

ORIGINAL ARTICLE

Postoperative haemoglobin estimation in elderly hip fractures

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Abstract

Objective: The purpose of our study was to analyze the effect of postoperative hemoglobin check on the day of surgery and 1 day postoperatively in elderly hip fracture patients with an aim to determine an optimum timing of postoperative hemoglobin check.

Material and methods: A retrospective study of 253 patients. Age, Charlson morbidity index, fracture type, time from admission to surgery, type of surgery, preoperative hemoglobin, postoperative hemoglobin, hemoglobin drop, day of postoperative hemoglobin measurement, blood transfusion, length of hospital stay, and 30-day mortality were recorded.

Results: One hundred and sixty-three patients (Group I) had postoperative hemoglobin check on the first postoperative day and 90 patients (Group II) on the day of surgery. Mean age in Group I was 82 years and 80 years in Group II. Mean Charlson morbidity index for Group I was 5.9 and Group II was 5.7. There was a significantly higher hemoglobin drop in Group I ($P < 0.05$) but no difference in blood transfusion requirement, length of stay, or 30-day mortality in the two groups ($P > 0.05$).

Conclusion: Our results suggest that postoperative hemoglobin measurement on the day of surgery is not a true reflection of hemoglobin drop and recommend estimation of hemoglobin on the first postoperative day.

KEYWORDS

blood transfusion, elderly, hemoglobin, hip fracture, postoperative

1 | INTRODUCTION

The hip fractures in the elderly are on the rise. In 1998, the total number of hip fractures worldwide was about 1.26 million and is estimated to be about 2.6 million by the year 2025 and 4.5 million by the year 2050.¹ The majority of the patients with fragility hip fractures are frail and have multiple comorbidities. The aim of service delivery in this high-risk group is to minimize hospitalization, morbidity, and mortality. Perioperative hemoglobin levels are an important marker of patient recovery, hospital stay,

readmissions, and mortality. Low perioperative hemoglobin is said to be one of the most important factors that delay patient mobility in early postoperative period² and therefore potentially increase the risk of medical complications and increase hospital stay. The perioperative hemoglobin levels can predict the mortality in elderly patients with hip fractures. Hemoglobin level below 10 g/dL is associated with increased mortality in elderly hip fractures.³ The higher postoperative hemoglobin reduces the length of hospital stay and readmissions within 2 months of surgery.⁴ There is a higher in-patient stay, increased morbidity, and mortality in elderly

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hip fracture patients with low perioperative hemoglobin.⁵ A timely detection of low postoperative hemoglobin in elderly hip fracture patients may enhance patient recovery, reduce hospital stay, and mortality as it will allow a prompt correction of postoperative anemia; hence, an early postoperative haemoglobin check is logical. The question remains how early should this be. There is not much published on the optimum timing of the postoperative hemoglobin check in elderly hip fractures and as a result, there are no standardized evidence-based guidelines and agreement. In general, it is checked on the first postoperative day. We conducted this study to investigate the effect of postoperative hemoglobin check on the day of surgery on hemoglobin drop, blood transfusion, length of stay, and mortality and compare with those who had it checked on the first postoperative day with an aim to establish an optimum timing for postoperative hemoglobin check in elderly hip fractures treated with surgery.

2 | MATERIALS AND METHODS

We performed a retrospective comparative observational study of elderly patients admitted in our hospital with a hip fracture from March 1, 2017 to December 31, 2017. Data were collected prospectively from the electronic patient records and local hip fracture database. Age, sex, Charlson morbidity score, type of fracture, time to surgery from admission, operative procedure, preoperative hemoglobin, postoperative hemoglobin, hemoglobin drop, blood transfusion requirement, length of stay, and 30-day mortality were recorded. Exclusion criteria were patients below the age of 65 and those requiring preoperative blood transfusion. There were 163 patients who had postoperative hemoglobin measured on the first postoperative day (Group I) and 90 patients in whom postoperative hemoglobin was measured on the day of surgery (Group II). An unpaired *t* test and chi-square test were used for statistical analysis. The level of significance was $P < 0.05$. The study was conducted in accordance with The principles of The Declaration of accordance Helsinki, and the study protocol was approved by the ethics

committee of hospital. Because of the retrospective nature of the study, patient consent for inclusion was waived.

3 | RESULTS

One hundred and thirty-one patients sustained intracapsular fractures, 92 extracapsular fractures, and 30 subtrocantorial fractures. One hundred and eleven patients underwent hemiarthroplasty, 92 had a dynamic hip screw, 30 cephalomedullary nailing, and 20 total hip replacements. Group I consisted of 124 females and 39 males ($n = 163$) with an average age of 82 years. Group II consisted of 59 females and 31 males ($n = 90$) with an average age of 80 years. Table 1 shows demography. The mean preoperative hemoglobin in Group I was 122.5 g/L and in Group II was 118.9 g/L (P value = .08). The mean hemoglobin drop from admission to postoperative hemoglobin level in Group I was 22.8 g/L compared to 19.2 g/L in Group II (P value = .03). The mean length of stay in the Group I was 17 days compared to 19 days in the Group II (P value = .14). The proportion of patients requiring postoperative blood transfusion in Group 1 was 36% compared to 47% of patients in Group II (P value = .10). Ten patients (6.1%) passed away within 30 days of surgery in Group I and 12 (13.3%) in Group II (P value = .08). Table 2 summarizes the results with the P value.

The postoperative blood transfusion increased the mean length of stay in Group 1 by 2 days (P value = 0.00) and in Group 2 by 3 days (P value = 0.03) when compared with those who did not receive the blood transfusion in the same group. There was no statistical difference in mean length of stay between transfused patients in Group I and Group II (P value = 0.08). Table 3 compares the hemoglobin drop, length of stay, and blood transfusion according to the operative procedure. The largest blood transfusion requirement and hemoglobin drop were in patients treated with cephalomedullary nailing and lowest in those treated with hemiarthroplasty. Seventy-eight percent and 75% of the patients who underwent cephalomedullary nailing required postoperative blood transfusion in Group I and group II, respectively. The length of stay was 4 days less in patients

TABLE 1 Patient demographics

	Group I Hemoglobin measured on the first postoperative day	Group II Hemoglobin measured on the day of surgery
Age	82 years	80 years
Sex	Female: 124 Male: 39	Female: 59 Male: 31
Charlson comorbidity index	5.9	5.7
Mean time to surgery	23 h	25 h
Patients operated within 36 h of admission	146 (89%)	76 (85%)
Hemiarthroplasty	79 (48.4%)	32 (35.5%)
Dynamic hip screw	57 (34.9%)	35 (38.8%)
Cephalomedullary nail	18 (11.0%)	12 (13.3%)
Total hip replacement	9 (5.5%)	11 (12.2%)

TABLE 2 Results with P values

	Group I	Group II	P value
Preoperative hemoglobin	122.5 g/L	118.9 g/L	0.08
Hemoglobin drop	22.8 g/L	19.2 g/L	0.03
Blood transfusion	36%	47%	0.10
Length of stay	17 days	19 days	0.14
30 day mortality	10 (6.1%)	12 (13.3%)	0.08

TABLE 3 Length of stay (LOS), transfusion, and drop in hemoglobin (HB) According to the operative procedure

	LOS Group I	LOS Group II	% transfused Group I	% transfused Group II	HB drop Group I	HB drop Group II
Hemiarthroplasty	14	19	28%	34%	20.9 g/L	14.9 g/L
Dynamic hip screw	11	15	32%	53%	22.2 g/L	19.7 g/L
Total hip replacement	13	15	33%	36%	25.8 g/L	25.1 g/L
Cephalomedullary nail	21	17	78%	75%	32.2 g/L	27.4 g/L

who had cephalomedullary nailing and postoperative hemoglobin check on the day of surgery followed by transfusion (P value = 0.04).

4 | DISCUSSION

The findings of our study demonstrate that measurement of the postoperative hemoglobin on the day of surgery is associated with an increased blood transfusion, hospital stay, and 30-day mortality. The postoperative blood transfusion increased the length of stay regardless of whether the postoperative hemoglobin was checked on the day of surgery or on the first postoperative day. In addition, the largest postoperative hemoglobin drop and increased blood transfusion requirement were in patients who sustained subtrochanteric fractures and were treated with cephalomedullary nailing regardless of the timing of postoperative hemoglobin check; however, those who had hemoglobin checked on the day of surgery and transfused promptly had a shorter hospital stay than those who had hemoglobin checked on the first postoperative day.

Significant perioperative blood loss in fragility hip fractures can have an effect on patient recovery and rehabilitation. An early perioperative hemoglobin check can help to correct anemia without any delay and may enhance postoperative recovery.⁶ It is well known that low hemoglobin levels in patients with hip fractures are associated with high mortality.⁷ Our study compares the hemoglobin drop, length of stay, postoperative blood transfusion, and 30-day mortality in patients who had hemoglobin check on the day of surgery and on the first operative day in order to standardize the timing of postoperative hemoglobin estimation.

In general, blood transfusion is required in about 53% of hip fracture patients. There are liberal and restrictive transfusion policies.⁸⁻¹⁰ In liberal transfusion policy, 74% to 100% of patients required a blood transfusion and 11% to 45% in the restrictive policy group.¹¹ Perioperative anemia contributes to postoperative delirium and a liberal transfusion policy has shown to reduce its incidence in

hip fracture patients. It has been shown that the frequency of postoperative delirium was 10% in a liberal transfusion strategy while 21% in restrictive policy.¹² The restrictive blood transfusion policy in elderly patients with hip fractures had a lower 30- and 90-day mortality.¹³ The liberal policy has shown to have no effect on 30-day overall Quality of life (OQoL) but an improved OQoL from 30 days to 1 year after surgery.¹⁰ There is an ongoing debate; hence, a patient-specific transfusion strategy has been recommended as there was no difference in restrictive and liberal transfusion policy on the length of stay, mortality, delirium, infections, thromboembolic events, arrhythmias, and heart failure in patients with hip fractures.¹⁴ We follow a case-specific approach, and our transfusion rate was 36% in Group I and 47% in Group II, which is almost similar to that reported in the literature. We observed a higher hemoglobin drop in patients who had hemoglobin checked on the first postoperative day that was significant and most likely represents an ongoing hidden blood loss, thus indicating that measurement of postoperative hemoglobin on the day of surgery may not represent the true hemoglobin drop.

The perioperative blood transfusion is not without its risks. The postoperative blood transfusion in elderly patients with hip fractures had an increased risk of mortality in the long term.¹⁵ In addition, a high risk of infections and an increased length of stay have been reported in elderly hip fracture patients who received blood transfusion.¹⁶ An increased length of hospital stay, high 30-day mortality, and high hospital readmission is associated with elderly patients with hip fractures who received blood transfusion,¹⁷ while some authors believe that blood transfusion in hip fracture patients is not associated with increased mortality, superficial and deep wound infection, deep venous thrombosis, chest infection, and congestive cardiac failure.¹⁸ In our study, postoperative hemoglobin measurement on day of surgery resulted in higher blood transfusion but did not translate into a shorter length of stay and reduced mortality.

The length of stay in hip fracture patients depends upon many factors. One of the risk factors is low postoperative hemoglobin though there is controversy in the literature. It is said that length

of stay depends upon postoperative medical complications rather than low postoperative hemoglobin,¹⁹ though an increase in the length of stay and medical complications has been reported in patients with low hemoglobin.²⁰ The patients with low hemoglobin on the first postoperative day feel lethargic, weak, and giddy, hence not willing to mobilize, which delays mobilization which in turn increases hospital stay. Low postoperative hemoglobin did reduce mobility in hip fracture patients that can potentially increase the length of hospital stay,²¹ and some authors recommend a preoperative blood transfusion in patients with hemoglobin less than 11 g/dL to reduce hospitalization.²² In our study, the length of stay was significantly higher in patients who received postoperative blood transfusion in both groups ($P < .05$). The transfusion requirement in patients who had hemoglobin checked on the day of surgery was higher (47%) than those who had hemoglobin checked on the first postoperative day (36%) along with a higher length of stay and 30-day mortality support, thus supporting the argument that blood transfusion in elderly hip fractures results in a higher length of stay and 30-day mortality.

The perioperative blood loss and blood transfusion requirement is less in intracapsular fractures than the extracapsular fractures,²³ and subgroup analysis in our study conquer this as we observed a low blood transfusion requirement in intracapsular fractures undergoing hemiarthroplasty in both groups. In our cohort, the blood transfusion requirement and hemoglobin drop were lowest in patients undergoing hemiarthroplasty, while a highest haemoglobin drop and a high blood transfusion in patients who sustained subtrocchenteric fractures and were treated with cephalomedullary nails in both groups. Furthermore, patients treated with cephalomedullary nails who had postoperative hemoglobin check on the day of surgery and subsequently transfused had a lower hospital stay as compared to their counterparts who had hemoglobin checked on the first postoperative day, therefore making a case for early hemoglobin check in patients sustaining subtrocchenteric fractures treated with cephalomedullary nailing.

It has been suggested to measure hemoglobin level on the second postoperative day²⁴; however, this study included patients who had a dynamic hip screw and hemiarthroplasty only and therefore may not represent the whole spectrum, as patients undergoing hip replacements and cephalomedullary nailing were not included in the study. The blood loss from a hip fracture continues after admission.²⁵ Surgery results in further blood loss; hence, delaying postoperative hemoglobin check for 48 hours may have an adverse effect on patient outcome. Our results demonstrate that postoperative hemoglobin measurement on the first postoperative day had a significantly higher drop in hemoglobin. We believe that there is an element of hidden blood loss at the fracture site and in the postoperative field that continues in the early postoperative period and most likely explains the higher hemoglobin drop on the first postoperative day, indicating that postoperative hemoglobin measured on the day of surgery is not a true reflection and a hemoglobin check on the first postoperative day is recommended.

Limitations of our study include a retrospective study and small numbers when data analyzed by procedure type. We analyzed the effect of postoperative hemoglobin on the length of stay and 30-day mortality, but there are several other factors that can influence as well; however, consideration of all the factors were beyond the scope of our study. The decision to transfuse was taken by different physicians who may differ in their approach, though a restrictive policy is followed at our situation.

In summary, postoperative hemoglobin check on the day of the surgery did not result in reduction of morbidity and mortality. We observed a higher blood transfusion requirement, higher length of stay, and higher mortality in patients who had postoperative hemoglobin checked on the day of surgery, though not significant; however, hemoglobin drop was significantly higher on the first operative day, indicating that hemoglobin measurement on the day of surgery is an underestimation. Hence, measurement of hemoglobin on the first postoperative day is a pragmatic approach, though hemoglobin check on the day of surgery in a small number of patients, in particular those who have sustained a subtrocchenteric fracture treated with cephalomedullary nail, may be beneficial; hence, a case-selective approach is advisable.

5 | CONCLUSION

Our results demonstrate that there is no reduction in morbidity and mortality in patients who had postoperative hemoglobin check on the day of surgery. However, there is a higher drop in hemoglobin on the first postoperative day, indicating that hemoglobin check on day of surgery is not a true reflection of blood loss; therefore, we favor the estimation of postoperative hemoglobin estimation on first postoperative day in elderly hip fracture patients.

CONFLICTS OF INTEREST

Nothing to declare.

AUTHOR CONTRIBUTIONS

M. Ali Fazal contributed to study design, analysis, writing, and preparation of the manuscript; Anand Shah, data collection, statistical analysis, and preparation of the manuscript; Foad Y. Mohammad, writing and preparation of the manuscript; Raza Hassan, study design and data collection.

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How to cite this article: Fazal MA, Shah A, Mohamed FY, Hassan R. Postoperative haemoglobin estimation in elderly hip fractures. *Aging Med*. 2021;4:175-179. <https://doi.org/10.1002/agm2.12172>