

DOI: 10.17238/issn2226-2016.2018.3.10-14

УДК 617.3

© У Линь, Мэн Шиань Фэн, Ван Шинь Юэ, Фу Пэн, Цуй Чжэн Ли, Бобров Д.С., 2018

## АНАЛИЗ ПЕРИОПЕРАЦИОННОЙ КРОВОПОТЕРИ ПРИ ИСПОЛЬЗОВАНИИ ДВУХ РАЗЛИЧНЫХ СПОСОБОВ ФИКСАЦИИ ПРИ ЛЕЧЕНИИ ПОЖИЛЫХ ПАЦИЕНТОВ С МЕЖВЕРТЕЛЬНОМИ ПЕРЕЛОМАМИ БЕДРЕННОЙ КОСТИ

У ЛИНЬ<sup>1,a</sup>, МЭН ШИАТЬ ФЭН<sup>1,b</sup>, ВАН ШИНЬ ЮЭ<sup>2,c</sup>, ФУ ПЭН<sup>2,d</sup>, ЦУЙ ЧЖЭН ЛИ<sup>2,e</sup>, Д.С. БОБРОВ<sup>3,f</sup><sup>1</sup>Центральная Больница месторождения нефти «шэн Ли», Дун Ин, КНР<sup>2</sup>Народная Больница г. Дун Ин, Дун Ин, КНР<sup>3</sup>ФГАОУ ВО Первый МГМУ им. И.М. Сеченова (Сеченовский университет) Минздрава РФ, Москва, 119991, Россия

**Резюме:** Цель: сравнить объем периоперационной потери крови у пожилых пациентов с межвертельными переломами, которые были прооперированы с использованием динамического бедренного штифта (группа PFNA) или динамического бедренного винта (группа DHS) фиксаторов.

**Методы:** Ретроспективный анализ был проведен для исследования клинических данных 124 пациентов с переломами бедренной кости, проходивших лечение с 1 января 2013 года по 1 ноября 2017 года. Объем кровопотери во время периоперационного периода был рассчитан с использованием уравнения Гросса. Оценивались рост, вес и изменения в общем анализе крови до и после операции. Сравнялись различия объемов кровопотери между группой PFNA и группой DHS.

**Результаты:** в группе PFNA было 78 пациентов со средней продолжительностью операции 69,0±27,1 мин, средний объем явной кровопотери (интраоперационно и по дренажам) 91,5±111,4 мл, средний общий объем кровопотери 825,7 ± 478,0 мл и средний объем скрытой кровопотери 734,2±455. 7 мл. В группе DHS было 46 пациентов со средней продолжительностью работы 97,5±25 мин, средний явный объем кровопотери 283,6 ± 142,1 мл, средний общий кровопотери 695,7±502,4 мл и средний объем скрытой кровопотери 412,1±457,6 мл. Интраоперационная кровопотеря и явная послеоперационная кровопотеря (по дренажам) были выше в группе DHS по сравнению с группой PFNA (P <0,001), тогда как объем послеоперационной скрытой кровопотери и общий объем кровопотери в группе PFNA были выше, чем те, в группе DHS (P <0,001).

**Выводы:** Сравнявая эти два способа внутренней фиксации можно сделать выводы, что использование DHS сопровождается большим разрезом, большей длительностью операции и большей интраоперационной кровопотерей, в то же время, использование PFNA сопровождается меньшей длиной разреза, менее продолжительным временем операции и меньшей явной интраоперационной кровопотерей. Вместе с тем использование PFNA приводит к большей скрытой кровопотере кровопотере, которая должна учитываться в клинической практике для уменьшения осложнений после операции.

**Ключевые слова:** межвертельный перелом бедра, интраоперационная кровопотеря, операция, фиксация перелома, пожилые пациенты.

## ANALYSIS OF PERIOPERATIVE BLOOD LOSS USING TWO DIFFERENT METHODS OF FIXATION IN ELDERLY PATIENTS WITH INTERTROCHANTERIC HIP FRACTURES

WU LIN<sup>1,a</sup>, MENG XIAN FENG<sup>2,c</sup>, WANG XINYUE<sup>2,c</sup>, FU PENG<sup>2,d</sup>, CUI ZHENGLI<sup>2,e</sup>, BOBROV D.S.<sup>3,f</sup><sup>1</sup>Shengli Oilfield Central Hospital, Dong Ying, Shan Dong, China<sup>2</sup>Dongying Peoples' Hospital, Dong Ying, Shan Dong, China<sup>3</sup>I.M. Sechenov First Moscow State Medical University (Sechenov University), Ministry of Health of Russia, Moscow, 119991, Russia

**Summary: Objective:** To study perioperative blood loss in aged patients with femoral intertrochanteric fracture by analysis of perioperative blood loss volume in aged patients treated by proximal femoral nail anti-rotation (PFNA) and dynamic hip nail (DHS).

**Methods:** Retrospective analysis was conducted to investigate clinical data of 124 cases of aged femoral intertrochanteric fracture diagnosed and treated by the use of PFNA and DHS in our department from January 1, 2013 to November 1, 2017. Blood loss volume during the perioperative period was calculated by the use of Gross equation with height, weight and changes of routine blood parameters before and after operation. Differences of blood loss volumes between the PFNA group and the DHS group were compared.

**Results:** The PFNA group had 78 patients with average operation duration of 69.0±27.1 min, average overt blood loss volume of 91.5±111.4 mL, average total blood loss volume of 825.7±478.0 mL and average occult blood loss volume of 734.2±455. 7 mL. The DHS group had 46 patients with average operation duration of 97.5±25 min, average overt blood loss volume of 283.6±142.1 mL, average total blood loss volume of 695.7±502.4 mL and average occult blood loss volume of 412.1±457.6 mL. Comparatively, both intraoperative blood loss and postoperative overt blood loss volume in the DHS group were higher than those in the

<sup>a</sup> E-mail: dr\_woo@126.com<sup>b</sup> E-mail: dymxf@126.com<sup>c</sup> E-mail: Wang.xinyue2007@163.com<sup>d</sup> E-mail: Lovefp\_1973@163.com<sup>e</sup> E-mail: gkcuizl@163.com<sup>f</sup> E-mail: footsurg@mail.ru

PFNA group ( $P < 0.001$ ), while both postoperative occult blood loss volume and total blood loss volume in the PFNA group were higher than those in the DHS group ( $P < 0.001$ ).

**Conclusions:** Between these two ways of internal fixation, DHS resulted in relatively large incisions, accompanied with longer operation duration and more intraoperative blood loss, while PFNA had smaller incisions, with shorter operation duration and less intraoperative blood loss. But PFNA led to more perioperative occult blood loss, which should receive sufficient clinical attention to reduce complications after operation.

**Key words:** Hip fracture; intraoperative blood loss; operation; fracture fixation; elderly patients.

Femoral intertrochanteric fracture is often seen in the aged, which in large part closely correlates with bone rarefaction and trauma. The absolute quantity of occurrences of this condition increases year by year in the course of aging society. Conservative treatment like the conventional traction can avoid operative wounds. However, it forces the aged patients to have prolonged bed rest, rising incidences of complications such as hypostatic pneumonia, deep venous thrombosis, urinary infection and malunion with coxa vara. These complications may become the main cause of death from aged femoral intertrochanteric fracture. One-year mortality from conservative treatment for femoral intertrochanteric fracture caused by trauma can reach 20% [1]. In recent years, internal fixation has gradually become the first choice of treating femoral intertrochanteric fracture, for it can reduce the bed rest, lower mortality and increase patients' quality of life. Specifically, DHS and PFNA are considered the superior therapies at the moment. However, in their course of using the therapies, clinicians gradually realize that patients after operation do not recover at the pace as expected and severe anemia tends to appear. Under such circumstances, possibilities of complications occurring increases and recovery extends. The concept of occult blood loss [2] was proposed by Sehat et al in 2000. It has been gradually realized that occult blood loss is the main cause of postoperative blood loss in intramedullary fixation system. This article conducted retrospective analysis of clinical data of aged patients with femoral intertrochanteric fracture treated by internal fixation using PFNA and DHS, to investigate perioperative blood loss in aged patients with femoral intertrochanteric fracture treated by different internal fixation therapies, and to take perioperative occult blood loss seriously.

## 1 Materials and Methods

### 1.1 General materials

Retrospective analysis was conducted to investigate clinical data of 205 cases of femoral intertrochanteric fracture diagnosed and treated in the department of orthopedics in our hospital from January 1, 2013 to November 1, 2017, including age, gender, height, weight, fracture type, injury mechanism, routine blood parameters before and after operation [hemoglobin (Hb) and hematocrit (Hct)], American Society of Anesthesiologists (ASA) classification, anesthesia method, intraoperative blood loss, postoperative drainage, perioperative blood

transfusion, complications (gastrointestinal bleeding, severe incision swelling, etc.). Inclusion criteria: (1) age  $\geq 60$  years old; (2) low-energy injury as injury mechanism; (3) no medical history of hematological disease, preoperative Hb  $> 80$  g/L; (4) non-multiple trauma; (5) no severe liver and kidney anomalies; (6) examinations of routine blood parameters within three days before and after operation; (7) use of preventive anticoagulants during perioperative period; (8) blood transfusion  $< 2000$  mL on the day of operation; (9) fractures with close reduction. Among those 124 patients were qualified, as shown in Table 1 in detail.

### 1.2 Intraoperative and postoperative treatment

Close reduction was applied for the PFNA group during operation. Operation time from skin incision to suture and intraoperative blood loss volume were recorded according to the standard PFNA procedure. Drainage tube was not installed after operation. For the DHS group, the standard procedure was followed to record operation time from skin incision to suture and intraoperative blood loss volume. Drainage tube was installed after operation as a routine to record daily drainage, and was removed when drainage was  $< 50$  mL/d. Re-examinations of routine blood parameters were performed immediately and one day after operation. Patients with Hb  $< 80$  g/L received blood transfusions. Hb and Hct measured in the re-examination of routine blood parameters in the third day after operation were taken as the final values of their own kind.

### 1.3 Calculation of occult blood loss

Gross equation [3] was applied to calculate the erythrocyte volume and then perioperative blood loss and occult blood loss. Preoperative patient blood volume (PBV) was obtained by the use of approach proposed by Nadler [4]:  $PBV = k_1 \times h^3 + k_2 \times w + k_3$ , where  $h$  is height in meter;  $w$  is weight in kilogram;  $k$  is a constant. For males,  $k_1 = 0.3669$ ,  $k_2 = 0.0322$  and  $k_3 = 0.6041$ . For females,  $k_1 = 0.3561$ ,  $k_2 = 0.0331$  and  $k_3 = 0.1833$ . Total loss of red blood cells = preoperative PBV  $\times$  (preoperative Hct - postoperative Hct). Theoretical total blood loss = total loss of red blood cells / preoperative Hct. Perioperative actual blood loss = occult blood loss + overt blood loss = theoretical total blood loss + blood transfusion; overt blood loss = intraoperative blood loss + postoperative drainage. Hemoconcentration in patients with femoral intertrochanteric fracture was adjusted by coefficient of 0.9. Pa-

Table 1

Clinical data of the patients

Type of fixation	n	Age /years		Gender		Mechanism of injury		ASA Type of fracture classification							Anesthesia method	
		Average	Range	M	F	High	Low	A1	A2	A3	I	II	III	IV	General	Local
PFNA	84	77.92	62-101	31	53	0	84	17	64	3	1	52	40	1	24	60
DHS	40	74.33	61-91	14	26	0	42	17	19	4	1	20	19	0	8	32

M-male; F-female; ASA-American Society of Anesthesiologists; PFNA-proximal femoral nail antirotation; DHS-dynamic hip screw.

tients as many as possible were asked for their heights and weights before operation. For fracture patients in bed rest, their weights were measured according to heights: Male standard weight over the age of 60 (kg) = height (cm)  $\times$  0.65 - 48.7. Female standard weight over the age of 60 = height (cm)  $\times$  0.56 - 33.4 [5].

#### 1.4 Statistical analysis

SPSS 13.0 was used for statistical analysis. Measurable data was shown in the form of  $x \pm s$ . Differences of average values between the PFNA group and the DHS group were compared by the use of One-Way ANOVA. LSD was used for homogeneity of variance while Tamhane's T2 for heterogeneity of variance. Difference was regarded statistically significant when  $P < 0.05$ .

## 2 Results

No statistical significance was found in basic information between the PFNA group and DHS group ( $P > 0.05$ ) regarding gender, fracture type, ASA classification, etc. The average age of patients in the DHS group was lower ( $P < 0.05$ ). Local anesthesia was the dominant anesthesia method in both the PFNA group and the DHS group ( $P < 0.05$ ). 78 patients were in the PFNA group with average operation duration of  $69.0 \pm 27.1$  min and average intraoperative blood loss of  $87.4 \pm 102.0$  mL. 50 patients received blood transfusion due to significant drop of Hb (Hb  $< 80$  g/L) after operation, with average blood transfusion of  $269.1 \pm 375.8$  mL. The average preoperative and postoperative Hb values were  $99.79 \pm 13.43$  g/L and  $94.05 \pm 10.54$  g/L, respectively. The average preoperative and postoperative Hct values were  $0.327 \pm 0.044$  g/L and  $0.276 \pm 0.031$  g/L, respectively. The average overt blood loss was  $91.5 \pm 111.4$  mL. The average total blood loss was  $825.7 \pm 478.0$  mL and the average occult blood loss was  $734.2 \pm 455.7$  mL. 46 patients were in the DHS group with average operation duration of  $97.5 \pm 27.1$  min and average intraoperative blood loss of  $161.4 \pm 88.1$  mL. 28 patients received blood transfusion due to significant drop of Hb (Hb  $< 80$ g/L) after operation, with average blood transfusion of  $130.0 \pm 246.2$  mL. The average preoperative and postoperative Hb values were  $105.43 \pm 14.87$  g/L and  $100.04 \pm 14.66$  g/L, respectively. The average preoperative and postoperative Hct values were  $0.340 \pm 0.051$  g/L and  $0.289 \pm 0.048$  g/L, respectively. Drainage tube was installed as a routine after operation. The average overt blood loss was  $283.6 \pm 142.1$  mL. The average total blood loss was  $695.7 \pm 502.4$  mL and the average occult blood loss was  $412.1 \pm 457.6$  mL. Variance analyses of data in the two groups showed that: The operation duration in the PFNA group was significantly lower than that in the DHS group ( $P < 0.001$ ); the total blood loss in patients of the DHS group was relatively low, but no statistical significance was found in the perioperative total blood loss between the PFNA group and the DHS group ( $P = 0.286$ ); the overt blood loss in the PFNA group was significantly less than that in the DHS group ( $P < 0.001$ ), and so was the occult blood loss in the PFNA group ( $P < 0.001$ ).

## 3 Discussions

The majority of patients with femoral intertrochanteric fracture are aged patients, who often have cardiovascular and cerebrovascular, and endocrine system conditions. They have poor operative tolerance and are likely to have anemia and hypovolemia after operation. Severe anemia can cause hypoxia and metabolism disorder, which influence incision and fracture healing and then delay recovery. Blood loss can

lead to inadequate circulating blood volume and lower immunity [6], which increase probabilities of infections in aged patients. Operative treatment in its early stage has become the first choice of treating femoral intertrochanteric fracture. DHS uses extramedullary fixation devices and intramedullary fixation devices are for PFNA. Postoperative management might be neglected clinically due to simple handling, short operation duration and fewer intraoperative overt blood loss. Consequently, critical conditions might not be dealt with in time if any, or other complications might occur. This study found that the total blood loss in patients of the DHS group was relatively low, but no statistical significance was found in the perioperative total blood loss between the PFNA group and the DHS group ( $P = 0.286$ ); the overt blood loss in the PFNA group was significantly less than that in the DHS group ( $P < 0.001$ ), but the occult blood loss in the PFNA group was higher than that in the DHS group with statistical significance ( $P < 0.001$ ). Through data analysis, it was also found that, according to perioperative statistics, the sum of intraoperative blood loss and postoperative overt blood loss was less than the actual blood loss, speculating about the existence of a great quantity of occult blood loss after operation. The average occult blood loss volume in patients receiving the PFNA treatment was  $734.2 \pm 455.7$  mL, accounting for approximately 88.92% of the total blood loss; for patients in the DHS group, the average occult blood loss volume was  $412.1 \pm 457.6$  mL, accounting for approximately 59.23% of the total blood loss. It is evident that a large amount of occult blood loss is present during the intramedullary internal fixation treatment like PFNA, especially when the medullary space is being opened and reamed. This might be the reason why the total blood loss with intramedullary fixation is slightly more than that with DHS.

Reasons for occult blood loss might be: (1) Trauma itself: femoral intertrochanteric fracture is a type of fracture of metaphysis, where the blood supply is abundant. The fracture itself and the surrounding blood vessel damage can lead to more blood loss during operation. Smith et al [7] conducted a retrospective analysis of 50 cases with femoral intertrochanteric fracture whose operations were deferred (75 hours after injury on average). Hb decreased by 20.2 g/L on average from admission to the start of operation. (2) Operation: factors include movement of fracture end points during reduction, separation and exposure of soft tissue, half way hemostasis during operation, etc. A large amount of occult blood loss might occur during the medullary space is being opened, especially when it is being reamed. In addition, gaps within the medullary cavity and between muscles provide space for occult blood loss [8]. (3) Timing of operation: Chechik et al [9] found that clotting level peaked in three to five days after injury. Medicine, mainly the anticoagulant might have harmful effects in early operation. By preventing platelets from gathering and disturbing the normal mechanism of coagulation, it decreases postoperative Hb and Hct levels, causes local hematoma that will lead to anemia, and even increases the possibility of blood transfusion [10]. (5) Other factors: Cardiovascular and cerebrovascular conditions, intraoperative average arterial pressure  $< 60$  mmHg (1 mmHg = 0.133 kPa), postoperative serum creatinine  $> 200$  mmol/L, gastrointestinal bleeding, etc [11]. (6) Repeated drawing of blood for blood test during perioperative period, causing loss of red blood cells.

Mechanism of occult blood loss has not been clear yet, probably involving two aspects: (1) Blood enters interstitial spaces, as Erskine et al [12] suggested as the main reason. Such blood do not participate in the systemic circulation thus causing the Hb level to decrease; McManus et al [13] also detected a large quantity of tagged blood cells entering interstitial spaces after operation using radioisotopes to tag blood cells, which decreased the Hb level. (2) Traumatic hemolysis of red blood cells occurs due to post-traumatic stress, anesthesia, operation, etc. Pattison et al [14] suggested that hemolysis was attributed to postoperative occult blood loss.

This study has limitations that patients' heights and weights could not be measured directly after fracture therefore deviations from the actual values might exist; the accurate measurement of blood loss depends on the accuracy of routine blood parameters on admission and after operation, as well as intraoperative blood loss, while measurements by different devices before and after operation have their own discrepancy; it was impossible to have routine blood parameters examined seven days after operation as final values for research due to short stay in hospital; other factors on blood loss were not studied; the retrospective analysis was short of evidence from a randomized controlled trial.

In conclusion, DHS for aged femoral intertrochanteric fracture causes less occult blood loss, but with larger incision, longer operation duration and more intraoperative blood loss, and drainage tube needs to be installed after operation; PFNA causes more occult blood loss, but with smaller incision, shorter operation duration and less intraoperative blood loss, and postoperative drainage is unnecessary. Clinicians should be vigilant about perioperative occult blood loss when treating femoral intertrochanteric fracture in aged patients, especially understanding the apparent increase of perioperative occult blood loss when using the intramedullary fixation device. Perioperative care and treatment should be attached great importance. Comparison of changes of Hb and Hct in routine blood parameters in three days before and after operation is helpful to discover potential occult blood loss in time. Blood transfusion, if indicated, can reduce harm from occult blood loss, lower risks in perioperative period and facilitate recovery after operation.

#### Список литературы/References

1. *Xu Y, Geng D, Yang H. et al.* Treatment of unstable proximal femoral fractures: comparison of the proximal femoral nail antirotation and gamma nail 3, J. Orthopedics, 2010, 33( 7) : 473 -478. DOI: 10.3928/01477447-20100526-03.
2. *Sehat K.R, Evans R. Newman J.H.* How much blood is really lost in total knee arthroplasty ? Correct blood loss management should take hidden loss into account, J. Knee, 2000, 7( 3) : 151 -155. DOI:10.1016/S0968-0160(00)00047-8.
3. *Gross J.B.* Estimating allowable blood loss: corrected for dilution, J. Anesthesiology, 1983, 58( 3) : 277 -280. DOI:10.1097/00000542-198303000-00016.
4. *Nadler S.B., Hidalgo J.H., Bloch T.* Prediction of blood volume in normal human adults, J. Surgery, 1962, 51( 2) : 224 -232. No DOI found.
5. *Luo T., Huang W.T., Wu W.* Analysis of perioperative blood loss in treatment for femoral intertrochanteric fracture, J. Journal of Practical Orthopaedics, 2011, 17( 9) : 796- 799. DOI:10.3969/j.issn.1008-5572.2011.09.008.
6. *Liu J., Wang S.K., Tai P.H.* TKA The effect of postoperative drainage on perioperative blood loss, J. Chinese journal of bone and joint injury, 2011, 26( 4) :364 -365.No DOI found.
7. *Smith G.H., Tsang J., Molyneux S.G. et al.* The hidden blood loss after hip fracture, J. Injury, 2011, 42( 2) : 133-135. DOI: 10.1016/j.injury.2010.02.015.
8. *Zhang P.X., Xue F., An S.* Analysis of perioperative blood loss volume in patients treated by proximal femoral nail anti-rotation (PFNA) and dynamic hip nail (DHS), J. Journal of Peking University: medical edition, 2012, 44( 6) : 891 -894. DOI:10.3969/j.issn.1671-167X.2012.06.018
9. *Chechik O., Thein R., Fichman G. et al.* The effect of clopidogrel and aspirin on blood loss in hip fracture surgery, J. Injury, 2011, 42(11):1277-1282. DOI:10.1016/j.injury.2011.01.011.
10. *Manning B.J., O'Brien N., Aravindan S. et al.* The effect of aspirin on blood loss and transfusion requirements in patients with femoral neck fractures, J. Injury, 2004, 35( 2) : 121 -124. DOI:10.1016/s0020-1383(03)00073-1.
11. *Foss N.B., Kehlet H.* Hidden blood loss after surgery for hip fracture, J. Bone Joint Surg Br, 2006, 88( 8) : 1053 - 1059. DOI:10.1302/0301-620X.88B8.17534.
12. *Erskine J.G., Fraser C., Simpson R. et al.* Blood loss with knee joint replacement, J R Coll Surg Edinb, 1981. 26 ( 5) : 295 -297. No DOI found.
13. *McManus K.T., Velchik M.G., Alavi A. et al.* Non-invasive assessment of postoperative bleeding in TKA patients with Tc-99m RNCs, J Nuclear Med, 1987, 28( 8) : 565 - 567. No DOI found.
14. *Pattison E., Protheroe K., Pringle R.M. et al.* Reduction in haemoglobin after knee joint surgery, J. Ann Rheum Dis, 1973,32 ( 6) : 582-584. DOI:10.1136/ard.32.6.582.

#### Информация об авторах

**У Линь** – Центральная Больница месторождения нефти «шэн Ли». Травматолог и ортопед. Место работы - ул Цзинань, No.38, Дун Ин, КНР. E-mail: dr\_woo@126.com

**Мэн Шиань Фэн** – Центральная Больница месторождения нефти «шэн Ли». Заместитель деректра отделения травматологии и ортопедии. Травматолог и ортопед. Место работы - ул Цзинань, No.38, Дун Ин, КНР. E-mail: dymxf@126.com

**Бобров Дмитрий Сергеевич** - к.м.н, доцент кафедры травматологии, ортопедии и хирургии катастроф лечебного факультета ФГАОУ ВО Первого московского государственного медицинского университета им. И.М. Сеченова (Сеченовский университет), ул. Трубецкая, д. 8, с. 2, Москва, 119991, Россия. E-mail: footsurg@mail.ru

**Ван Шинь Юэ** – Народная Больница г. Дун Ин, Нефролог. Место работы- ул. Нань И, No.317, Дун Ин, КНР. E-mail: Wang.xinyue2007@163.com

**Фу Цэн** – Центральная Больница месторождения нефти «шэн Ли». Травматолог и ортопед. Место работы - ул Цзинань, No.38, Дун Ин, КНР. E-mail: Lovefp\_1973@163.com

**Цуй Чжэн Ли** – Центральная Больница месторождения нефти «шэн Ли». Деректра отделения травматологии и ортопедии. Травматолог и ортопед. Место работы - ул. Цзинань No.38, Дун Ин, КНР. E-mail: gkcuizl@163.com

#### Information about the authors

**Wu Lin** – Shengli Oilfield Central Hospital. Doctor of Trauma and Orthopedics. Address: № 38 Ji Nan Road, Dong Ying, Shan Dong, China. E-mail: dr\_woo@126.com

**Meng Xian Feng** – Shengli Oilfield Central Hospital. Doctor of Trauma and Orthopedics. Vicedirector of Department Trauma and Orthopedics. Address: № 38 Ji Nan Road, Dong Ying, Shan Dong, China. E-mail: dymxf@126.com

*D.S. Bobrov* – PhD, I.M. Sechenov First Moscow State Medical University (Sechenov University), Moscow, Russia 119991. [footsurg@mail.ru](mailto:footsurg@mail.ru)

*Wang Xinyue* – Dongying Peoples' Hospital. Renal physician. Address: № 317 Nan Yi Road, Dong Ying, Shan Dong, China.

E-mail: [Wang.xinyue2007@163.com](mailto:Wang.xinyue2007@163.com)

*Fu Peng* – Shengli Oilfield Central Hospital. Doctor of Trauma and Orthopedics. Address: № 38 Ji Nan Road, Dong Ying, Shan Dong, China.

E-mail: [Lovefp\\_1973@163.com](mailto:Lovefp_1973@163.com)

*Cui Zhengli* – Shengli Oilfield Central Hospital. Doctor of Trauma and Orthopedics. Director of Department Trauma and Orthopedics. Address: № 38 Ji Nan Road, Dong Ying, Shan Dong, China. E-mail: [gkcuizl@163.com](mailto:gkcuizl@163.com)

**Финансирование:** Исследование не имело спонсорской поддержки.

**Funding:** The study had no sponsorship.

**Конфликт интересов:** Авторы заявляют об отсутствии конфликта интересов.

**Conflict of interests:** The authors declare no conflict of interest.

**Для цитирования:**

*Бобров Д.С., У Л., Ван Ш.Ю., Фу П., Мэн Ш.Ф., Цуй Ч.Л.*, ANALYSIS OF PERIOPERATIVE BLOOD LOSS IN TWO WAYS OF FIXATION TREATMENT FOR FEMORAL INTERTROCHANTERIC FRACTURE IN AGED PATIENTS// Кафедра травматологии и ортопедии. 2018.№3(33). с. 10-14. [*Bobrov D.S., WU L., WANG X., FU P., MENG X.F., CUI Z.*, АНАЛИЗ ПЕРИОПЕРАЦИОННОЙ КРОВОПОТЕРИ ПРИ ИСПОЛЬЗОВАНИИ ДВУХ РАЗЛИЧНЫХ СПОСОБОВ ФИКСАЦИИ ПРИ ЛЕЧЕНИИ ПОЖИЛЫХ ПАЦИЕНТОВ С МЕЖВЕРТЕЛЬНЫМИ ПЕРЕЛОМАМИ БЕДРЕННОЙ КОСТИ// Department of Traumatology and Orthopedics. 2018.№3(33). p. 10-14. In Russ].