

The risk factors of perioperative hemoglobin and hematocrit drop after intramedullary nailing treatment for intertrochanteric fracture patients

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Received: 9 June 2014 / Accepted: 16 October 2014 / Published online: 1 November 2014
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Abstract

Background The objective of this study was to analyze the risk factors associated with the hemoglobin and hematocrit drops in the early postoperative period for intertrochanteric fracture patients with intramedullary nailing treatment.

Methods From January 2003 to December 2013, 634 intertrochanteric fracture patients with complete information were recruited into the study. Their age, gender, operating time, medical diseases, blood routine examination at admission and postoperative first day, and the days between the trauma and operation were recorded. **Results:** The hemoglobin (HGB) change of patients (<75 years) was significantly greater than that of patients (>75 years) ($P = 0.039$). Meanwhile, the change of hematocrit (HCT) level of patients (<75 years) was greater than that of patients (>75 years), but the difference was not significant ($P = 0.062$). The gender had no significant influence on HCT and HGB. The HGB and HCT change of patients with diabetes (ΔHCT , $8.47 \pm 3.36\%$; ΔHGB , $29.19 \pm 13.10\text{ g/l}$) were statistically greater than that of patients without diabetes (ΔHCT , $5.52 \pm 3.84\%$; ΔHGB , $19.81 \pm 14.68\text{ g/l}$) ($P = 0.006$, $P = 0.022$). The hypertension and coronary heart disease had no significant influence on the change of HCT and HGB levels.

The operation time had a significant influence on the change of HCT and HGB. The ΔHCT and ΔHGB in the group for which the time was more than 48 h between the trauma and operation were greater than that in the group with less than 48 h between the trauma and operation but not significantly different (ΔHCT , $P = 0.672$; ΔHGB , $P = 0.66$).

Conclusion The factors of age, medical disease such as diabetes, operation time, and time between the trauma and operation may be associated with the change of perioperative hemoglobin and hematocrit levels for intertrochanteric fracture patients after intramedullary nailing treatment in the early postoperative period.

Introduction

Hip fractures are among the most important health problems in the elderly, and intertrochanteric fractures constitute one of the most common fractures of the hip, occurring mainly in elderly people with osteoporosis. Intramedullary nailing is an important therapy for intertrochanteric fracture. Foss has reported that intramedullary nailing for hip fracture could cause more hidden blood loss than other fixations and arthroplasty [1]. It has been reported that patients with underlying anemia have a greater risk of dying than those without anemia in the perioperative period [2–5]. Preoperative evaluation of hemoglobin (HGB) level is very important for patients with intertrochanteric fracture. It has been reported that the hidden blood loss exists in intertrochanteric fracture patients after intramedullary nailing treatment. The HGB level on admission was found to be falsely reassuring and could lead to a very low postoperative HGB level [1]. The blood loss associated with the initial trauma in

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intertrochanteric fracture patients accounts for a significant part of perioperative total blood loss [6]. The hidden blood loss often occurs after intramedullary nailing surgery for intertrochanteric fracture. In the literature, it has been reported that many factors could influence the change of HGB and hematocrit (HCT) after intramedullary nailing surgery [4, 5, 7–12]. Thus, our aims were to analyze the influential factors associated with the change of HGB and HCT levels for intertrochanteric fracture patients after intramedullary nailing treatment in the early postoperative period.

Patients and methods

The ethical approval for this study was obtained from the local Ethics Committees of our hospital and informed consent was obtained from each patient. From January 2003 to December 2013, 634 intertrochanteric fracture patients with complete information were recruited into the present study, which comprised a retrospective chart review conducted at a university hospital. Inclusion criteria were an age of at least 18 years at the time of diagnosis and a fresh fracture. The standard of fresh fracture was that the intertrochanteric fracture occurred within two weeks of when patients were admitted. Exclusion criteria were multiple fractures, revision surgery, not the first surgery for the hip fracture, and patients with intertrochanteric fracture caused by a high-energy trauma. X ray and CT scanning were used to decide the diagnosis.

In all cases, the antibiotics and thromboprophylaxis were administered with second-generation cephalosporins and low-molecular-weight heparin. The age, gender, operating time, the blood routine examination at admission and at the first day postoperation, their medical diseases (hypertension, diabetes, and coronary heart disease), the duration between trauma and admission, and the days between the trauma and operation were recorded. All patients received intramedullary nailing fixation, such as proximal femoral antirotation nail (PFNA) and Gamma nail. All surgical treatments were performed by expert surgeons in our trauma center to avoid problems related to a learning curve.

Statistical strategy

Statistical analyses were conducted with Statistical Package for Social Sciences (SPSS Inc., Chicago, IL, USA) 13.0 software. The continuous data were described as mean \pm standard deviation (SD). Comparison of variables between the groups was performed using the independent sample *t* test. If a *P* value was found to be less than 0.05, then the result would be considered statistically significant.

Results

The details of the patients recruited in the study are shown in Table 1. The data regarding a total number of 634 patients was included in the final analysis. Table 2 shows that the perioperative HGB change of patients <75 years was statistically significantly larger than that of patients >75 years (*P* = 0.039). Meanwhile, the change of HCT level of patients <75 years was also larger than that of patients >75 years but not statistically significantly (*P* = 0.062) (Table 2). The gender had no significant influence on the change of perioperative HGB and HCT levels.

Table 1 Details of the 634 patients with fracture of the hip

Mean age (years)	76.7 \pm 12.1
Gender	
Male	314
Female	320
Weight (kg)	62.5 \pm 8.4
Height (cm)	165 \pm 24.9
Hospitalization time(days)	8.8 \pm 1.1
Duration of surgery (min)	85.3 \pm 12.1
Delay to surgery in hours	68.6 \pm 10.1
Duration between trauma and admission (h)	8.1 \pm 3.5
Number of PFNA fixation	249
Number of Gamma fixation	385

Table 2 The influence of basic indexes on the change of HCT and HGB

	Δ HCT(%)	Δ HGB (g/l)
Age		
<75 years (<i>n</i> = 316)	6.71 \pm 3.78	24.35 \pm 14.35*
>75years (<i>n</i> = 318)	5.36 \pm 3.65	18.69 \pm 13.64
	<i>P</i> = 0.062	<i>P</i> = 0.039
Gender		
Female (<i>n</i> = 320)	4.16 \pm 0.55	15.73 \pm 2.08
Male (<i>n</i> = 314)	3.65 \pm 0.50	13.92 \pm 1.91
	<i>P</i> = 0.933	<i>P</i> = 0.786
Operation time		
<1 h (<i>n</i> = 319)	4.81 \pm 3.20 [#]	16.96 \pm 12.48 [#]
>1 h (<i>n</i> = 315)	7.15 \pm 4.25	25.63 \pm 15.85
	<i>P</i> = 0.001	<i>P</i> = 0.022
Days between the trauma and operation		
<48 h (<i>n</i> = 31)	5.27 \pm 6.55	18.50 \pm 24.25
>48 h (<i>n</i> = 603)	5.97 \pm 3.74	21.25 \pm 14.21
	<i>P</i> = 0.672	<i>P</i> = 0.66

* Δ HGB in the group <75 years was significantly larger than that in the group >75 years; [#] Δ HCT and Δ HGB in the group for operation time <1 h was significantly lower than that in the group of operation time >1 h

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