World Journal of Pharmaceutical Sciences
ISSN (Print): 2321-3310; ISSN (Online): 2321-3086
Published by Atom and Cell Publishers
Available online at: http://www.wjpsonline.org/
Original Article

A Study on Topical Tranexamic Acid to Reduce Postoperative Blood Loss in Total Knee Arthroplasty in a Tertiary Government Hospital

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Received: 14-11-2014 / Revised: 15-12-2014 / Accepted: 16-12-2014

ABSTRACT

This study was performed to test the effectiveness of topical tranexamic acid (TXA) in reducing blood loss in Total Knee Arthroplasty surgeries. Study done in RIMS General Hospital Kadapa from 2012 to 2014. There was minimal systemic absorption, and no difference in the rates of deep-vein thrombosis or pulmonary embolism between patients who received tranexamic acid and those who received the placebo.

Key words: Topical Tranexamic Acid, RIMS Kadapa, Total Knee Arthroplasty

INTRODUCTION

Total knee arthroplasty decreases pain and restores function in patients with osteoarthritis of the knee, but it is associated with postoperative blood loss resulting in anemia and allogeneic blood transfusion in 10% to 38% of patients [1-4]. Preoperative autologous blood donation is costly; does not eliminate the risks of clerical errors or bacterial contamination; and may be unused, leaving patients anemic. Different blood loss prevention protocols have been adopted after total knee replacement (TKR) because bleeding is a major complication of TKR and transfusions is frequently required [5]. Increased bleeding has been associated with delayed recovery, increased complications, increased costs and decreased patient satisfaction.

Many RCT studies support efficacy and safety of intravenous (IV) use but there are concerns regarding IV administration of tranexamic acid (TXA) in some settings, and topical application may be considered an alternative with less risk than IV use [6].

Safety have been confirmed in studies comparing TXA treatment against placebo [7-10], but in many studies that showed equivalent safety, TXA is used in patients groups that were selected to exclude complicated patients at risk of DVT, with thromboembolic or heart disease.

The preparation and topical application of tranexamic acid proceeds in three stages:

Step 1: Prepare Solution
Prepare tranexamic acid solution using aseptic technique.
Prepare the 3-g solution by combining three vials of sterile (preservative-free) tranexamic acid with 70 ml of sterile normal saline solution for a total volume of 100 ml. Each 10-ml, vial contains 1g of tranexamic acid. If you are using the 1.5-g solution, prepare it by combining 1.5 g of tranexamic acid (15 ml) and 85 ml of sterile normal saline solution for a total volume of 100 ml.

Step 2: Apply Solution
Apply tranexamic acid solution to the open joint and soft-tissue surfaces.
After all components are cemented into place, with the pneumatic tourniquet inflated and the knee in extension, apply the tranexamic acid solution to the open joint and soft-tissue surfaces using a bulb syringe. Leave the solution in contact with the tissues for five minutes.

Step 3: Remove Solution and Close
Remove tranexamic acid, keeping the tourniquet inflated until the wound is closed and the dressing is applied.
After five minutes, remove the remaining tranexamic acid solution by placing the suction tip on the cemented component without suctioning other parts of the joint and surrounding soft tissues. Some solution may be absorbed into the tissue. Do

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not irrigate the wound again. Keep the tourniquet inflated until the wound is closed and the dressing is applied.

RESULTS

Topical application of tranexamic acid directly into the surgical wound prior to closure at the end of a total knee arthroplasty reduces postoperative bleeding by 20% to 25%, or 300 to 400ml. This resulted in 16% to 17% higher postoperative hemoglobin levels compared with those in the placebo group. There was minimal systemic absorption and no difference in the rates of deep-vein thrombosis or pulmonary embolism between patients who received tranexamic acid and those who received the placebo.

What to Watch For

Indications

Primary or revision total knee arthroplasty performed with a pneumatic tourniquet.

Contraindications

Allergy to tranexamic acid.

History of thromboembolic disease (for example, deepvein thrombosis, pulmonary embolus, or cerebral vascular accident).

Pregnancy and breast-feeding. Tranexamic acid crosses the placenta and is passed into breast milk during lactation.

Disturbance of color vision is a contraindication to use of tranexamic acid, and retinal changes can be caused by long-term use and large doses.

Renal failure. Topical administration of tranexamic acid is associated with minimal systemic absorption; however, this medication is eliminated by glomerular filtration and can accumulate in patients with renal failure.

Pitfalls & Challenges

The solution should be used within twenty-four hours after preparation.

The volume of study medication used in our study (100 ml) can be too large for the joint space in some patients.

Clinical Comments

In our study, we did not directly investigate the effect of tranexamic acid on the local tissue, prosthetic joint, or healing of the wound. We inferred that the topical application of tranexamic acid did not affect postoperative wound-healing or patient function on the basis of a lack of a significant difference between placebo and tranexamic acid groups with regard to postoperative knee flexion, visual analogue pain scores, length of hospital stay, time to the start of rehabilitation, and improvement in functional scores on the Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC) six weeks after surgery [11,12].

In our study, we did not include patients who had undergone revision total knee arthroplasty as we had a limited number of such patients. However, we believe that patients undergoing revision surgery may receive an even greater benefit from the use of topical tranexamic acid, and we recommend and use the medication in this patient population.

We found that the total volume of medication used in our original study (100ml) can be too large for the joint space in some patients, and since completing the study we have used a smaller total volume of tranexamic acid solution, usually 80 ml. This volume of tranexamic acid solution still ensures contact of the medication with the tissue surfaces of the knee. The volume of the tranexamic acid solution and the duration for which the medication was left in place in our study were based on studies of topical administration of tranexamic acid in cardiac surgery. In those randomized trials, the tranexamic acid was diluted with sterile normal saline solution to a volume of 100 ml. The medication or placebo (an equal amount of saline solution) was poured into the pericardial cavity and/ or over the mediastinal tissues at the end of the surgery and before the closure of the median sternotomy and was left for two to five minutes. We did not compare different durations for which the medication was left in place. It is possible that a shorter duration of application is also effective for reducing postoperative blood loss.

Conflict of Interest: Nil

References

1. 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;8:83-87.
2. Bierbaum BE, Callaghan JJ, Galante JO, Rubash HE, Tooms RE, Welch RB. An analysis of blood management in patients having a total hip or knee arthroplasty. J Bone Joint Surg [Am] 1999;81-A:2-10.
3. Bong MR, Patel V, Chang E, Issack PS, Hebert R, Di Cesare PE. Risks associated with blood transfusion after total knee arthroplasty. J Arthroplasty 2004;19:281-287.

4. Freedman J, Luke K, Monga N, Lincoln S, Koen R, Escobar M, Chiavetta J. A provincial program of blood conservation: The Ontario Transfusion Coordinators (ONTraC). Transfus Apher Sci 2005;33:343-349.
5. Zhang H, Chen J, Chen F, et al. The effect of tranexamic acid on blood loss and use of blood products in total knee arthroplasty: a meta-analysis. Knee Surg Sports Traumatol Arthrosc 2012;20:1742-52.
6. Luigi Sabatini and Francesco Atzori. Topical intra-articular and intravenous tranexamic acid to reduce blood loss in total knee arthroplasty. Ann Transl Med. 2015 May; 3(Suppl 1): S18.
7. Alshryda S, Mason J, Vaghela M, et al. Topical (intra-articular) tranexamic acid reduces blood loss and transfusion rates following total knee replacement: a randomized controlled trial (TRANX-K). J Bone Joint Surg Am 2013;95:1961-8.
8. Ishida K, Tsumura N, Kitagawa A, et al. Intra-articular injection of tranexamic acid reduces not only blood loss but also knee joint swelling after total knee arthroplasty. Int Orthop 2011;35:1639-45.
9. Wong J, Abrishami A, El Beheiry H, et al. Topical application of tranexamic acid reduces postoperative blood loss in total knee arthroplasty: a randomized, controlled trial. J Bone Joint Surg Am 2010;92:2503-13.
10. Roy SP, Tanki UF, Dutta A, et al. Efficacy of intra-articular tranexamic acid in blood loss reduction following primary unilateral total knee arthroplasty. Knee Surg Sports Traumatol Arthrosc 2012;20:2494-501.
11. N. Bellamy. WOMAC Osteoarthritis Index User Guide. Version V. Queensland, Brisbane .2002.
12. N. Bellamy, W.W. Buchanan, C.H. Goldsmith, J. Campbell, L.W. Stitt. Validation study of WOMAC: a health status instrument for measuring clinically important patient relevant outcomes to antirheumatic drug therapy in patients with osteoarthritis of the hip or knee. J Rheumatol, 15 (1988), pp. 1833–1840.