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Original Article

Assessment of effectiveness of tranexamic acid (TA) in lower-limb arthroplasty- A clinical study

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ABSTRACT:

Background: The present study was conducted to assess effectiveness of tranexamic acid (TA) in lower-limb arthroplasty. **Materials & Methods:** 138 patients selected for lower-limb arthroplasty were divided into 3 groups. Group I received no TA, group II received 15 mg/kg IV TA and group III received 3 g IA TA. The effect on calculated total blood loss, hemoglobin, transfusion, and duration of hospitalization was studied. **Results:** The mean age was 65.2 years in group I, 64.7 years in group II and 62.3 years in group III. Knee arthroplasty was done in 22, 20 and 24 in group I, II and III respectively. Hip arthroplasty was done in 16, 19 and 12 in group I, II and III respectively and Acetabular revision in 8, 7 and 10 in group I, II and III respectively. The mean blood loss was 542.6 ml, 328.5 ml, group III was 368.2 ml in group I, II and III respectively. Post- operative hemoglobin was 11.4 g/dl, 11.6 g/dl and 11.8 g/dl in group I, II and III respectively. The mean length of hospital stay was 7.2 days, 4.6 days and 4.4 days in group I, II and III respectively. There were 25 number in group I, 12 in group II and 8 in group III needed in group I, II and III respectively. **Conclusion:** Tranexamic acid administration in patients requiring lower limb surgery is an effective way of treatment.

Key words: Tranexamic acid, Blood loss, lower limb surgery

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INTRODUCTION

Elective arthroplasty surgery of the lower limb is a surgical procedure widely performed for the treatment of terminal arthrosis. Prevalence is estimated between 2.3% and 4.5% in 2010 among adults aged 50 years or older, and >2 million procedures per year are estimated to be performed by 2020 in the United States.[1] However, it is associated with a higher morbidity and mortality than would be expected for a functional surgery. An increased perioperative blood loss is associated with increased transfusion rate, postoperative infections, poorer physical function and recovery, increased length of hospital stay, and mortality.[2] Furthermore, blood transfusion increases both morbidity and mortality[5] and is a source of cardiovascular, immunological, and viral complications. Therefore, multiple means of reducing blood loss have been studied (for example, use of a tourniquet, autotransfusion, intraoperative blood salvage, and use of iron or erythropoietin) to avoid perioperative blood transfusion.[3]

Tranexamic acid (TXA) is a synthetic lysine analog, it can competitively inhibit the activation of plasminogen and plasmin binding protein. Several randomized controlled trials (RCTs) and meta-analysis studies have shown that intravenous (IV), topical (TA) or oral application of TXA can successfully reduce blood loss and transfusions in primary TKA without increasing the risk of thrombosis.[4] Recently, an increasing number of studies have focused on the issue that when compared with only IV or TA TXA, whether combination application of IV and topical TXA has additional benefits in primary TKA.[5] Compared with IV TXA, TA application has the advantage of being easy to administer, it leads to 70% lower systemic absorption and thus may be a safer alternative to giving it systemically. Additionally, topical application of TXA has the advantage of inducing partial microvascular hemostasis by stopping fibrin clot dissolution in the affected area.[6] The present study was conducted to assess effectiveness of the combined intravenous (IV) and intraarticular (IA) administration of tranexamic acid (TA) in lower-limb arthroplasty.

MATERIALS & METHODS

The present study was conducted in the department of Orthopaedics. It consisted of 138 patients selected for lower-limb arthroplasty of both genders. All were informed regarding the study and their consent was obtained. Ethical clearance was obtained before starting the study.

Data such as name, age, gender etc. was recorded. Patients were divided into 3 groups. Group I received no TA, group II received 15 mg/kg IV TA and group III received 3 g IA TA. The effect on calculated total blood loss, hemoglobin, transfusion, and duration of hospitalization was studied. Results were analyzed statistically.

RESULTS

Table I Distribution of patients

Groups	Group I	Group II	Group III
TA	No TA	15 mg/kg IV TA	3 g IA TA
Number	46	46	46

Table I shows that group I patients received no TA, group II received 15 mg/kg IV TA and group III received 3 g IA TA. Each group had 46 patients.

Table II Comparison of parameters

Parameters	Group I	Group II	Group III	P value
M:F	26:20	22:24	20:26	18:28
Mean age (Years)	65.2	64.7	62.3	69.1
Intervention				
Knee arthroplasty	22	20	24	0.012
Hip arthroplasty	16	19	12	
Acetabular revision	8	7	10	

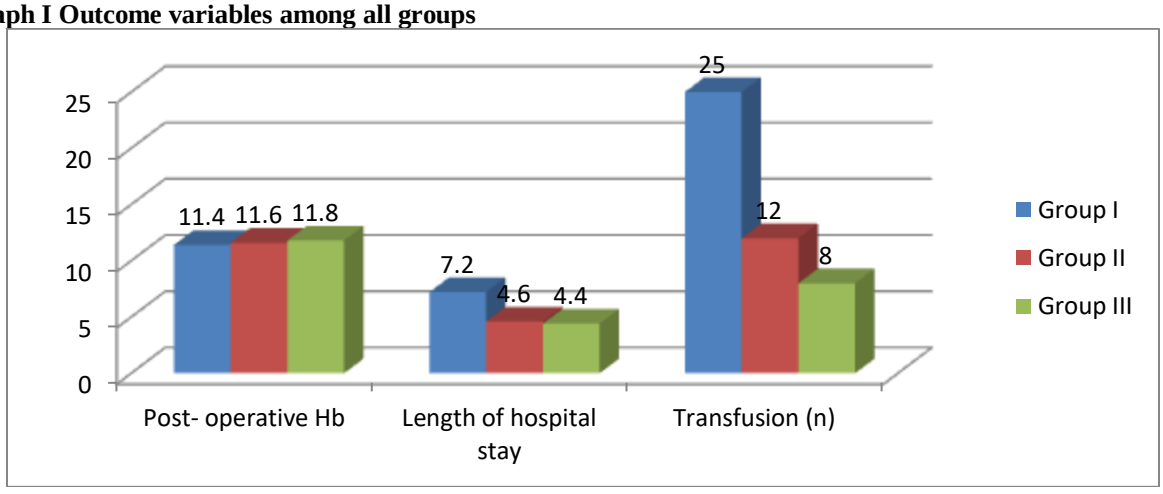
Table II shows that there were 26 males and 20 females in group I, 22 males and 24 females in group II and 20 males and 26 females in group III. The mean age was 65.2 years in group I, 64.7 years in group II and 62.3 years in group III. Knee arthroplasty was done in 22, 20 and 24 in group I, II and III respectively. Hip arthroplasty was done in 16, 19 and 12 in group I, II and III respectively and Acetabular revision in 8, 7 and 10 in group I, II and III respectively. The difference was significant (P< 0.05).

Table III Outcome variables among all groups

Parameters	Group I	Group II	Group III	P value
Blood loss	542.6	328.5	368.2	0.01
Post- operative Hb	11.4	11.6	11.8	0.92
Length of hospital stay	7.2	4.6	4.4	0.05
Transfusion (n)	25	12	8	0.05

Table III shows that mean blood loss was 542.6 ml, 328.5 ml, group III was 368.2 ml in group I, II and III respectively. Post- operative hemoglobin was 11.4 g/dl, 11.6 g/dl and 11.8 g/dl in group I, II and III respectively. The mean length of hospital stay was 7.2 days, 4.6 days and 4.4 days in group I, II and III respectively. There were 25 number in group I, 12 in group II and 8 in group III needed in group I, II and III respectively. The difference was significant (P< 0.05).

Graph I Outcome variables among all groups



DISCUSSION

Total knee arthroplasty (TKA) and total hip arthroplasty (THA) is an effective orthopedic procedure for patients with severe knee and hip diseases.[7] However, significant blood loss may occur due to hyper-fibrinolysis induced by surgical trauma or tourniquet. Thus, it often leads to significant postoperative anemia and transfusion requirements. Postoperative anemia may be an important issue associated with adverse events, including increased mortality and morbidity and prolonged hospitalization due to transfusion-related needs.[8] The efficacy of intravenous (IV) tranexamic acid (TA) due do its antifibrinolytic action has been confirmed by meta-analysis. Furthermore, its intra-articular (IA) use has been shown to reduce blood loss and the need for transfusion. Since 2014, numerous randomized controlled trials have studied the efficacy of combined IV and IA TA on blood loss as well as transfusion needs.[9] These small studies reported contradictory results as to the efficacy of TA but no increase in the occurrence of adverse events. Three meta-analyses have confirmed the benefits of the combined use of TA and its safety. However, none of these studies has formally quantified blood salvation related to the combined IV and IA administration of TA.[10] The present study was conducted to assess effectiveness of the combined intravenous (IV) and intraarticular (IA) administration of tranexamic acid (TA) in lower-limb arthroplasty.

In present study, group I patients received no TA, group II received 15 mg/kg IV TA and group III received 3 g IA TA. Each group had 46 patients. Vacheron et al[11] determined the effectiveness of the combined intravenous (IV) and intraarticular (IA) administration of TA in lower-limb arthroplasty. Patients were divided into four groups: no TA, 15 mg/kg IV TA, 3 g IA TA, and 15 mg/kg IV and 3 g IA. The effect on calculated total blood loss (milliliter of red blood cell [RBC]), hemoglobin, transfusion, and duration of hospitalization was studied after adjustment on age, American Society of Anesthesiologists, surgery, and postoperative curative anticoagulation. Complications related to TA administration were systematically reported. A total of 1909 patients were included – "no TA," n = 184; "IV," n = 1137; "IA," n = 214; and "IV + IA," n = 374. In the IV + IA group, a decrease in blood loss was observed compared to the no TA group (+220 ml 95% confidence interval of RBC $P < 0.001$) and in the IA group. The length of hospital stay of the IV + IA group was shorter compared to the no TA group to the IA group and the IV group. One case of deep vein thrombosis occurred in the group without TA.

We found that there were 26 males and 20 females in group I, 22 males and 24 females in group II and 20 males and 26 females in group III. The mean age was 65.2 years in group I, 64.7 years in group II and 62.3 years in group III. Knee arthroplasty was done in 22, 20 and 24 in group I, II and III respectively. Hip arthroplasty was done in 16, 19 and 12 in group I, II and III respectively and Acetabular revision in 8, 7 and 10 in group I, II and III respectively. Xiong et al[12] in their study a total of 6 RCTs involving 701 patients were included in the meta-analysis. The combined group provided lower total blood loss, drainage volume, maximum hemoglobin drop than IV TXA alone. No significant difference was found in terms of transfusion requirements, DVT and PE between the two group. Subgroup analyses shows that the combined group was less total blood loss in non-tourniquet ($P = 0.0008$), topical TXA dose > 1.5 g ($P < 0.00001$) and number of IV TXA ≥ 2 doses ($P = 0.005$) of TXA compared with the IV group alone.

The shortcoming of the study is small sample size.

CONCLUSION

Authors found that tranexamic acid administration in patients requiring lower limb surgery is an effective way of treatment.

REFERENCES

1. Chen JY, Chin PL, Moo IH, Pang HN, Tay DK, Chia SL, et al. Intravenous versus intra-articular tranexamic acid in total knee arthroplasty: A double blinded randomised controlled noninferiority trial. Knee. 2016;23:152–6.
2. Wu Y, Yang T, Zeng Y, Li C, Shen B, Pei F. Clamping drainage is unnecessary after minimally invasive total knee arthroplasty in patients with tranexamic acid: a randomized, controlled trial. Medicine. 2017;96:e5804.
3. Xie J, Ma J, Kang P, Zhou Z, Shen B, Yang J, et al. Does tranexamic acid alter the risk of thromboembolism following primary total knee arthroplasty with sequential earlier anticoagulation? A large, single center, prospective cohort study of consecutive cases. Thromb Res. 2015;136:234–8.
4. May JH, Rieser GR, Williams CG, Markert RJ, Bauman RD, Lawless MW. The assessment of blood loss during Total knee arthroplasty when comparing intravenous vs Intracapsular Administration of Tranexamic Acid. J Arthroplast. 2016;31:2452–7.
5. Georgiadis AG, Muh SJ, Silverton CD, Weir RM, Laker MW. A prospective double-blind placebo controlled trial of topical tranexamic acid in total knee arthroplasty. J Arthroplast. 2013;28:78–82.
6. MacGillivray RG, Tarabichi SB, Hawari MF, Raoof NT. Tranexamic acid to reduce blood loss after bilateral total knee arthroplasty: A prospective, randomized double blind study. J. Arthroplasty. 2011;26:24–8.
7. Wang H, Shen B, Zeng Y. Comparison of topical versus intravenous tranexamic acid in primary total knee arthroplasty: a meta-analysis of randomized controlled and prospective cohort trials. Knee. 2014;21:987–93.
8. Wei Z, Liu M. The effectiveness and safety of tranexamic acid in total hip or knee arthroplasty: A meta-analysis of 2720 cases. Transfusion medicine (Oxford, England). 2015;25:151–62.

9. Charoencholvanich K, Siriwattanasakul P. Tranexamic acid reduces blood loss and blood transfusion after TKA: A prospective randomized controlled trial. Clin Orthop Relat Res. 2011;469:2874–80.
9. Tzatzairis TK, Drosos GI, Kotsios SE, Ververidis AN, Vogiatzaki TD, Kazakos KI. Intravenous vs topical tranexamic acid in Total knee arthroplasty without tourniquet application: a randomized controlled study. J Arthroplast. 2016; 31:2465–70.
10. Vacheron CH, Roy P, Petit PY, Appery J, Fessy M, Piriou V, Viste A, Friggeri A. Effectiveness and Safety of the Combined Use of Tranexamic Acid: A Comparative Observational Study of 1909 Cases. Indian Journal of Orthopaedics. 2020 Sep;54(1):165-71.
11. Xiong H, Liu Y, Zeng Y, Wu Y, Shen B. The efficacy and safety of combined administration of intravenous and topical tranexamic acid in primary total knee arthroplasty: a meta-analysis of randomized controlled trials. BMC musculoskeletal disorders. 2018 Dec 1;19(1):321.