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The effect of intra articular tranexemic acid on the postoperative haemoglobin and requirement of blood transfusion

Dr. Deepak Aher[1], Dr. Tejas Upasani[2*], Dr. Meghal Shah[3], Dr. Tanmay Shah[4]
[1.] Senior Registrar, Upasani Superspeciality Hospital, Mumbai, Maharashtra, India
[2.] Consulatant Orthopaedic Surgeon, Upasani Superspeciality Hospital, Mumbai, Maharashtra, India
[3.] DNB Resident, Maharaja Agrasen Hospital, Delhi, India
[4.] Resident, Jagjiwan Ram Western Railway Hospital, Mumbai, Maharashtra, India

Abstract
Objective: Different strategies have been developed to reduce blood loss in total knee arthroplasty (tKA). The efficacy of both systemic and local tranexamic acid (tXA) administration is demonstrated in the literature. The aim of the present study was to assess the efficacy of local tranexamic acid in reducing blood loss and requirement of blood transfusion in total knee replacement.
Methods: The retrospective study was conducted at our super speciality Hospital and comprised data of patients who underwent total knee replacement between January 2018 and December 2018. The effect of intra articular tranexamic acid on postoperative haemoglobin and number of blood units transfused was noted.
Results: A total of 100 patients undergoing knee replacement surgeries were selected with 20(20%) men and 80(80%) women. The overall mean age was 62 years (range: 42-86 years). Local Tranexamic acid was used in all the patients. When it was used, only 2 (2%) patients required blood transfusion. the average fall in haemoglobin postoperatively was 0.872 gm/dl.
Conclusion: Intra articular Tranexamic acid was able to reduce total blood loss and transfusion requirements

Keywords: total knee replacement, joint replacement, tranexamic acid, blood loss

Introduction
Total knee replacement (TKR) is usually associated with postoperative blood loss [1]. Also, due to use of tourniquet for prolonged period of time, TKR is associated with increased risk of local fibrinolytic activity [2-5]. Antifibrinolytic drugs, including aprotin, aminocaproic acid, and tranexamic acid (TXA) have been proposed, as hyperfibrinolysis is considered the major cause of postoperative bleeding after TKR surgery. Tranexamic acid (TXA), a synthetic anti-fibrinolytic agent is approximately 7-10 times more potent than epsilon-aminocaproic acid and competitively blocks the lysine-binding site of plasminogen, plasmin, and tissue plasminogen activator which prevents their association with fibrin [4, 6]. Different Authors have proposed topical intraarticular (IA) administration of TXA before wound closure to reduce the possible complications related to the risk of thrombotic events [7-9]. The present study was conducted to evaluate the effect of the use of TXA on postoperative blood loss and transfusion requirements in patients undergoing TKR.

Materials and method
This retrospective study was conducted at our superspeciality hospital. The data of patients who underwent TKR between January 2018 and December 2018 was collected.

Inclusion criteria
1. Unilateral and bilateral TKR

Exclusion criteria
1. Revision knee
2. Additional procedures done other than TKR
3. Those with incomplete data

Preoperatively if any patient taking aspirin or clopidogrel were instructed to stop this platelet lowering drug 3 days before surgery and this drug was restarted 3 days after surgery. All surgeries were done by same surgical team. An appropriate sized tourniquet was applied in proximal thigh with pressure maintained at 300 mm HG. Surgery was done using either standard Medial Parapatellar Arthrotomy or subvastus approach. Bony cuts in Tibia, femur and patella were made using standard jigs. Before proceeding to final cuts, soft tissue balance was checked. Wound was thoroughly irrigated with normal saline and final implantation of appropriate sized components were done using bone cement. All visible blood vessels in the field were coagulated. Drain was not used in any case. IA (intraarticular) TXA was given. Wound closure was done in layers. tourniquet was deflated before skin closure. Compressive Dressing was done.

Results
A total of 100 patients were studied, with females being 80 (80%) and males 20(20%). The mean age was 62 years (42-86 years).

The mean preoperative haemoglobin was 11.99 gm/dl and the mean postoperatvieve haemoglobin was 11.12 gm/dl. the mean fall in hemoglobin was 0.87 by calculating the difference between mean preop and mean post op and 0.872 by taking mean of all the patients total fall in hemoglobin. Only 2 patients required blood transfusion post operatively

Discussion

After TKR, the reported incidence of blood loss ranges from 500ml to 1500ml depending on patients and surgery variables [10-15]. In terms of pharmacology, blood loss in TKR can be reduced by various antifibrinolytic agents such as e-aminocaproic acid, aprotinin and TXA. As TXA is cheaper and less allergenic than aprotinin and is more potent than e-aminocaproic acid, it is preferred [4]. Some studies suggest that administration of Tranexemic acid has decreased postop blood transfusion [16]. A potential increased risk of thrombotic events and some cases of allergic reaction were found by some authors on administration of TXA [17]. Wong *et al*. demonstrated that after topical application, the plasma level of TXA was significantly (~70%) lower than that following an equivalent dose of TXA via systemic administration [18]. They concluded that, topical intra-articular application of TXA during TKA is safer in terms of thromboembolic risk than systemic administration so, the iA route of tXA administration was proposed. The latest RCT comprising of 200 patients in 4 groups undergoing primary navigated TKA were compared : control, IV TXA, IA TXA, and combined [19]. The authors found that TXA use decreased blood loss. Contrary to the previous RCTs, no differences among the single or combined administration routes were noticed with conclusion that there are no added advantages in combining multiple TXA administration. Lin *et al*., in a study of 120 patients, demonstrated greater reductions in blood loss, hemoglobin drop, total drain amount and transfusion rate using a combined protocol as compared to iA administration alone [20].

Konig *et al*. reported a reduction in blood loss (1729 mL versus 1384 mL) and a lower transfusion rate (10% versus 0%) after topical administration of 3 g TXA in standard TKA patients as compared with the control group. [21] A recent meta-analysis showed that IA TXA in patients undergoing TKA is both effective and reliable in reducing blood loss and avoiding the need for blood transfusion without increasing the rate of DVT [22]. Soni *et al*. showed that intra-articular administration of TXA can equally be efficient as a three-dose IV regimen in reducing intraoperative blood loss during TKA [23].

One of the limitations of the present study is the use of drainage. It has been reported that drains can increase blood loss and that they may not be accurate for calculating postoperative blood loss owing to the progressive reduction in hematocritover time [24, 25]. Recently, Hamlin *et al*. showed that topical TXA diminished the rate of transfusion compared to IV TXA in patients who underwent primary TKA (0% versus 2.4%) [26]. Also, Seo *et al*. found that topical TXA was more effective in terms of reducing blood loss and the frequency of blood transfusion in patients with TKA [27]. In theory, topical application of TXA may be safer than intravenous administration because topically applied TXA results in a 90% reduction in plasma concentration compared to intravenous [28, 29]. Like other studies, there were some limitations in our study. The sample size was limited and we did not compare the different regimens of TXA administration such as different doses of the drug. Also, in our study the level of TXA in circulation was not measured. The postoperative Hb level was compared only at 24 hours and it seems that a more detailed investigation can be helpful.

Conclusion

Overall, Intra articular tranexamic acid reduces the fall in haemoglobin post operatively and also need for post operative blood transfusion is reduced

References

1. Sehat KR, Evans RL, Newman JH. Hidden blood loss following hip and knee arthroplasty. Correct management of blood loss should take hidden loss into account. J Bone Joint Surg Br. 2004; 86:561-5.
2. Alvarez JC, Santiveri FX, Ramos I, Vela E, Puig L, Escolano F. Tranexamic acid reduces blood transfusion in total kneearthroplasty even when a blood conservation program is applied. Transfusion. 2008; 48:519-25.
3. Zohar E, Fredman B, Ellis M, Luban I, Stern A, Jedeikin R. A comparative study of the postoperative allogeneic blood-sparing effect of tranexamic acid versus acute normovolemic hemodilution after total knee replacement. Anesth Analg. 1999; 89:1382-7.
4. Hoylaerts M, Lijnen HR, Collen D. Studies on them echanism of the antifibrinolytic action of tranexamic acid. Biochim Biophys Acta. 1981; 673:75-85.
5. Wittmann FW, Ring PA. Blood loss associated with Ring uncemented total knee replacement: comparison between continuous and intermittent suction drainage. J R Soc Med. 1984; 77: 556-8.
6. Horrow JC, Van Riper DF, StrongMD, Grunewald KE, Parmet JL. The dose-response relationship of tranexamic acid. Anesthesiology. 1995; 82: 383-92.
7. soni A, saini R, Gulati A, *et al*. Comparison between intravenous and intra-articular regimens of tranexamic acid in reducing blood loss during total knee arthroplasty. J Arthroplasty. 2014; 29:1525-1527.
8. Patel Jn, spanyer JM, smith Ls, *et al*. Comparison of intravenous versus topical tranexamic acid in total knee arthroplasty: a prospective randomized study. J Arthroplasty. 2014; 29:1528-1531.
9. Chen s, Wu K, Kong G, *et al*. the efficacy of topical tranexamic acid in total hip arthroplasty: a meta-analysis. BMC Musculoskelet Disord. 2016; 17:81.
10. Mylod AG Jr, France MP, Muser DE, Parsons JR. Perioperative blood loss associated with total knee arthroplasty. A comparison of procedures performed with and without cementing. J Bone Joint Surg Am. 1990; 72:1010-2.
11. Burkart BC, Bourne RB, Rorabeck CH, Kirk PG, Nott L. The efficacy of tourniquet release in blood conservation after total knee arthroplasty. Clin Orthop Relat Res. 1994; 299:147-52.
12. Karnezis TA, Stulberg SD, Wixson RL, Reilly P. The hemostatic effects of desmopressin on patients who had total joint arthroplasty. A double-blind randomized trial. J Bone Joint Surg Am. 1994; 76:1545-50.

13. Goodnough LT, Verbrugge D,Marcus RE. The relationship between hematocrit, blood lost, and blood transfused in total knee replacement. Implications for postoperative blood salvage and reinfusion. Am J Knee Surg. 1995; 8:83-7.
14. Fragen RJ, Stulberg SD, Wixson R, Glisson S, Librojo E. Effect of ketorolac tromethamine on bleeding and on requirements for analgesia after total knee arthroplasty. J Bone Joint Surg Am. 1995; 77: 998-1002.
15. Faunø P, Suomalainen O, Rehnberg V, Hansen TB, Krøner K, Soimakallio S, *et al*. Prophylaxis for the prevention of venous thromboembolism after total knee arthroplasty. A comparison between unfractionated and low-molecular-weight heparin. J Bone Joint Surg Am. 1994; 76:1814-8.
16. Ho KM, Ismail H. Use of intravenous tranexemic acid to reduce allogenic blood transfusion in total hip and knee arthroplasty a meta analysis Anaesth intensive care. 2003; 31(5):529-537.
17. Tengborn L, Blomback M, Berntorp E. tranexamic acid-an old drug still going strong and making a revival. thromb Res. 2015; 135:231-242.
18. Wong J, Abrishami A, Beheiry H El, *et al*. Topical application of tranexamic acid reduces postoperative blood loss in total knee arthroplasty: a randomized, controlled trial," The Journal of Bone and Joint Surgery—American. 2010; 92(15): 2503-2513.
19. Song EK, Seon JK, Prakash J, *et al.* Combined administration of IV and topical tranexamic acid is not superior to either individually in primary navigated TKA J Arthroplasty. 2017; 32(1):37.
20. Lin sY, Chen CH, Fu YC, *et al*. the efficacy of combined use of intraarticular and intravenous tranexamic acid on reducing blood loss and transfusion rate in total knee arthroplasty. J Arthroplasty. 2015; 30:776-780.
21. Konig G, Hamlin BR, Waters JH. Topical tranexamic acid reduces blood loss and transfusion rates in total hip and total knee arthroplasty," The Journal of Arthroplasty. 2013; 28(9):1473–1476.
22. Zhao Yu C, Yan G, Wei C, Yuejv L, Ying Ze Z. Reduced blood loss after intra-articular tranexamic acid injection during total knee arthroplasty: a meta-analysis of the literature Knee Surg Sports Traumatol Arthrosc. 2014; 22(12):3181.
23. Soni A, Saini R, Gulati A, Paul R, Bhatty S, Rajoli SR. Comparison between intravenous and intra-articular regimens of tranexamic acid in reducing blood loss during total knee arthroplasty. J Arthroplasty. 2014; 29(8):1525-7.
24. Husted H, Gromov K, Malchau H, *et al.* Traditions and myths in hip and knee arthroplasty Acta Orthop. 2014; 85(6): 548.
25. Harrap RS, Whyte GS, Farrugia A, Jones C. Some characteristics of blood shed into the Solcotrans postoperative orthopaedic drainage/reinfusion system Med J Aust. 1992; 157(2): 95.
26. Hamlin BR, DiGioia AM, Plakseychuk AY, Levison TJ. Topical versus intravenous tranexamic acid in total knee arthroplasty. J Arthroplasty. 2015; 30(3):384-6.
27. Seo JG, Moon YW, Park SH, Kim SM, Ko KR. The comparative efficacies of intra-articular and IV tranexamic acid for reducing blood loss during total knee arthroplasty. Knee Surg Sports Traumatol Arthrosc. 2013; 21(8):1869-74.
28. Abrishami A, Wong J, El Beheiry H, Hasan SM, Chung F. Intra-articular application of tranexamic acid for perioperative blood loss in total knee arthroplasty: a randomized controlled trial. Can J Anesth, 2009, 56.

Mc Cormack PL. Tranexamic acid: a review of its use in the treatment of hyperfibrinolysis. Drugs. 2012; 72:585-617. https://doi.org/10.2165/11209070- 000000000-00000.