the use of tranexamic acid also did clamping of drain and found more favourable results as compared to using tranexamic acid alone or clamping of drain without using this drug.⁷ PC Lin conducted a study in which they found the difference between one dose of iv tranexamic intra operatively with 2 doses of tranexamic, one given pre operatively and one given post operatively. Statistically there were no difference between two groups.¹⁷

There are certain limitations of this study. Firstly we didn't determine the decrease in haemoglobin level as well as the number of transfusions required in both groups. Moreover we didn't determine the overall decrease in blood volume loss i-e per operative blood loss were not calculated.

CONCLUSION

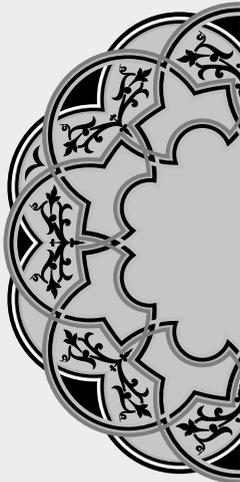
Tranexamic acid is the only option for us to reduce the blood loss. It is cheap and easily available drug without potential adverse effects. It can decrease the rate of blood transfusions and hence the complications associated with it.

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*“Two things define you:
Your patience when you have nothing, and
your attitude when you have everything”*

Unknown

AUTHORSHIP AND CONTRIBUTION DECLARATION

Sr. #	Author-s Full Name	Contribution to the paper	Author=s Signature
1	Dr. Mehran Khan	Concept	
2	Dr. Ashfaq Ahmed	Article writing	
3	Dr. Fraz Umer	Data collection	
4	Dr. Atiq uz zaman	Data analysis	
5	Dr. Saeed Ahmad	Supervision	
6	Dr. Naeem Ahmed	Supervision	
7	Dr. Shahzad Javed	Critical review	
8	Dr. Amer Aziz	Final approval	