Efficacy and safety of reducing post-traumatic hidden blood loss with early tranexamic acid intervention in elderly patients with intertrochanteric fracture: A retrospective analysis

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Introduction

Globally, hip fracture is a frequent cause of morbidity and mortality, particularly among elderly people[1]. Recent studies have confirmed that elderly patients with intertrochanteric fractures exhibit preoperative non-negligible hidden blood loss (HBL), which can impact functional outcomes and increase mortality by lowering hemoglobin (Hgb) levels. TXA is a synthetic analogue of an amino acid with biological activity that inhibits plasminogen from dissolving clots; such activity can reduce blood loss and transfusion requirements[2]. Previous studies have shown that TXA reduces total blood loss and the requirement for transfusion in hip arthroplasty and hip fracture surgery[3,4]. Recently, studies describing HBL during the perioperative period following intertrochanteric fractures have been increasing in number[5,6].

Methods

A retrospective study was conducted with 77 patients (age ≥65 years, injury time ≤6 h) who presented with intertrochanteric fracture from November 2016 to April 2018. Patients in the TXA group (n=39) received 1 g of IV TXA at admission, whereas those in the normal saline (NS) group (n=38) received an equal volume of saline. Hemoglobin (Hgb) and hematocrit (Hct) were recorded at post-traumatic admission (PTA) and on post-traumatic day (PTD) 1–3. HBL was calculated using the Gross formula. The criterion of blood preoperative transfusion (POT) was as an Hgb level of <80 g/L or symptomatic anemia (light-headedness, palpitation, or shortness of breath not associated with other etiologies) in a patient with an Hgb level of 80–100 g/L[7]. Lower extremity venous ultrasound was performed to detect venous thrombosis.

Data analysis

Continuous data were analyzed using independent-sample t-tests, and the nonparametric alternative (Mann-Whitney U tests) was used where data were not normally distributed. A chi-square test or Fisher's exact test for difference in proportions was used to estimate differences between groups in categorical variables. The difference was considered statistically significant if *P* < 0.05.

Conflicts of Interest and Sources of Funding:

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Results

77 patients (23 males and 54 females) were finally included. The supplemental TXA group included 39 patients (male:female = 11:28), and the NS group included 38 patients (male:female = 12:26). No differences were found between the two groups with respect to age, sex, or body mass index (*P* > 0.05, Table 1). Hgb and Hct on PTD 2 and 3 were statistically higher in the TXA group than in the NS group (*P* < 0.05, Table 2). HBL on PTDs 1-3 were significantly less in the TXA group than in the NS group (*P* < 0.05, Table 2). The preoperative transfusion (POT) rate was significantly lower in the TXA group than in the NS group [TXA, 10.26% (2.0 U packed RBC in two patients on PTD 4 and 4.0 U packed RBC in two patients on PTD 5) vs. NS, 28.95% (2.0 U packed RBC in seven patients on PTD 3 and 4.0 U packed RBC in four patients on PTD 4); *P* = .036, Table 2]. In the TXA group, 4 patients developed venous thrombosis in the lower limbs, and 3 patients developed lower extremity venous thrombosis in the NS group (*P* = .515, Table 3).

Table 1: Comparison of general characteristics of patients in the study

Items	TXA group (n = 39)	NS group (n = 38)	P
Female (%)	28 (71.79)	26 (68.42)	.807§
Age (year)	78.6 ± 8.0	78.9 ± 7.0	.883*
BMI (kg/m ²)	22.7 ± 3.1	23.3 ± 2.6	.476^
Length of trauma to admission (h)	2.7 ± 1.2	2.6 ± 1.2	.831^
Receiving PFNA (%)	36 (92.3)	35 (92.1)	.650§

*Independent-sample t-tests; § chi-squared and Fisher's exact test; ^Mann-Whitney U test; TXA, tranexamic acid; NS, normal saline; BMI, body mass index; PFNA, proximal femoral nail antirotation

Table 2: Comparison of post-traumatic outcomes between the TXA and NS groups

Items	TXA group (n = 39)	NS group (n = 38)	P
Hgb (g/L)			
Hgb PTA	116.1 ± 4.6	114.8 ± 6.7	.288*
Hgb PTD 1	111.2 ± 5.3	108.6 ± 7.3	.068*
Hgb PTD 2	105.4 ± 6.6	100.3 ± 7.7	.003^
Hgb PTD 3	98.7 ± 9.4	88.6 ± 8.2	<.001^
Hct (%)			
Hct PTA	43.3 ± 2.4	42.4 ± 2.2	.128^
Hct PTD 1	39.2 ± 2.5	38.6 ± 1.7	.058^
Hct PTD 2	35.8 ± 3.0	34.3 ± 2.6	.005^
Hct PTD 3	32.6 ± 3.8	27.0 ± 3.0	<.001^
HBL (mL)			
HBL PTD 1	173.9 ± 16.0	182.3 ± 21.0	.021*
HBL PTD 2	238.5 ± 25.6	254.7 ± 29.2	.005^
HBL PTD 3	281.2 ± 23.2	360.1 ± 40.5	<.001^
POT rate (%)	4 (10.26)	11 (28.95)	.036§
POT units (U)	12	30	-

*Independent-sample t-tests; § chi-squared and Fisher's exact test; ^Mann-Whitney U test; Hct, hematocrit; Hgb, hemoglobin; HBL, hidden blood loss; TXA, tranexamic acid; NS, normal saline; PTA, post-traumatic admission; PTD, post-traumatic day; POT, preoperative transfusion

Table 3: Complications in the TXA and NS groups

Items	TXA group (n = 39)	NS group (n = 38)	P§
Vein thrombosis	4	3	.515
Pulmonary embolism	0	0	-
Respiratory infection	4	5	.517

§ Chi-squared and Fisher's exact test; TXA, tranexamic acid; NS, normal saline

Conclusions

The most important finding of this study was that the early application of intravenous TXA supplements can reduce the post-traumatic HBL, preoperative transfusion rate, and without increasing the incidence of venous thrombosis, or mortality in elderly patients with intertrochanteric fractures.

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