Intraarticular Tranexamic Acid Decreased Transfusion Rates and Blood Loss in Primary Total Hip Arthroplasty: A Prospective Randomized Double-Blind Placebo-Controlled Trial

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Backgrounds: *Total hip arthroplasty (THA) often requires blood transfusion postoperatively. Tranexamic acid (TXA) has been successfully used intravenously to control bleeding. Intraarticular TXA is safe and effective at reducing postoperative bleeding in orthopedic procedures, but there is limited literature regarding its use in THA. The objective of this prospective randomized study was to determine if intraarticular TXA decreased postoperative transfusion rates and bleeding after primary THA.*

Propose: *To study the efficacy of intraarticular tranexamic acid to decrease postoperative transfusion rates and blood loss after primary total hip arthroplasty.*

Methods: *A prospective double-blinded, randomized controlled trial of 135 primary THA of 118 patients investigated the efficacy of intraarticular application of TXA on blood loss compared with a placebo in Maharat Nakhon Ratchasima Hospital during the period from September 2013 to March 2015. Intraarticular TXA (750 mg) was applied after acetabular and femoral canal preparation. The primary outcome was blood transfusion rate, the mean drain blood loss, and total blood loss by Gross formula. Secondary outcomes include the units of blood transfusion, nadir post-operative hemoglobin and hematocrit, hemoglobin and hematocrit concentration change, visual analog scales (VAS), length of hospital stay, and up to 12 weeks follow-up for surveillance complications.*

Results: *Patients in the TXA group insignificantly improved in reduction of transfusion rates (TXA group = 39.7%, Placebo = 55.2%; P-value = 0.07), drain blood loss (TXA group = 535 mL, Placebo = 540mL; P-value = 0.45), and total blood loss by Gross formula (TXA group = 771 mL, Placebo = 757 mL; P-value = 0.59) compared with the placebo. However, the units of blood transfused decreased significantly in the TXA group cases compared to the placebo (TXA = 0.53 units per case, Placebo = 0.88 units per case; P-value=0.035). Visual analog scales (VAS) also reduced significantly in the TXA group (TXA = 3.9, Placebo = 4.7; P-value=0.001). There were three complications in the tranexamic acid group (two acute febrile illness and one dislocation) and five in the placebo group (one superficial infection, two acute febrile illness and two dislocation). There was no sciatic nerve irritation from the diluted dose of tranexamic acid used in the study.*

Conclusions: *The use of 750mg intraarticular tranexamic acid in patients undergoing THA does not effectively reduce postoperative blood transfusion rates and bleeding. However, the units of transfusion (units per case) and visual analog scale could be declined statistically significantly.*

Keywords*: Tranexamic acid, Intraarticular, Total hip arthroplasty, Transfusion rate, Blood loss*

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Introduction

Total joint replacement surgery may produce large amounts of perioperative blood loss and significant rates of transfusions. Patients undergoing total hip arthroplasty (THA) are transfused at rates of 16–37%.[1] However, such transfusions are associated with a risk of microbial infection, viral transmission, fluid overload, and high costs.[2]

A variety of blood-conserving techniques has been developed to reduce blood loss and postoperative transfusion rates, including controlled hypotension, regional anesthesia, autologous blood transfusion, intraoperative blood salvage, and the use of erythropoietin and antifibrinolytic agents.[3-4]

In recent years, there have been several studies on the effectiveness of tranexamic acid (TXA), a fibrinolytic inhibitor, for reducing intraoperative and postoperative blood loss.[5-8] Tranexamic acid is a synthetic derivative of the

amino acid lysine that inhibits fibrinolysis by blocking the lysine-binding sites on plasminogen.[9] The coagulation and fibrinolytic systems remain in a state of dynamic balance, which maintains an intact vascular system.[10]

Tranexamic acid, as an antifibrinolytic agents, have been used in orthopedics surgery via an intravenous (IV) route, resulting in a 50% reduction in the rate of transfusions.[11-13] However, there are isolated case reports of thrombus formation, which has generated concerns over the risk of thromboembolic complications in patient populations already at high risk for deep vein thrombosis and pulmonary embolism. These have prevented the widespread acceptance of the use of IV antifibrinolytics in total joint replacement surgery.[14-15]

Topical application of antifibrinolytic agents may produce the same efficacy, but lower systemic absorption and thus a lower risk for thromboembolic complications. Prior studies have suggested that topical tranexamic acid is safe and effective at reducing postoperative bleeding in orthopedic procedures.[16-17] These studies are small and limited to screw fixation of the lumbar spine and total knee arthroplasty (TKA).[18-20] The objective of this prospective randomized study was to determine if intraarticular tranexamic acid decreased postoperative transfusion rates and bleeding after primary total hip arthroplasty (THA).

Patients and Methods

After receiving Institutional Review Board (IRB) approval, this study was performed as a prospective, randomized, double-blind, placebo-controlled trial of the effect of intra-articular application of tranexamic acid on transfusion and blood loss requirements following a unilateral total hip arthroplasty at a single tertiary health care provider (Maharat Nakhon Ratchasima Hospital) with a single surgeon.

Patients of the surgeon author, aged 18 years and older, who were scheduled for a primary THA with or without cement were eligible for inclusion in the trial. Patients with known hypersensitivity to TXA or its ingredients, current preoperative coagulopathy or thrombocytopenia, previous history of deep vein thrombosis (DVT) or pulmonary embolism (PE), suspected pathologic fracture from primary or metastasis bone tumor, or those who refused to participate in the research project were excluded from this study. The baseline level of hemoglobin, hematocrit, prothrombin percentage activity (PT), active partial thromboplastin time (APTT), and platelet count were measured in all participants at least a week before the arthroplasty.

The primary outcome was the change in the proportion of patients undergoing blood transfusion during the index procedure. Secondary outcome measures were blood loss, the units of blood transfused, hemoglobin and hematocrit concentration changes, length of stay, and complications.

Postoperative blood loss was determined by measuring the Redivac drain volumes at the time of removal. The total blood loss (ABL) was calculated using the formula of Gross[27,28,36]as follows:

$$ABL = BV \times \frac{[Hct(i) - Hct(f)]}{Hct(m)}$$

$$Blood\ Volume\ (BV) = Body\ weight\ in\ Kgs \times 70\ mlkg^{-1}$$

Where the reduction in hematocrit was the difference between the preoperative and the lowest postoperative hematocrit values. The Hemoglobin level and the hematocrit were recorded preoperatively and on the first and second postoperative days, and anytime when the patient had anemic symptoms.

The total hip arthroplasty was performed with use of a spinal anesthetic or general anesthesia. The patient was positioned semi-lateral decubitus on the operating table. A standard lateral approach (Modified Hardinge's) with navigation was used.

Designated operating room staff prepared either the study drug, 750 mg of tranexamic acid in 100 mL of saline solution, or the placebo, 100 mL of a saline solution with a similar color, smell, and feel. 50 mL of solution was bathed after acetabular preparation the acetabulum, left for 3 minutes, then removed with suction. An uncemented acetabular component was then impacted with or without adjunct screw fixation. After femoral canal broach preparation, the remaining 50 mL of the solution was placed within the femoral canal, left for 3 minutes, and then removed with suction. The femoral stem was then impacted into place followed by reduction of the final hip components. The gluteus medius muscle was repaired. A Redivac drain was placed. Deep fascia, subcutaneous, and skin closure were performed in a standard fashion.

According to the postoperative protocols, serial blood samples were collected from the patients for complete blood count (CBC) at twenty-four and forty-eight hours postoperatively. The drain was inserted and removed in the morning of the second day postoperatively in all cases. After discharge from hospital, the patients were appointed to follow-up at two, four, eight and twelve weeks after surgery.

A transfusion protocol was utilized to standardize the use of blood transfusions. According to the protocol blood transfusion was not indicated when the hemoglobin concentration was >10 g/dL; was indicated when the hemoglobin concentration was <8 g/dL; and was indicated when the hemoglobin concentration was between 8 and

10 g/dL in a patient who developed fatigue, palpitation, pallor, tachycardia, and tachypnea due to anemia.

Patients received standard patient-controlled analgesia involving morphine for the first forty-eight hours and were then transitioned to oral analgesia. No patients received any thromboprophylaxis.

Prior to participating in the trial, all participants provided written informed consent, which was obtained in the physician office by the surgeon preoperatively.

Randomization was performed by computerization (block of four) and concealed envelopes. Anonymous basic details regarding the patient and surgeon were entered (to allow stratification and subsequent identification), and the staff confirmed this information before randomization. A unique identification number and the allocation group were subsequently assigned. The staff prepared the study medicine and provided it to the surgeons. The surgeons, their team members, and the patient remained blinded to the allocation. The outcomes measures consisted of objective data (transfusion rate, drain blood loss, total blood loss, units of transfusion, nadir post-operative hemoglobin and hematocrit, hemoglobin level change, hematocrit level change, visual analog scale(VAS), length of stay, and complications).

Statistical analysis

Analysis was on the basis of intention to treat. The power calculation was based on the primary outcome measure of the proportion of patients who received blood transfusions 32.1% in placebo group and 12.5% in tranexamic acid group. A one-tailed continuity corrected Chi-squared test with 80% power and a 5% level of significance produced a required sample size which was increased by 20% to allow for drop out, and was 132 cases (66 per groups). Statistical analysis was performed using the STATA, version 12.0 (College Station, TX). Data are reported as mean ± standard deviation (SD). Student t-test and Fisher's exact test were used to compare non-parametric means. Since some continuous data distributions were highly skewed, bootstrapped estimation (10,000 bootstrap samples) was also performed, and was reported when the result differed qualitatively from the parametric findings. The data were analyzed with the use of the Mann-Whitney *U*-test. A *P*-value < 0.05 was considered to be statistically significant.

Results

During the recruitment period from September 2013 to March 2015, 152 cases were scheduled to have a total hip arthroplasty at Maharat Nakhon Ratchasima Hospital. Thirteen cases were excluded due to ineligibility and four cases declined participation. The remaining 135 cases from 118 eligible participants were recruited and formed the study cohort; sixty-seven cases were randomized to the placebo group and sixty-eight, to the tranexamic acid group (Fig. 1). The two groups had similar baseline characteristics (Table 1).

The primary and secondary outcomes are shown in Table 2. The blood transfusion rate tended to be lower in the tranexamic acid group (39.7%) when compared the placebo group (55.2%), but did not show a statistically significant difference (P = 0.07, RR = 0.72) (Fig. 2). The median drain blood loss was 540 mL in the placebo group and 535 mL in the tranexamic acid group (P = 0.45). Total blood loss was estimated with use of the formula developed by Gross[27,28,36]. The mean total blood loss was 757 mL in the placebo group and 771 mL in the tranexamic acid group (P = 0.59). There was no statistically significant difference (Fig. 3). Significantly fewer units of blood were transfused in the tranexamic acid group (0.53 units per case) than the placebo group (0.88 units per case) with a mean difference of 0.35 units per case, P = 0.035 (Fig. 4). Hemoglobin and hematocrit levels were tested on postoperative day two unless there was an earlier clinical need. The nadir postoperative hemoglobin level was higher in the tranexamic acid group (median Hb = 10.2 g/dL) compared with the placebo group (median Hb = 9.6 g/dL), but did not show a statistically significant difference (P = 0.09). Similarly, the nadir postoperative hematocrit level was higher in the tranexamic acid group (median Hct = 30%) compared with the placebo group (median Hct = 29%), but did not show a statistically significant difference (P = 0.15). The change of hemoglobin was lower in the tranexamic acid group compared with the placebo group (median Hb change = 1.7 g/dL vs 1.9 g/dL ; P = 0.33). The change of hematocrit was also lower in the tranexamic acid group compared with the placebo group (median Hct change = 30% vs 29% ; P = 0.33). The mean visual analog scale (VAS) was 3.9 in the tranexamic acid group, significantly less than the 4.7 in the placebo group (mean difference 0.8, P = 0.01). Patients who received the placebo had a mean hospital stay of 5 days compared with 4 days for patients who received tranexamic acid (median difference 1 day; P = 0.18). At the twelve weeks follow-up, there were three complications in the tranexamic acid group (two acute febrile illness and one dislocation) and five in the placebo group (one superficial infection, two acute febrile illness and two dislocation). The frequencies of these complications did not differ significantly between the two arms of the study. There was no sciatic nerve irritation, deep vein thrombosis and venothromboembolism from the diluted dose of tranexamic acid used in the study.

Discussion

THAs may cause considerable blood loss. Postoperative anemia can lead to increased mortality and morbidity, a longer hospital stay, and delayed rehabilitation, especially in patients with vascular disease.[29-32] Blood transfusion is associated with several well-recognized risks and complications, including transfusion-related acute lung injury, hemolytic transfusion reactions, transfusion-associated sepsis, and transmission of infectious agents.[33,34]

In a recent systematic review and meta-analysis[35] of eleven randomized controlled trials, intravenous tranexamic acid reduced blood loss and transfusion needs significantly. However, only one of the included trials had more than fifty participants. Only five studies described a transfusion trigger, which is essential to standardize blood transfusion as an outcome measure. Overall, intravenous tranexamic acid reduced blood transfusion rates by 20% (range, 28% to 34%), comparable with intraarticular tranexamic acid. A similar trend was seen in drain blood loss.

The potential advantages of the intraarticular application of tranexamic acid are direct targeting of the site of bleeding and prevention of systemic side effects. In literature of intraarticular tranexamic acid, there has been only two randomized trials and three retrospective studies evaluating intraarticular tranexamic acid in THA. Although the dosage range used in the literature was 1 to 3g, there are differences in the regiment and technique of administration. However, there is a trend toward reductions in blood transfusion rates and units of blood transfused for tranexamic acid over placebo in all literatures.[21,23,24,25,26] But there is no literature using lower than 1g of intraarticular tranexamic acid.

Our study was carefully designed to minimize error (minimizing bias through use of a randomized design and sampling error through adequate study power). The study design, protocol, and patient information sheets were reviewed by expert research bodies, and the patients receiving care were blinded to the treatment allocation and operated on by a single surgeon. Treatment and placebo solutions had the same color, smell, and feel, maintaining blinding throughout the surgery.

Although visible drain blood loss was not demonstrated to be significantly lower in the tranexamic acid group, it has been known that some blood loss is not clinically visible. Eipe and Ponniah[27] showed that surgical blood loss was underestimated by 64% when clinical methods were used to assess blood-soaked sponges and blood lost to suction bottles and the vacuum drain. They therefore recommended using a biochemical method based on the hematocrit level. In our study, the total blood loss was estimated with use of the Gross formula[27, 28,36]. However, it could be confounded by factors such as patient hydration.

The present study had some limitations. First, the dosage of intraarticular tranexamic acid used in our study (0.75 g) was lower than that used in other studies in which the dosage ranged from 1 to 3g. Inadequate dosage or inadequate bathing time may be the cause of the not statistically significant reduction in transfusion rates and blood loss, thus further study should be performed. Although the dosage of tranexamic acid was low, we may effectively reduce the units for blood transfusion in our patients by using the intraarticular administration route. It implied that intraarticular tranexamic acid may demonstrate cost effectiveness over the placebo. Second, venography or CT scans were not routinely performed to screen for pulmonary embolism or thromboembolic complications. Some asymptomatic venous thromboembolism might have been overlooked. Third, serum concentrations of TXA were not measured. Forth, the study was not adequately powered to detect differences in rare complication such as venothromboembolism. The low incidence rate of their occurrence would necessitate a very large number of participants to detect a small difference precisely. Fifth, the twelve weeks follow-up period was thought to be adequate to identify known adverse events, but it might be inadequate to detect longer-term safety issues, such as accelerated wear of the joint due to exposure to tranexamic acid and functional recovery.

Conclusions

The use of 750mg intraarticular tranexamic acid in patients undergoing THA did not effectively reduced postoperative blood transfusion rates and bleeding. However, the units of transfusion (units per case) and visual analog scale were declined by a statistically significant amount.

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Table 1 Baseline Characteristics of the Study Population			
Demographic Characteristic	Placebo Group (n=67)	Tranexamic Acid Group (n=68)	*P*-value
Age† (yr)	51 ± 14.6	52 ± 14.8	0.55
Gender (n: female/male) % male	17/50 74.6%	24/44 64.7%	0.21
BMI‡ (kg/m^2)	20.8 (18.7-23.4)	21.2 (19.3-24.3)	0.23
Side (n: left/right) % left	40/27 59.7%	35/33 51.5%	0.34
ASA status [n(%)]			0.53
I	14 (20.9%)	11 (16.2%)	
II	31 (46.3%)	38 (55.9%)	
III	22 (32.8%)	19 (27.9%)	
IV	0	0	
Diagnosis [n(%)]			0.6
Osteonecrosis	44 (65.7%)	43 (63.2%)	
DDH	3 (4.5%)	7 (10.3%)	
Osteoarthritis	8 (11.9%)	6 (8.8%)	
Fracture	12 (17.9%)	12 (17.7%)	
Preoperative laboratory values‡			
Hemoglobin (g/dL)	12.1 (10.9-13.3)	12.3 (11.3-13.7)	0.52
Hematocrit (%)	36.4% (33.5%-40.7%)	38.0% (34.2%-41.4%)	0.42
Platelet count (x10^9/L)	265.0 (216.0-349.0)	241.5 (194.5-317.0)	0.13
Preoperative comorbidities [n(%)]			
Coronary arterial disease	1 (3.0%)	0 (0.0%)	0.24
Hypertension	18 (26.9%)	23 (33.8%)	0.38
Dyslipidemia	6 (9.0%)	5 (7.4%)	0.73
Diabetes mellitus	5 (7.5%)	4 (5.9%)	0.74
Obstructive lung disease	3 (4.5%)	2 (2.9%)	0.68
Chronic renal insufficiency	7 (10.5%)	6 (8.8%)	0.75
Cerebrovascular accident	1 (1.5%)	0 (0.0%)	0.49
Liver disease	4 (6.0%)	0 (0.0%)	0.06
Autoimmune disease	7 (10.5%)	10 (14.7%)	0.46
Precaution	4 (6.0%)	1 (1.5%)	0.21
Stem type [n(%)]			0.36
Cementless conventional stem	42 (62.7%)	40 (58.8%)	
Cementless short stem	23 (34.3%)	22 (32.4%)	
Hybrid stem	2 (3.0%)	6 (5.9%)	
Cup size† (mm)	51.5 ± 2.7	51.6 ± 2.7	0.89
General/spinal anesthesia (n)	26/41	19/49	0.18
Operative time‡ (min)	107 (90-135)	113 (90-145)	0.64

† The values are given as the mean and the standard deviation.
‡ The values are given as the median and interquartile range : Non parametric : Mann-Whitney *U*-test
¥ Significantly different.

Table 2 Primary and Secondary Outcomes

	Placebo Group (n=67)	Tranexamic Acid Group (n=68)	*P*-value
Primary end point			
Transfusion [n(%)]	37 (55.2%)	27 (39.7%)	0.07
Blood loss‡			
Drain blood loss (mL)	540 (320-690)	535 (400-702.5)	0.45
Total blood loss (mL)	757.1 (387.6-1127.5)	771.8 (340.2-1163.2)	0.59
Secondary end point			
Units of transfusion† (unit per case)	0.88 ± 1.12	0.53 ± 0.76	0.035¥
Nadir post-op hemoglobin‡ (g/dL)	9.6 (9.0-10.7)	10.2 (9.0-11.7)	0.09
Nadir post-op hematocrit‡ (%)	29.0 (27.0-32.0)	30.0 (27.0-34.0)	0.15
Change of hemoglobin‡ (g/dL)	1.9 (1.1-2.9)	1.7 (0.8-2.9)	0.33
Change of hematocrit‡ (%)	6.7 (4.0-9.0)	6.35 (3.1-9.7)	0.48
Length of hospital stay‡ (days)	5 (4-7)	4 (4-6)	0.18
Visual Analog Scale†	4.7 ± 1.9	3.9 ± 1.8	0.01¥
Complication [n(%)]	5 (7.5%)	3 (4.4%)	0.49
Subcutaneous hematoma	1	0	
DVT or PE	0	0	
Acute febrile illness	2	2	
Dislocation or Fracture	2	1	

† The values are given as the mean and the standard deviation.
‡ The values are given as the median and interquartile range : Non parametric : Mann-Whitney *U*-test
¥ Significantly different.

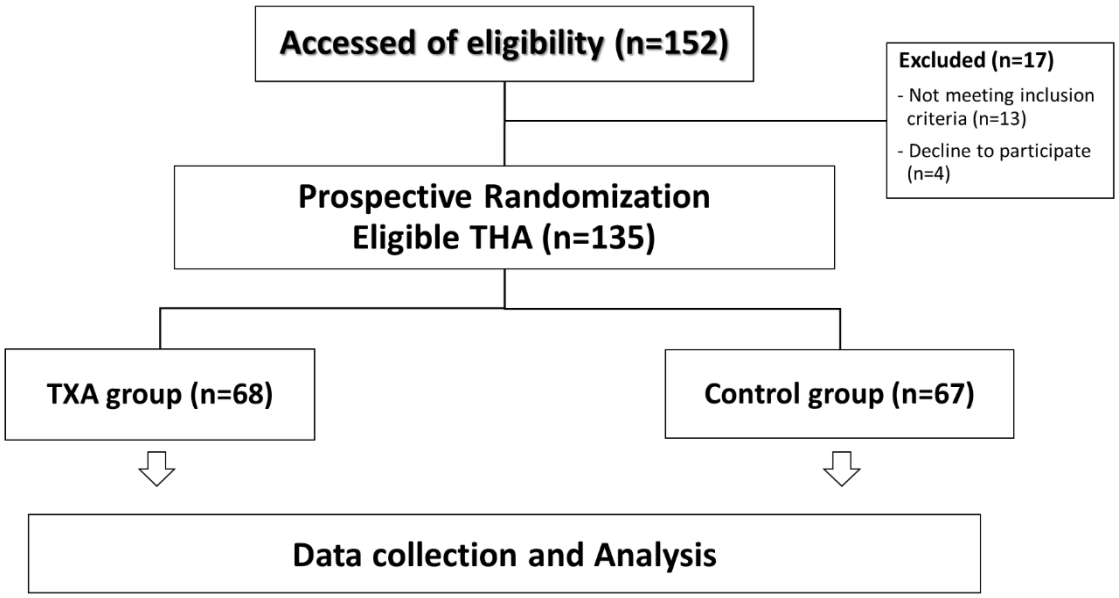

Fig. 1 Flow diagram of patients involved in the trial.

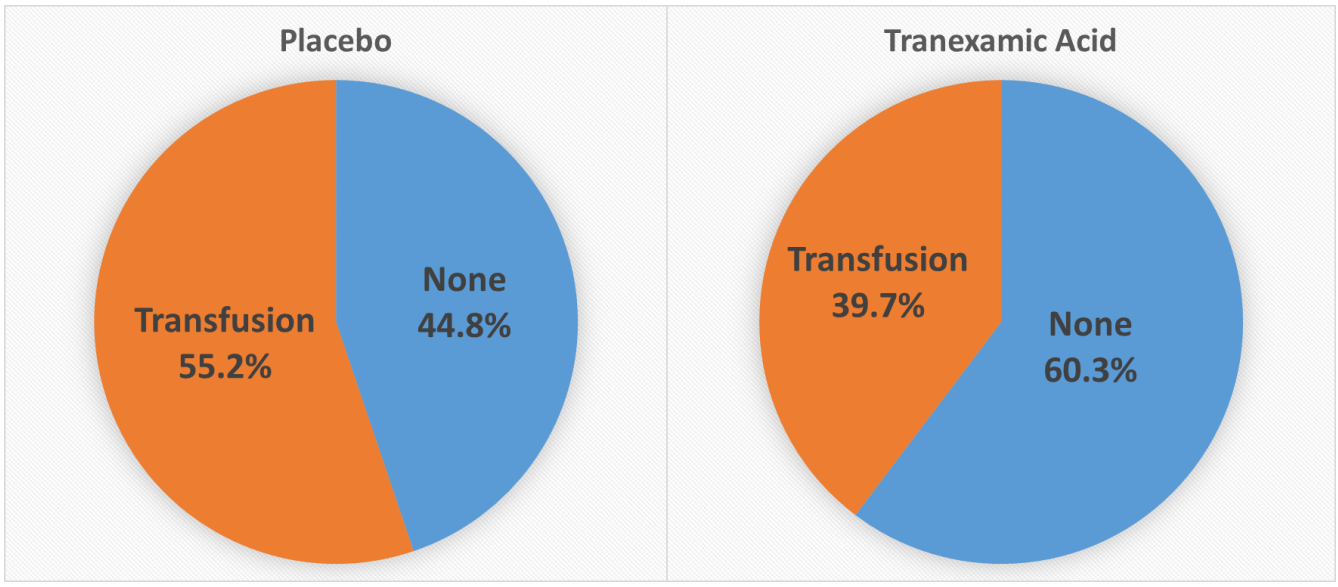

Fig. 2 Flow diagram of primary outcome of blood transfusion rate.

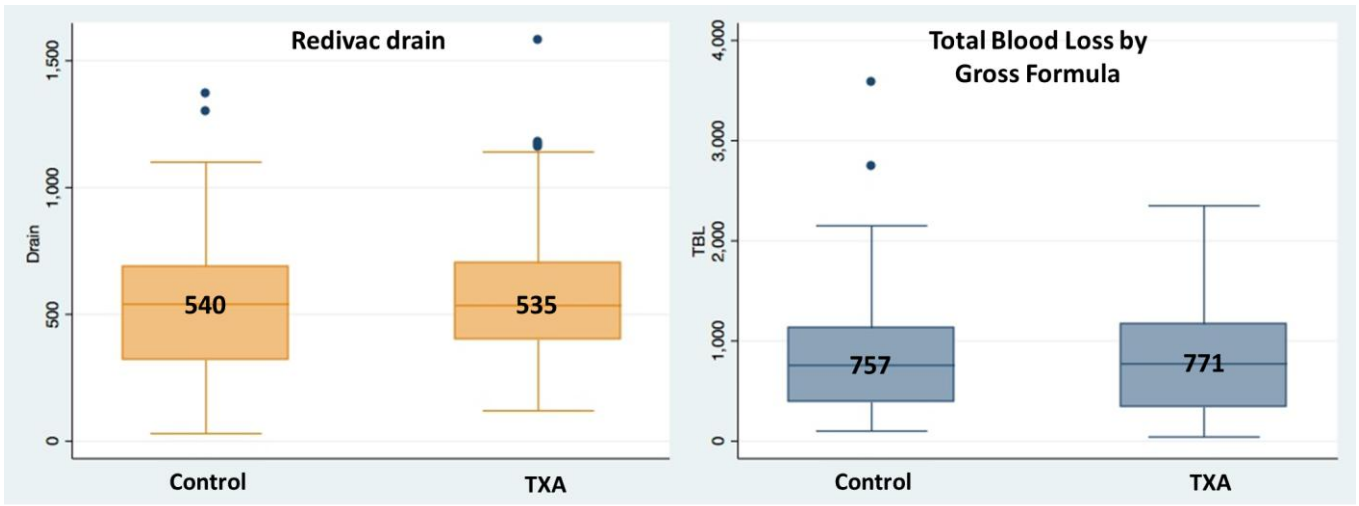

Fig. 3 Flow diagram of primary outcome of blood loss.

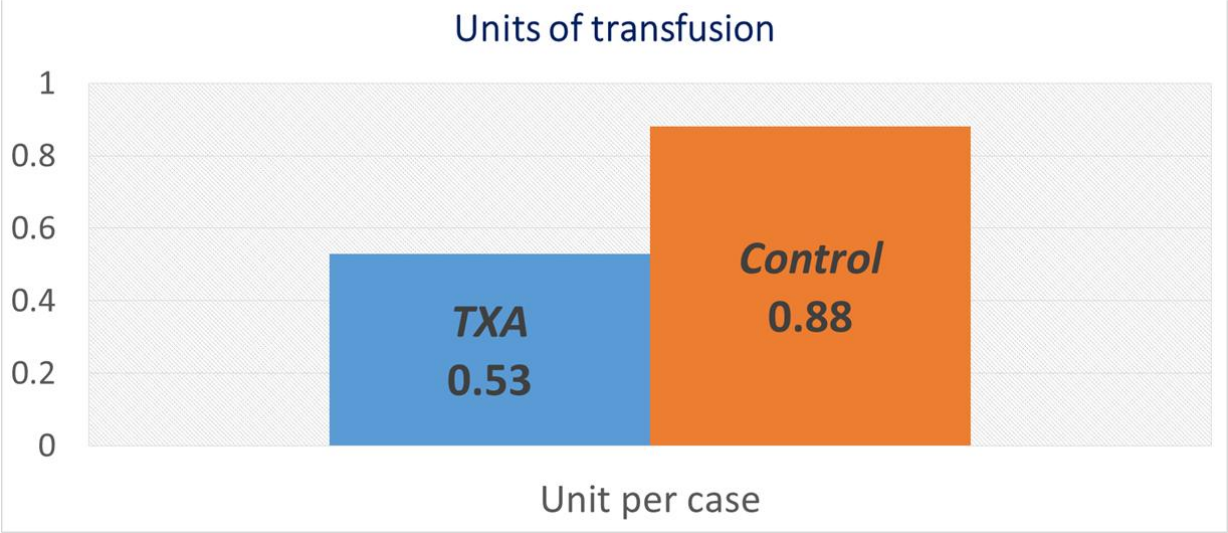

Fig. 4 Flow diagram of secondary outcome of units of blood transfusion.

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การศึกษาการใช้ยาต้านการสลายไฟบริน (ทรานซามีน) แบบเฉพาะที่ ในผู้ป่วยผ่าตัดเปลี่ยนข้อสะโพกเทียม เพื่อลดการเสียเลือด และอัตราการรับเลือดหลังผ่าตัด

จิธายุทธ เสือจุ้ย, พบ, ณัฐวุฒิ ชนะฤทธิชัย, พบ, อุรวิศ ปิยะพรมดี พบ, ยิ่งยง สุขเสถียร, พบ

วัตถุประสงค์: *เพื่อศึกษาการใช้ทรานซามีนแบบในข้อ ในการผ่าตัดข้อสะโพกเทียมชนิดทั้งหมด เพื่อการลดปริมาณการรับส่วนประกอบของเลือด และลดการเสียเลือด*

วิธีการศึกษา: *การศึกษาประสิทธิภาพของยาต้านการสลายไฟบริน (ทรานซามีน) แบบเฉพาะที่ โดยศึกษาไปข้างหน้า มีการทดลองแบบสุ่มและปกปิดสองทางเทียบกับยาหลอก ในการผ่าตัดข้อสะโพกเทียมชนิดทั้งหมด ณ โรงพยาบาลมหาราชนครราชสีมา ระหว่างเดือนกันยายน พ.ศ. 2556 ถึง เดือนมีนาคม พ.ศ. 2558 มีจำนวนการผ่าตัดที่เข้าร่วมศึกษาทั้งสิ้น 135 ครั้ง จากผู้ป่วย 118 ราย โดยการใช้ยาต้านการสลายไฟบริน ในขนาด 750 มก. แบ่งครึ่งสารละลาย และนำไปแช่หลังการเตรียมเบ้าสะโพก และหลังจากการเตรียมโพรงกระดูกก่อนใส่ข้อสะโพกเทียม นาน 3 นาที ทั้งสองที่โดยผลลัพธ์หลักที่ทำการศึกษาคือร้อยละของผู้ป่วยที่ได้รับส่วนประกอบของเลือด และปริมาณการสูญเสียเลือด ทั้งจากสายระบายเลือด และจากการคำนวณด้วยสูตรของ Gross และผลลัพธ์รอง ได้แก่ ค่าเฉลี่ยจำนวนถุงเลือดที่ได้ต่อคน ค่าฮีโมโกลบิน และฮีมาโตคริตที่ต่ำที่สุดหลังผ่าตัด ค่าฮีโมโกลบิน และฮีมาโตคริตที่ลดลง ค่าความเจ็บปวด ระยะเวลาการนอน รพ.หลังผ่าตัด และติดตามผู้ป่วยในสัปดาห์ที่ 2, 4, 8, 12 หลังการผ่าตัดเพื่อศึกษาผลข้างเคียงต่างๆของการใช้ยาต้านการสลายไฟบริน เฉพาะที่*

ผลการศึกษา: *ผู้ป่วยในกลุ่มที่ได้รับยาต้านการสลายไฟบริน (ทรานซามีน) มีอัตราการรับเลือดที่ไม่แตกต่างจากกลุ่มควบคุม (TXA group = 39.7%, Placebo = 55.2%; P-value = 0.07), มีปริมาณการเสียเลือดทางสายระบายเลือดไม่แตกต่าง (TXA group = 535 มล., Placebo = 540 มล.; P-value = 0.45) และปริมาณการสูญเสียเลือดจากการคำนวณด้วยสูตรของ Gross ไม่แตกต่างเมื่อเทียบกับกลุ่มควบคุม (TXA group = 771 มล., Placebo = 757 มล.; P-value = 0.59) แต่พบว่าผู้ป่วยในกลุ่มที่ได้รับยาทรานซามีนมีปริมาณการใช้ส่วนประกอบของเลือดลดลงอย่างมีนัยสำคัญทางสถิติ เมื่อเทียบกับกลุ่มควบคุม (TXA = 0.53 units per case, Placebo = 0.88 units per case; P-value=0.035). ด้านความเจ็บปวด visual analog scales (VAS) พบว่าลดลงอย่างมีนัยสำคัญทางสถิติเช่นกัน (TXA = 3.9, Placebo = 4.7; P-value=0.001) และด้านผลข้างเคียงจากการใช้ยา พบว่ามี 3 รายในกลุ่มที่ได้รับยาทรานซามีน (ไข้ 2ราย และข้อสะโพกเทียมหลุดเคลื่อน 1 ราย) และ 5 รายในกลุ่มควบคุม (แผลติดเชื้อชั้นตื้น 1 ราย, ไข้ 2 ราย และข้อสะโพกหลุดเคลื่อน 2 ราย) และไม่พบการระคายเคืองต่อเส้นประสาทไซอาติก จากการใช้ยา ในการศึกษานี้*

สรุป : *การใช้ยาต้านการสลายไฟบริน (ทรานซามีน) ในขนาด 750 มิลลิกรัม แบบเฉพาะที่ในการผ่าตัดเปลี่ยนข้อสะโพกเทียมไม่มีประสิทธิภาพในการลดอัตราการรับเลือด และลดปริมาณการเสียเลือดได้อย่างมีนัยสำคัญทางสถิติ ซึ่งอาจเกิดจากปริมาณยาที่ไม่เพียงพอ หรือจากการแช่ที่ไม่นานเพียงพอ อย่างไรก็ตามพบว่าสามารถลดปริมาณการรับสารประกอบของเลือดในผู้ป่วย และคะแนนความเจ็บปวดหลังผ่าตัดได้อย่างมีนัยสำคัญทางสถิติ โดยไม่พบความแตกต่างในเรื่องของผลข้างเคียงจากการใช้ยา*