

Evaluation of Blood Transfusion in Elderly Patients with Hip Fractures Treated with Modular and Monoblock Partial Prosthesis

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Abstract

Hip fractures significantly increase mortality and morbidity in the elderly. Among the perioperative disorders affecting mortality, anemia is the most common. This study aims to evaluate perioperative anemia and blood transfusion in its treatment in patients who have undergone monoblock and modular hemiarthroplasty due to proximal femur fracture. Elderly patients who underwent cementless monoblock (n = 38) or modular (n = 58) hemiarthroplasty operation due to proximal femoral fracture were evaluated. Hemoglobin, hematocrit values, and blood transfusion amounts were evaluated at the time of hospitalization, before and after the surgery. The relationship between anesthesia type, gender, age, and perioperative anemia - blood transfusion amounts was investigated. Although there was no significant difference between the perioperative anemia status and blood transfusion amounts between the two groups, the mean amount of blood transfusion in the monoblock prosthesis group was higher (1.95 versus 1.48 units). It was observed that anesthesia type, gender, and age did not differ significantly in terms of anemia and blood transfusion amounts. It was observed that the number of patients transfused and the amount of transfusion was significantly higher in the post-operative period and the most transfused amount during the operation was 2 units. In elderly trauma patients undergoing monoblock and modular hemiarthroplasty, anemia frequently progresses during the period until surgery and after surgery. With close monitoring of pre-operative blood values, consideration of blood transfusion in the preoperative period, and operation preparation with 2 units of erythrocyte suspension can be recommended.

Research Article

INTRODUCTION

Hip fractures significantly increase mortality and morbidity, and their frequency increases with increasing life expectancy in the population¹. 15-20 % of elderly patients with hip fractures die within the first year².

In a meta-analysis, it was observed that the mortality rate after hip fracture was highest in the first 3 months and the frequency of death was higher in men³. The mortality rate during hospitalization was reported to be %4-12¹. Although factors likely to increase mortality have been identified, no consensus has yet been reached on this issue^{4,5}. Factors such as anemia and blood loss during operation may be effective on mortality and functional outcomes in geriatric hip fractures⁶. Most patients with hip fractures have additional cardiovascular problems, respiratory diseases, hematopoietic system problems, and severe osteoporosis. Anemia is the most common condition among these perioperative disorders. The primary treatment for perioperative anemia is blood transfusion. In several studies, it

has been concluded that perioperative allogenic blood transfusion is required in 30% to 70% of elderly patients with hip fractures^{7,8}.

90% of hip fractures show an even distribution between the femoral neck fracture and intertrochanteric fractures. Hemiarthroplasty and internal fixation are the preferred surgical options for stable fixation after hip fracture. Various meta-analyses report that arthroplasty is an appropriate surgical option for femoral neck fractures in elderly patients^{9,10}. Arthroplasty and internal fixation treatment options are controversial for intertrochanteric fractures in geriatric patients¹¹. Studies comparing internal fixation with hemiarthroplasty in unstable intertrochanteric femoral fractures in older patients indicate that hemiarthroplasty is preferable with earlier mobilization, low re-operation rate, and similar functional results^{11,12}. Besides, it has been reported that the need for blood transfusion is higher in arthroplasty applications¹³.

Monoblock hip prostheses and modular prostheses were compared in elderly patients with femoral neck fractures,

and higher mortality rates were reported for a one-year follow-up for monoblock prostheses¹⁴. Although it is known that arthroplasty increases the need for blood transfusion in intertrochanteric fractures, there is no study investigating the effects of the type of prosthesis used in this regard.

The purpose of this retrospective study was to investigate the effects of the prosthesis type on perioperative anemia, which is effective on mortality, and therefore blood transfusion. In addition, we aimed to investigate risk factors for patients in need of blood transfusion and to reach a clinical path in terms of preparation for transfusion.

MATERIALS and METHODS

Ethical approval

Ethical approval for this study was obtained from Namık Kemal University Ethics Committee (2020.138.05.39).

Patients and study design

In our study, 105 patients who underwent partial prosthesis due to traumatic hip fracture between February 2015 and November 2019 were included in the evaluation. The patients were divided into two groups as those with a modular partial hip replacement and those with a monoblock partial hip replacement. Nine patients with cemented prostheses were excluded. While modular prosthesis was the primary choice for intertrochanteric fractures requiring calcar replacement, monoblock prosthesis was preferred for femoral neck fractures that did not require calcar support. Of the 96 patients included, 58 had intertrochanteric fractures and 38 had femoral neck fractures. Cables were used in 25 of 58 patients using a modular prosthesis and in 11 of 38 patients with monoblock prosthesis. Of the 58 patients with a modular prosthesis, 40 were female and 18 were male, 24 of the 38 patients who used monoblock prosthesis were female and 16 were male (Table 1). Intertrochanteric fractures were classified based on Evans-Jensen and Femur neck fractures based on Pauwels classifications. 10 patients were E1 (18%), 10 patients were E2 (18%), 4 patients were E3 (6%), 22 (38) were E4, and 12 (20%) were E5 (Table 2). Of the 38 patients with femoral neck fractures, 12 were P1 (32%), 6 were P2 (16%), and 20 were P3 (52%) (Table 3). In the intertrochanteric group, 30 patients were operated on the left and 28 on the right side. While 24 of the patients with femoral neck fractures were operated on the left side, the operation direction was right on 14 patients. There

was no significant difference between the two groups in terms of sides ($p = 0.272$).

Table 1: Distribution of patients by prosthesis type and gender

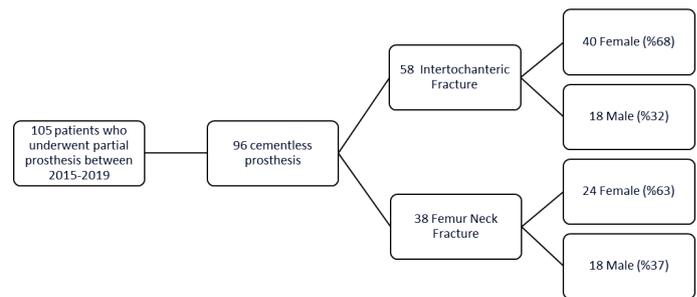


Table 2: Distribution Intertrochanteric Fractures according to Evans-Jensen classification

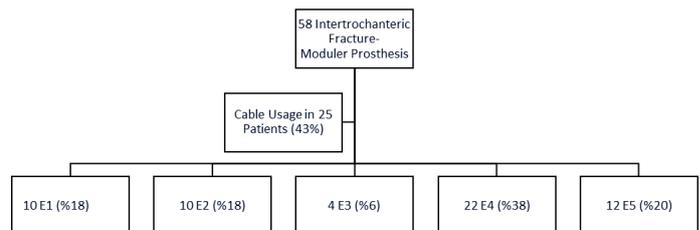
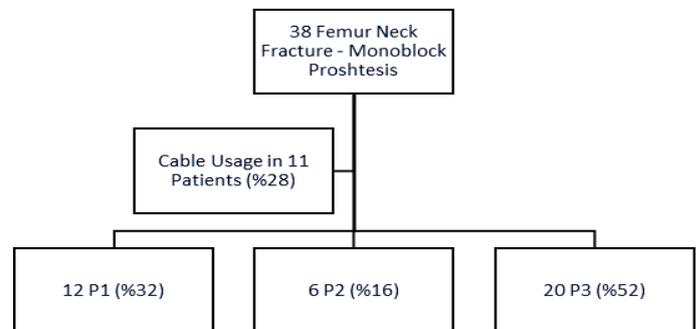


Table 3: Distribution of Femur Neck Fractures by Pauwels classification



All surgeries were performed by experienced orthopedists. All patients were consulted to the relevant clinical departments for the treatment of concomitant diseases, and the preoperative operation was delayed until they could tolerate surgery. In the surgical approach, the standard posterior approach was used. 1st generation cefazolin prophylaxis was applied to all patients 30 minutes before the operation and on the post-op 1st day. Low molecular weight heparin was started for deep vein thrombosis prophylaxis in all patients and continued until discharge time. In the postoperative period, all patients were dressed in anti embolic socks and a foot pump was applied for prophylaxis of mechanical thromboembolism. The patients were mobilized to the level that they could tolerate when the drain was closed on post-op day 0. Post-op 48th hour drains were removed. After discharge, 100 mg aspirin oral tablet daily was prescribed for 1 month. The

patients were evaluated on the post-operative 15th day for stitch removal and wound control. Patients were evaluated regularly at 1-month, 3-month, 6-month, and 1-year, and thereafter with annual outpatient controls.

The number of blood products used for patients was evaluated. Hemoglobin values were evaluated retrospectively at the time of admission to the hospital, before the operation and in the post-operative period. The type of anesthesia, concomitant diseases, and drugs used were screened and evaluated retrospectively.

Statistical analysis

Statistical transactions were made with SPSS 25.0 (SPSS Inc, Chicago IL, USA) program and studied with a 95% confidence interval. The distributions of the data were evaluated. Frequency analysis was used for categorical data and mean \pm standard deviation for continuous data. In the normality analysis, the Wilcoxon test, which is the non-parametric equivalent of the paired t-test, was used to compare the pre and post-op hemoglobin and hematocrit values of the groups that did not conform to the normal distribution. Mann-Whitney U test, which is the non-parametric equivalent of the independent sample t-test, was used to evaluate blood products between the two groups. Kruskal-Wallis test was used to determine whether the anesthesia type had an effect on blood values and blood products. Situations in which the p-value was below 0.05 were considered statistically significant.

RESULTS

In our patients who underwent modular hemiarthroplasty due to intertrochanteric fracture, the pre-operative hemoglobin value was 11.6 for women and 12.2 for men; hematocrit values were 35.5 for women and 37.6 for men. In this group, values seen before surgery were Hb 10.7 in women and 11.0 in men; Hct is 32.9 in women and 33.2 in men and there was a significant decrease in both sexes ($p < 0.001$). Also in the post-operative period, Hb is 9,1 in women, 9,2 in men; Hct is 28.0 in women and 28.3 in men. It is seen that anemia becomes prominent in until the operation time ($p = 0.001$) and also in the period after the operation ($p < 0.001$) considering Hb and Hct values (Graphic 1 and 2).

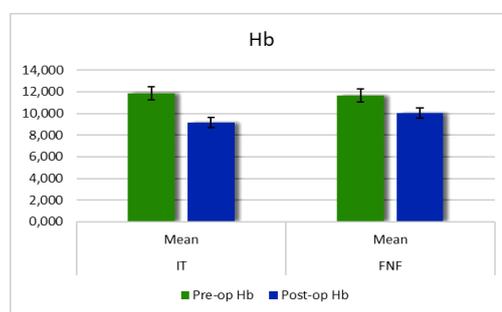
There were 18 male and 42 female patients with the intertrochanteric femur fracture undergoing partial modular prosthesis. The blood products used did not differ in gender ($p = 0.972$). There were 16 male and 24 female patients with

femoral neck fractures undergoing monoblock prosthesis. There is no significant difference in this group in terms of gender ($p = 0.423$).

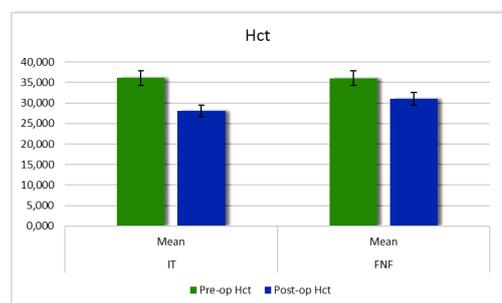
On average, 1.91 units were used for 11 patients over 80 years old with femoral neck fractures and 1.96 units were used for 27 patients under 80 years of age ($p = 0.507$). In our study, although there was no significant difference between the intertrochanteric fracture group with modular prosthesis and the femoral neck fracture group with monoblock prosthesis, it was found to be 1.95 units in the monoblock group, while it was 1.48 in the modular group ($p = 0.127$).

In our study, 12 of 96 patients underwent blood transfusion during surgery, and the average amount of transfusion in these 12 patients was 1.17 (0-2). In the intertrochanteric fracture group with modular prosthesis, 6 patients were transfused during the operation and an average of 1 unit. The amount of transfusion in this group before surgery is 11. In 1 week postoperatively, 32 patients were transfused. An average of 2.53 units of blood transfusions was performed in patients who underwent postoperative transfusion.

The anesthesia type did not show a significant difference in the intertrochanteric fracture group in terms of the use of blood products ($p = 0.058$). Anesthesia type did not make a significant difference in the femoral neck fracture group ($p = 0.626$). The number of patients transfused and the amount of transfusion was higher in the post-operative period and the most transfused amount during surgery was 2 units.



Graphic 1: Distribution of Hemoglobin values before and after surgery by groups



Graphic 2: Distribution of Hematocrit values before and after surgery by groups

DISCUSSION

As life expectancy increases with better medical care, the frequency of hip fractures in elderly patients has also increased and has become a common source of morbidity and mortality worldwide¹⁵. It is known that geriatric hip fractures are seen 3-4 times more in women than men due to increased bone destruction in the post-menopausal period¹⁶. In our study, 64 women (40 intertrochanteric fractures, 18 femoral neck fractures), 36 males (24 intertrochanteric fractures, 18 femoral neck fractures) were included, and the female / male ratio was approximately 2 times higher. Proximal femur fractures are frequently seen over 60 years of age¹⁷. Although there are different surgical methods in younger patients, partial prostheses are frequently preferred in this age range. In our study, the mean age was found to be 78.58 (53-98), and patients who underwent hemiarthroplasty in this age group were included in our study. In the study conducted by Kharomi et al.¹⁸, the average age was reported as 81 and this is similar to our average age.

Due to the frequency of osteoporosis in elderly patients, hip fractures tend to be comminuted and displaced. Unstable intertrochanteric fractures, especially including large and small trochanter, may appear like the most complex forms of hip fractures in older patients. Internal fixation may also result in early biomechanical failure due to poor bone quality in the elderly. Several studies have reported successful outcomes of cemented partial prosthesis applications with or without support, in geriatric hip fractures^{19,20}. Donaldson et al.²¹ have suggested that the use of cementless prosthesis can minimize mortality and morbidity ratios in high-risk patients.

There are several factors affecting mortality and morbidity in hip fractures⁵. It is known that mortality increases with pre- and post-operative anemia²³. Foss and Kehlet reported that post-operative anemia was associated with higher medical complications and increased hospital stay²⁴. In our study, it was observed that anemia was frequent and the amount of blood transfusion was significantly higher in both patient groups in the postoperative period. In this context, it is important to regularly monitor blood values.

In orthopedic surgeries, pre-operative anemia varies between 20-51%. Anemia is defined by the World Health Organization (WHO) as hemoglobin value is <12 g / dl in women, 13 g / dl in men, accompanying hematocrit value is

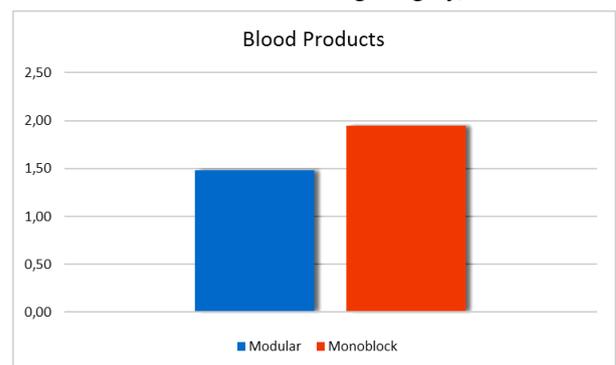
<36% in women and <39% in men^{25, 26}. In our patients who underwent modular hemiarthroplasty due to intertrochanteric fracture, the pre-operative hemoglobin value was 11.6 for women and 12.2 for men; hematocrit values were 35.5 for women and 37.6 for men. In this group, values seen before surgery were Hb 10.7 in women and 11.0 in men; Hct is 32.9 in women and 33.2 in men and there was a significant decrease in both gender. Also in the post-operative period, Hb is 9,1 in women, 9,2 in men; Hct is 28.0 in women and 28.3 in men. It is seen that anemia becomes prominent until the operation time (p

Table 4: Distribution of blood transfused patients by groups

Modular Prosthesis	Pre-op 11 patients Per-op 6 patients Post-op 32 patients
Monoblock Prosthesis	Pre-op 7 patients Per-op 6 patients Post-op 29 patients

= 0.001) and also in the period after the operation (p <0.001) considering Hb and Hct values.

Bajs et al.²⁷ used blood transfusions during the operation in 62 of 135 patients they operated for an intertrochanteric femur fracture. In our study, 12 of 96 patients underwent blood transfusion during surgery, and the average



Graphic 3: The distribution of the average amount of blood products used by groups

amount of transfusion in these 12 patients was 1.17 (0-2). In the intertrochanteric fracture group which we applied modular prosthesis, 6 patients were transfused during the operation and the average amount of transfusion was 1 unit. The number of people transfused in this group before surgery is 11. In 1 week postoperatively, 32 patients were transfused. An average of 2.53 units of blood transfusions was performed in patients who underwent postoperative transfusion (Table 4). Low hemoglobin levels and advanced age in intertrochanteric fractures have been reported to be among the effective factors

for transfusion²⁸.

Swain et al.²⁹ retrospectively evaluated patients with 249 femoral neck fractures, indicating that there was a significantly higher use of blood products in patients over the age of 80 compared to the group under the age of 80. In patients over the age of 80, the mean transfusion was reported as 1.64 units and 0.94 for the under. In our study, an average of 1.91 units was used for 11 patients over 80 years old with a femoral neck fracture, and 1.96 units for 27 patients under 80 years of age. In our study, although there was no significant difference between the intertrochanteric fracture group with a modular prosthesis and the femoral neck fracture group with monoblock prosthesis, it was found that it was 1.95 units in the monoblock group and 1.48 in the modular group (Graphic 3).

Heng Kan et al.¹⁴ evaluated 249 traumatic patients with 112 modular and 147 monoblock prostheses and reported a higher mortality rate in the 1-year period and no difference in the 30-day period in the monoblock group. We have seen that anesthesia type, age, and gender do not make a significant difference in terms of anemia and blood transfusion in monoblock and modular prosthesis groups until the time they are discharged.

The limitations of our study include that no perioperative blood loss was determined, the number of patients was relatively low, and the data was compiled retrospectively.

CONCLUSION

There was a significant decrease in hemoglobin and hematocrit values in two groups of elderly hip fractured patients with modular and monoblock partial prosthesis respectively, both from the time of hospitalization to the time of surgery and after the surgery. It is seen that blood products are used with a significant frequency after surgery. The maximum amount used during the surgery is 2 units. It is seen that age, gender, anesthesia type, and prosthesis type do not make a significant difference in terms of the use of blood products. As a result, in these fractures which blood loss is predicted, with close monitoring of pre-operative blood values, consideration of blood transfusion in the preoperative period, and operation preparation with 2 units of erythrocyte suspension can be recommended.

Conflict of interest

The authors declare that they have no conflict of interest.

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