

ORIGINAL RESEARCH

Assessment of role of intravenous tranexamic acid in reducing the blood loss during total knee arthroplasty

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ABSTRACT

Background: The present study was conducted for assessing the role of intravenous tranexamic acid in reducing the blood loss during total knee arthroplasty. **Materials & methods:** A total of 40 osteoarthritis patients were enrolled. Complete demographic and clinical details of all the patients was obtained. The patients were divided in two groups by random allocation as follows: Group A – 20 patients with administration of intravenous tranexamic acid, and Group B- 20 patients who were not administered tranexamic acid. The tourniquet was used in all the cases at appropriate pressure and for the appropriate duration. Tranexamic acid was given 30 mins pre operatively. Patients were assessed for preoperative hemoglobin levels. We evaluated the amount of blood loss occurring during the total knee arthroplasty with and without the administration of tranexamic acid. **Results:** Mean perioperative blood loss among patients of group A and group B was 275.6 ml and 414.7 ml respectively. Mean postoperative blood loss among patients of group A and group B was 684.9 ml and 911.8 ml respectively. Mean units of blood transfused peri-operatively among patients of group A and group B was 0.38 units and 1.12 units respectively. On comparing, the results were found to be statistically significant. **Conclusion:** TXA administered intravenously to TKA patients resulted in lower drainage blood loss and lower transfusion frequency and volume. Thus, by preserving a hemodynamically stable state and lowering the likelihood of transfusion-related adverse effects and problems, TXA may contribute to enhancing the general health of patients receiving TKA.

Key words: Tranexamic acid, Blood loss, Arthroplasty

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INTRODUCTION

The knee is typically described as a hinged joint. Physiologically, it also undergoes axial rotation and femoral "rollback" in deeper degrees of flexion. Knee arthroplasty i.e. reconstruction of the knee joint is a very reliable procedure with predictable results. TKA provides reliable outcomes for patients suffering from end-stage, tri-compartmental, degenerative osteoarthritis (OA). Even with appropriate techniques, new technologic advances, and a better understanding of knee kinematics, approximately 1 out of 5 people who undergo TKA remain unsatisfied. There are numerous TKA designs and different levels of constraints for particular cases.^{1, 2} Several measures have been introduced to limit blood loss during and following tranexamic acid (TXA), including the use

of tourniquets, autologous blood transfusion, drain clamping or re-transfusion drains, computer assisted surgery, hypotensive anesthesia, as well as various pharmaceuticals. The efficacy and drawbacks of these blood management strategies are frequently debated. While erythropoietin and antifibrinolytic drugs such as TXA are known to be effective with limited side effects, fibrinogen and fibrin sealants were recently found ineffective.^{3, 4} Likewise, the use of tourniquets reduced blood loss intraoperatively, but not postoperatively, hence a diminished net effect, as well as risks of bruising, neurovascular injury, and metabolic disturbance. There is a significant influence of preoperative Hb on the requirement for transfusion in TKA. Patients with Hb greater than 150 g/L preoperatively rarely require allogenic blood. Risk

factors associated with an increased need for transfusion include weight, age greater than 75 years, male gender, hypertension and body mass index less than 27 kg/cm². Therefore, in patients with multiple risk factors, it is vitally important to correct anaemia and maximize preoperative red cell mass. Erythropoietin is a synthetic hormone, stimulating progenitor cells in the bone marrow to differentiate into red blood cells and activating hematopoiesis. Erythropoietin is a powerful agent in correcting anaemia.^{5, 6} Hence; the present study was conducted for assessing the role of intravenous tranexamic acid in reducing the blood loss during total knee arthroplasty.

MATERIALS & METHODS

The present study was conducted for assessing the role of intravenous tranexamic acid in reducing the blood loss during total knee arthroplasty. A total of 40 OA patients were enrolled. Complete demographic and clinical details of all the patients was obtained. The patients were divided in two groups by random allocation as follows: Group A – 20 patients with administration of intravenous tranexamic acid, and Group B- 20 patients who were not administered tranexamic acid. The tourniquet was used in all the cases at appropriate pressure and for the appropriate duration. Tranexamic acid was given 30 mins pre

operatively. Patients were assessed for preoperative hemoglobin levels. We evaluated the amount of blood loss occurring during the total knee arthroplasty with and without the administration of tranexamic acid. All the results were recorded and analysed using SPSS software.

RESULTS

Mean age of the patients of group A and group B was 62.3 years and 64.8 years respectively. Both the groups were comparable in terms of age-wise distribution of patients. 80 percent of the patients of group A and 70 percent of the patients of group B were females while the remaining were males. Both the groups were comparable in terms of gender-wise distribution of patients. Mean perioperative blood loss among patients of group A and group B was 275.6 ml and 414.7 ml respectively. Mean postoperative blood loss among patients of group A and group B was 684.9 ml and 911.8 ml respectively. Mean units of blood transfused peri-operatively among patients of group A and group B was 0.38 units and 1.12 units respectively. On comparing, the results were found to be statistically significant. While comparing, it was seen that mean Haemoglobin at postoperative day 1 and postoperative day 7 was significantly lower among patients of group B in comparison to patients of group A.

Table 1: Perioperative blood loss (ml)

Perioperative blood loss (ml)	Group A	Group B
Mean	275.6	414.7
SD	71.3	98.4
p-value	0.000*	

*: Significant

Table 2: Total volume of postoperative blood loss

Postoperative Blood loss (ml)	Group A	Group B
Mean	684.9	911.8
SD	81.3	113.7
p- value	0.000*	

*: Significant

Table 9: Units of perioperative blood transfusions

Units of blood transfused	Group A	Group B
Mean	0.38	1.12
SD	0.81	1.23
p- value	0.000*	

*: Significant

DISCUSSION

Total knee arthroplasty (TKA) is among the most commonly performed orthopedic procedures. With the ageing of the population, increase in life expectancy and our ability to more effectively manage comorbidities in the perioperative period, the number of people undergoing joint replacement surgery has been steadily increasing over the last decades and that trend is going to continue into the foreseeable future. Tranexamic acid, a synthetic derivative of the

amino acid lysine, is an antifibrinolytic that competitively inhibits the activation of plasminogen to plasmin.⁷⁻⁹ Hence; the present study was conducted for assessing the role of intravenous tranexamic acid in reducing the blood loss during total knee arthroplasty.

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group A and 70 percent of the patients of group B were females while the remaining were males. Both the groups were comparable in terms of gender-wise distribution of patients. Mean perioperative blood loss among patients of group A and group B was 275.6 ml and 414.7 ml respectively. Mean postoperative blood loss among patients of group A and group B was 684.9 ml and 911.8 ml respectively. Li et al in 2020 assessed the efficacy and safety of the intravenous (IV) administration combined with topical administration of tranexamic acid (TXA) in patients (aged over 60) scheduled for a 2-level lumbar fusion surgery. Two hundred eighty patients scheduled for a 2-level lumbar fusion surgery were randomized into four groups. Patients in the combined group, in the IV group, in the topical group, and in the control group were administered with 15 mg/kg of IV-TXA + 2 g TXA in local, 15 mg/kg IV-TXA, 2 g TXA in local, and 100 ml IV, respectively. The results of total blood loss (TBL), maximum hemoglobin drop, the transfusion rate, and the number of allogeneic blood units were compared. The combined use of TXA effectively reduced the total blood loss and blood transfusion rate in patients aged over 60 scheduled for a 2-level lumbar fusion, without increasing the incidence of DVT and PE formation.⁹

Mean units of blood transfused peri-operatively among patients of group A and group B was 0.38 units and 1.12 units respectively. On comparing, the results were found to be statistically significant. While comparing, it was seen that mean Haemoglobin at postoperative day 1 and postoperative day 7 was significantly lower among patients of group B in comparison to patients of group A. Konarski et al reviewed medical records of a total of 491 patients undergoing arthroplasty. 226 patients were administered TXA IV, and 265 did not receive an additional intervention. In the TXA group, 7/226 patients required BT vs. 41/265 in the non-TXA group ($p < 0.001$). The Non-TXA group required a significantly higher blood transfusion volume than the TXA group (mean 82,42 mL vs. 12,74 mL; $p < 0.001$). They conclude that two doses of 1g TXA administered [intravenously (IV)] before incision and during skin suturing reduce the need for blood transfusion in patients undergoing JRS.¹⁰ Zha et al investigated the efficacy and safety of intravenous TXA in primary THA via the direct anterior approach (DAA). They performed a retrospective analysis of prospectively collected data on 70 patients with nontraumatic avascular necrosis of the femoral head who underwent THA via the DAA. Patients were divided into two groups: TXA group (39 patients) received 1.5 g TXA intravenously and control group (31 patients) did not receive TXA. Patients were assessed by operative time, postoperative hemoglobin (HB) drop, transfusion rate, postoperative length of hospital stays (LHS), deep vein thrombosis (DVT), and Harris hip score (HHS). Total blood loss, hidden blood loss, and postoperative HB drop in the TXA

group were significantly lower than in the control group ($p < 0.05$). There was no statistical difference between the two groups in terms of intraoperative blood loss, operative time, transfusion rate, postoperative LHS, HHS, or incidence of DVT ($p > 0.05$). TXA may reduce perioperative blood loss without increasing complications in THA via the DAA.¹¹

CONCLUSION

TXA administered intravenously to TKA patients resulted in lower drainage blood loss and lower transfusion frequency and volume. Thus, by preserving a hemodynamically stable state and lowering the likelihood of transfusion-related adverse effects and problems, TXA may contribute to enhancing the general health of patients receiving TKA.

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