

Cohort study to evaluate the efficacy and potency of tranexamic acid in reducing blood loss during internal fixation of distal femur fracture

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Abstract

Background: Tranexamic acid [TXA] is a medication used to treat or prevent excessive blood loss from major trauma. It is antifibrinolytic haemostatic agent and is used in various cases like orthopaedic surgery, nosebleeds, vaginal bleeding, dental operations etc. The present study was conducted to assess the efficacy and potency of tranexamic acid in reducing blood loss during and after internal fixation of distal femur fracture. **Materials and Methods:** The study was conducted in Department of Orthopaedics, GMC Hospital, Jammu from June 2019 to December 2020. Total patients [n=40] [100%] were divided into control and test patients with 20 [50%] patients each. Test group [n=20] [50%] was administered with tranexamic acid [15mg/kg] for 15 min before and after surgery with IV bolus stat slowly [10ml] whereas control group [n=20] [50%] operated without infusion of tranexamic acid. Data was collected with respect to blood loss in all cases [n=40] [100%] and sent for statistical analysis. **Results:** Tranexamic acid is effectively associated with reduced blood loss during intraoperative period and postoperative period. Tranexamic acid reduces early post-surgical blood loss by 150-250 ml in test group [n=20] vs 290-420 ml in control group [n=20] whereas blood loss during surgery in test group [n=20] is reduced by 450-560 ml vs 720-1000ml in control group [n=20] with significant p value < 0.05. **Conclusion:** Tranexamic acid is highly effective in reducing blood loss when it is administered 15 min before and 15 min after surgery.

Keywords: Tranexamic acid, Distal femur fracture, Blood loss.

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Introduction

Distal femur fractures are fractures that occur at the distal end of the femur bone, which includes the femoral condyles and the metaphysis [1]. Distal femur fractures are mainly caused by high and low energy types of injuries. High energy fractures usually occur in young adults (predominantly 30 year old males) and results in intra-articular fractures. Mechanism of injury commonly includes motor vehicle accidents, high-velocity missile injuries or a direct blow mechanism. Low energy fractures mostly occur in elderly people, secondary to osteoporosis predominantly in women over 65 years [2-4]. These fractures most commonly occur with twisting motions or falls [5]. Distal femoral fractures account for 3-6% of adult femoral fractures and 0.4% of all fractures and are associated with significant morbidity and mortality rates. These rates are high because of heavy blood loss during and after surgery.

Studies of major orthopaedic surgery procedures demonstrate a considerable intra-operative blood loss [6-8]. The amount of blood loss during surgery varies with patient and institution for a given surgical procedure [6,7] which limits standardization of perioperative blood orders. However, such blood losses are usually controlled by use of appropriate surgical techniques including meticulous cauterization of bleeding vessels with diathermy etc. Femoral fracture surgery results in significant blood loss, which could lead to severe anaemia and

subsequent need for transfusion, prolonged hospital stay, high hospital cost and detrimental effect on long-term mortality [9,10]. Blood transfusion could correct anaemia, but it could cause complications such as infections, haemolytic reaction, cardiovascular dysfunction and even death [10,11]. Therefore it is significant issue to reduce perioperative blood loss following surgeries for femoral fracture. In this regard Pharmacological means of controlling blood loss has become popular with the introduction of antifibrinolytic agent such as tranexamic acid. These agents reduce the blood loss and requirement of blood transfusion, apart from promoting the maintenance of homeostasis [12]. Tranexamic acid (TXA) have been associated with reduction in blood loss during intraoperative and post operative period and have been widely used to decrease transfusion rate in joint replacement surgeries. Therefore, we conducted a systematic review to evaluate the efficacy and safety of TXA usage in distal femur fracture fixation.

Material and Methods

A cohort study was conducted at Department of orthopaedics GMC Jammu for the duration of 1.6 years from June 2019 to December 2020. The study was conducted on 40 patients [n=40] undergoing various modalities of distal femur fracture fixation. The selected patients were divided into two groups, control [n=20] and test [n=20]. Written informed consent was taken from the selected patients prior to the inclusion in the study group. The study was done under the supervision and guidance of institutional ethical committee. All the prerequisite parameters like HB level, blood pressure, blood glucose level, coagulation profile, blood urea, renal function test, liver function test, pulmonary function test and pre anaesthetic check-up was taken into full consideration. Patients under control group [n=20]

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were given slow transfusion of tranexamic acid [15mg/kg] in IV bolus stat for 15 min before surgery and 15 min after surgery i.e in 2 doses: one at the time of induction and second at the time of closure whereas patients in control group were operated without infusion of tranexamic acid under controlled conditions. The amount of blood loss in test group was calculated by measuring the volume of blood in suction apparatus and volume of blood absorbed in the swab by excluding their dry weight from the total volume. Data were collected pertaining to the blood loss in control group and test group and sent for statistical analysis. The collected data were analysed statistically and results were obtained.

Observation And Results

Statistical data reveals that mean blood loss in test group [n=20] during surgery was 482.75ml with the range of 420-560ml and the mean blood loss in test group after surgery was 183.75ml with the range of 150-240ml whereas in control group [n=20] mean blood loss during surgery was 835ml with the range of 720-1000ml whereas mean blood loss in control group after surgery was 313.5ml with the range of 290-420ml The total mean blood loss in test group[n=20] during and after surgery was 666.5ml whereas total mean blood loss in control group [n=20] during and after surgery was 1148.5ml.

Demographic data related to blood loss in test group is shown in table 1 and demographic data related to blood loss in control group shown in table 2.

Table 1: Data of test group

No. of cases	Blood loss during surgery	Blood loss after surgery	Total blood loss in surgery
Case 1	480ml	150ml	620ml
Case 2	510ml	155ml	665ml
Case 3	490ml	160ml	650ml
Case 4	485ml	175ml	660ml
Case 5	475ml	200ml	675ml
Case 6	450ml	180ml	630ml
Case 7	520ml	230ml	750ml
Case 8	530ml	170ml	700ml
Case 9	460ml	180ml	640ml
Case 10	420ml	220ml	640ml
Case 11	450ml	230ml	680ml
Case 12	560ml	240ml	800ml
Case 13	490ml	150ml	640ml
Case 14	470ml	165ml	635ml
Case 15	455ml	170ml	625ml
Case 16	550ml	185ml	735ml
Case 17	480ml	190ml	670ml
Case 18	460ml	195ml	655ml
Case 19	465ml	180ml	645ml
Case 20	455ml	150ml	605ml

Statistical analysis of table 1

Mean blood loss during surgery=482.75

Mean blood loss after surgery =183.75

Total mean blood loss =666.5

Range of blood loss during surgery=420-560ml

Range of blood loss after surgery = 150-240ml

Table 2: Data of control group

No. of cases	Blood loss during surgery	Blood loss after surgery	Total blood loss in surgery
Case 1	730ml	300ml	1030ml
Case 2	900ml	290ml	1190ml
Case 3	950ml	305ml	1255ml
Case 4	840ml	290ml	1130ml
Case 5	780ml	310ml	1090ml
Case 6	870ml	295ml	1165ml
Case 7	890ml	320ml	1210ml
Case 8	790ml	330ml	1120ml
Case 9	860ml	320ml	1210ml
Case 10	720ml	295ml	1015ml
Case 11	820ml	410ml	1230ml
Case 12	810ml	345ml	1155ml
Case 13	795ml	415ml	1210ml
Case 14	905ml	380ml	1285ml
Case 15	1000ml	290ml	1290ml
Case 16	785ml	360ml	1145ml
Case 17	885ml	305ml	1190ml
Case 18	860ml	290ml	1150ml
Case 19	750ml	420ml	1170ml
Case 20	760ml	410ml	1170ml

Statistical analysis of table 2

Mean blood loss during surgery =835ml

Mean blood loss after surgery =313.5ml

Total mean blood loss =1148.5ml

Range of blood loss during surgery=720-1000ml

Range of blood loss after surgery = 290-420ml

Table 3:Comparitive statistical analysis of test group and control group

Study Group	Blood loss before surgery	Blood loss after surgery
Blood loss in test group	420-560ml	150-240ml
Blood loss in control group	720-1000ml	290-420ml
P Value	<0.05	<0.0001

Discussion

Tranexamic acid (TXA) significantly reduces blood loss and blood transfusion requirements in patients undergoing orthopaedic surgery and over the last decade an increasing amount of literature regarding the perioperative use of tranexamic acid (TXA) for bleeding control in orthopedic surgery has been published[13,14].Tranexamic acid is considerably used in orthopaedic surgery to reduce blood loss, to the extent of reducing or altogether abolishing the need for perioperative blood collection. It is of proven value in clearing the field of surgery and reducing blood loss when given before or after surgery. Drain and number of transfusions are reduced[15,16]. Patients suffering from femoral fractures were more susceptible to thromboembolic events comparing with patients undergoing elective joint replacement [17]. Therefore, there is still clinical uncertainty regarding TXA application in femoral fracture patients. However, the potential benefits of TXA in significantly decreasing blood loss and transfusion rates are overwhelming. In addition, TXA could bring improved functional recovery, shorter length of hospital stay and lower cost[18].Therefore, the potential benefits of TXA in internal fixation of femoral fracture patients may outweigh the risk of it.

Conclusion

Blood loss from surgical procedures is a major issue worldwide as the demand for blood products is increasing. In this regard Tranexamic acid is an utmost important creation in the field of medical sciences because it just not reduce the blood loss but also reduces transfusion requirements and call for improved functional recovery of patient. When comes to safety grounds Tranexamic acid has been shown to be a safe medication[19,20].

Ethical Approval

The ethical approval for the study has been obtained from the institutional ethics committee.

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Conflict of Interest: Nil

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