Original Article | Journal of Clinical Orthopaedics | 2026 January-June; 11(1):-78-81

Postoperative Hemoglobin Change and Blood Transfusion Requirement Following Open Lumbar Surgery: A 20-Patient Case Series

Sumedha Shinde[1], Arvind J. Vatkar[2], Saloni Mhatre[3], Sahil Dabholkar[3], Gaurav Gupta[4], Gursimran Singh Sandhu[3], Elvin Anto Keettikal[3]

Abstract

Background: Postoperative anemia remains an important concern after open lumbar surgery because hemoglobin decline may delay recovery and increase the need for allogeneic blood transfusion.

Objective: To analyze perioperative hemoglobin change, estimated blood loss, and postoperative blood transfusion requirement in a 20-patient case series of open lumbar surgery.

Methods: A retrospective observational analysis was performed using the uploaded dataset of 20 patients undergoing open lumbar surgery. Variables included age, sex, number of lumbar levels operated, preoperative hemoglobin, postoperative hemoglobin, estimated blood loss, and postoperative transfusion requirement. Hemoglobin drop was calculated as preoperative minus postoperative hemoglobin, paired t-test was used to compare preoperative and postoperative hemoglobin, one-way ANOVA was used to compare hemoglobin drop across surgical levels, and linear regression was applied to assess the effect of additional operated levels on hemoglobin reduction.

Results: The cohort comprised 20 patients with mean age 59.5 ± 9.7 years; 15 were male and 5 were female. Mean preoperative hemoglobin was 13.06 ± 0.99 g/dL, mean postoperative hemoglobin was 11.92 ± 1.61 g/dL, and mean hemoglobin drop was 1.13 ± 0.90 g/dL. The reduction in hemoglobin was statistically significant ($t = 5.65$, $p = 0.0000$). Mean estimated blood loss was 252.5 ± 129.2 mL. Hemoglobin drop increased significantly with the number of operated levels, with a regression equation of hemoglobin drop = -0.23 + 0.85 × (number of levels), corresponding to an increment of 0.85 g/dL per additional level (95% CI 0.44 to 1.26; $p = 0.0004$; $R^2 = 0.508$). Postoperative allogeneic transfusion was required in 3 patients (15.0%), and each of these patients received 1 pint of blood.

Conclusion: Open lumbar surgery was associated with significant postoperative hemoglobin decline, and multilevel surgery showed greater hemoglobin reduction and a higher need for postoperative blood transfusion.

Keywords: Lumbar surgery, TLIF, Hemoglobin, Blood loss, Postoperative anemia, Transfusion.

Introduction

The perioperative management of haemoglobin and blood loss in lumbar spine surgery is clinically significant since postoperative anaemia can limit mobilisation, lengthen hospitalisation, and necessitate allogeneic transfusion. Sasaji et al. found that postoperative haemoglobin drop after posterior lumbar decompression increased with the number of operated levels, emphasising the need of postoperative blood control [1]. Open lumbar procedures such as transforaminal lumbar interbody fusion are generally more invasive than simple decompression and may therefore carry a meaningful risk of blood loss and postoperative transfusion [2]. The present case series was undertaken to rewrite the template study using the updated uploaded dataset and to additionally quantify postoperative transfusion requirement in the analyzed cohort.

[1]Department of Immuno Haematology and Blood Transfusion, Dr. D.Y. Patil School of Medicine, Navi Mumbai, Maharashtra, India.
[2]Department of Orthopaedics, MGM Medical College, Navi Mumbai, Maharashtra, India.
[3]Department of Orthopaedics, Dr D Y Patil School of Medicine, Navi Mumbai, Maharashtra, India.
[3]Central Institute of Orthopaedics, Safdarjung Hospital, New Delhi, India.

Address of Correspondence
Dr. Sumedha Shinde,
Department of Immuno Haematology and Blood Transfusion, Dr. D.Y. Patil School of Medicine, Navi Mumbai, Maharashtra, India.
E-mail: sumedhashinde@gmail.com

Submitted Date: 29-12-2025, Review Date: 21-01-2026, Accepted Date: 19-04-2026 & Published Date: 10-05-2026

Journal of Clinical Orthopaedics | Available on www.jcorth.com | DOI: https://doi.org/10.13107/jcorth.2026.v11.i01.846

Table 1: Summary according to number of operated levels

Variable	1 level	2 levels	3 levels
Patients, n	11	6	3
Preoperative Hb, g/dL	13.18 ± 0.93	13.38 ± 0.97	11.97 ± 0.68
Postoperative Hb, g/dL	12.55 ± 1.04	11.95 ± 1.59	9.60 ± 1.65
Hb drop, g/dL	0.64 ± 0.33	1.43 ± 0.75	2.37 ± 1.35
Estimated blood loss, mL	168.2 ± 68.1	291.7 ± 49.2	483.3 ± 76.4
Transfusion required, n	0	1	2

Materials and Methods

This retrospective case series used the retrospective data of operated patients in navi Mumbai by the authors AV and SK, containing 20 patients who underwent open lumbar surgery from October 2025 to March 2026. Recorded variables were patient number, number of operated lumbar levels, age, sex, preoperative hemoglobin, postoperative hemoglobin, estimated blood loss, and whether postoperative transfusion was required.

Technique of Surgery- Patient was given general anaesthesia and injection tranexamic acid 1 gram iv before taking incision. Midline incision was used, pedicle screws were inserted, using anatomical landmarks and xray guidance. Midline laminectomy was done, pars interarticularis on one side- usually symptomatic side was fractured by osteotome. Decompression of nerves was done. Then discectomy and cage insertion was done. Rods were inserted and the wound was closed in layers after achieving hemostasis.

Hemoglobin drop was defined as the difference between preoperative and postoperative hemoglobin. Descriptive statistics are presented as mean ± standard deviation. Paired t-test assessed the difference between preoperative and postoperative hemoglobin, one-way ANOVA tested differences in hemoglobin drop between 1-level, 2-level, and 3-level surgery, and linear regression modeled the relationship between operated levels and haemoglobin decline. Postoperative transfusion rate was calculated as the proportion of patients recorded as requiring transfusion in the spreadsheet.

Results

Demographic and perioperative findings

The study included 20 patients with a mean age of 59.5 ± 9.7 years, including 15 men and 5 women. One-level surgery was performed in 11 patients, two-level surgery in 6 patients, and three-level surgery in 3 patients. Mean estimated blood loss for the entire cohort was 252.5 ± 129.2 mL, ranging from 100 to 550 mL.

Hemoglobin change

Mean preoperative hemoglobin was 13.06 ± 0.99 g/dL, while mean postoperative hemoglobin was 11.92 ± 1.61 g/dL. The mean postoperative hemoglobin decline was 1.13 ± 0.90 g/dL, and this reduction was statistically significant on paired analysis ($t = 5.65$, $p = 0.0000$).

Patients undergoing one-level surgery had a mean hemoglobin drop of 0.64 ± 0.33 g/dL, those undergoing two-level surgery had a drop of 1.43 ± 0.75 g/dL, and those undergoing three-level surgery had a drop of 2.37 ± 1.35 g/dL. One-way ANOVA showed a significant difference in hemoglobin drop among the three level groups ($F = 8.83$, $p = 0.0023$).

Linear regression showed that hemoglobin drop increased by 0.85 g/dL for each additional operated level, with the equation hemoglobin drop = -0.23 + 0.85 × (number of levels). This association was statistically significant (95% CI 0.44 to 1.26; $p = 0.0004$).

Postoperative transfusion requirement

Postoperative allogeneic blood transfusion was required in 3 of 20 patients, giving a transfusion rate of 15.0%. All transfused patients

patient no	level of spine surgery (Lumbar)	Age (in years)	sex	pre hb (gm/dl)	post op hb (gm/dl)	estimated blood loss (ml)	transfusion required
1	1	54	M	12.6	11.2	150	nil
2	2	63	m	11.7	9	300	1 pint
3	2	49	m	13.6	11.6	300	nil
4	1	70	m	14.3	14	100	nil
5	1	64	m	12.2	12	100	nil
6	1	46	m	13.4	13	100	nil
7	2	49	m	14	13.1	200	nil
8	3	73	f	12.5	11.5	400	nil
9	3	52	m	12.2	8.5	500	1 pint
10	1	55	m	13.4	12.7	200	nil
11	1	61	f	11.6	10.8	250	nil
12	1	56	m	13.6	12.9	200	nil
13	1	70	m	13.7	12.8	300	nil
14	2	65	m	14.5	13.4	350	nil
15	3	76	f	11.2	8.8	550	1 pint
16	2	73	m	13.5	12.5	300	nil
17	1	46	f	12.1	11.6	200	nil
18	1	48	m	13.6	13	100	nil
19	1	64	m	14.5	14	150	nil
20	2	57	f	13	12.1	300	nil

received 1 pint of blood.

The transfused patients were patient 2, patient 9, and patient 15, corresponding to one 2-level surgery and two 3-level surgeries. Their postoperative hemoglobin values were 9.0 g/dL, 8.5 g/dL, and 8.8 g/dL, respectively, and their estimated blood losses were 300 mL, 500 mL, and 550 mL. No patient in the 1-level surgery group required transfusion as shown in table 1.

Discussion

This case series demonstrates that open lumbar surgery is associated with a significant postoperative fall in hemoglobin, and that the magnitude of hemoglobin decline rises progressively with the number of operated levels. The findings parallel the level-dependent pattern described by Sasaji et al. in posterior decompression surgery, although the present study additionally documents postoperative transfusion events in a fusion-oriented open surgery dataset [1].

According to Suresh et al's systematic review, decreased preoperative Hb/Hct was a significant predictor of greater postoperative morbidity, including return to the operating room, pulmonary problems, transfusions, and extended length of stay [3, 4].

A clinically useful finding in the current dataset is that postoperative transfusion was required in 3 patients (15.0%), and all transfused patients belonged to the 2-level or 3-level groups . This suggests that increasing surgical extent may not only worsen hemoglobin drop but may also increase the probability of requiring postoperative blood replacement. Similar results have been shown by Nuttall et al in his study of 244 patients, which showed multiple regression model suggesting low pre-operative hemoglobin levels and multiple level spine surgery , increased the chances of blood transfusion [5].

These results fit with broader perioperative blood management literature, which supports restrictive transfusion practice while emphasizing careful patient selection, preoperative anemia optimization, and anticipation of higher-risk cases. In elective spine surgery, blood transfusion has been associated with less favorable perioperative outcomes in observational studies, which strengthens the rationale for minimizing avoidable blood loss and identifying patients at higher risk before surgery [3].

The similar study by Zou et al [6] involved patients with an average age of 56.6 years. Out of 183 patients, 83 had one-level surgeries and 100 had two-level surgeries. The average intraoperative bleeding volume was 477 ml, with a mean autotransfusion volume of 163 ml.

The present study has several limitations. It is retrospective, includes only 20 patients, is based on only approximate calculations of anaesthetist in terms of estimated blood loss during surgery, and relies on one recorded postoperative hemoglobin value rather than serial nadir measurements . The dataset also does not provide operative duration, drain output, body mass index, comorbidity burden, implant details, or exact institutional transfusion triggers, so the transfusion analysis should be interpreted cautiously.

Conclusion

In this updated 20-patient case series of open lumbar surgery, postoperative hemoglobin decreased significantly after surgery, and the decline increased with the number of operated levels . Postoperative allogeneic blood transfusion was required in 3 patients, all of whom underwent multilevel surgery, indicating

Declaration of patient consent: The authors certify that they have obtained all appropriate patient consent forms. In the form, the patient has given his consent for his images and other clinical information to be reported in the Journal. The patient understands that his name and initials will not be published, and due efforts will be made to conceal his identity, but anonymity cannot be guaranteed.

Conflict of Interest: NIL; **Source of Support:** NIL

References

1. Sasaji T, Horaguchi K, Shinozaki N, Yamada N, Iwai K. Postoperative anemia following posterior decompression surgery for lumbar spinal canal stenosis. Tohoku J Exp Med [Internet]. 2013 Jan;229(1):1–4. Available from: http://dx.doi.org/10.1620/tjem.229.1

2. Karikari IO, Isaacs RE. Minimally invasive transforaminal lumbar interbody fusion: a review of techniques and outcomes. Spine (Phila Pa 1976) [Internet]. 2010 Dec 15;35(26 Suppl) :S294–301. Available from: http://dx.doi.org/10.1097/BRS.0b013e3182022ddc

3. Rybaczek M, Kowalski P, Mariak Z, Grabala M, Suszczyńska J, Łysoń T, et al. Safety in Spine Surgery: Risk Factors for Intraoperative Blood Loss and Management Strategies. Life (Basel) [Internet]. 2025 Oct 16;15(10). Available from: http://dx.doi.org/10.3390/life15101615

4. Suresh KV, Wang K, Sethi I, Zhang B, Margalit A, Puvanesarajah V, et al. Spine Surgery and Preoperative Hemoglobin, Hematocrit, and Hemoglobin A1c: A Systematic Review. Global Spine J [Internet]. 2022 Jan;12(1):155–65. Available from: http://dx.doi.org/10.1177/2192568220979821

5. Nuttall GA, Horlocker TT, Santrach PJ, Oliver WC Jr, Dekutoski MB, Bryant S. Predictors of blood transfusions in spinal instrumentation and fusion surgery. Spine (Phila Pa 1976) [Internet]. 2000 Mar 1;25(5):596–601. Available from: http://dx.doi.org/10.1097/00007632-200003010-00010

6. Zou H, Li Z, Sheng H, Tan M, Yang F, Liang L, et al. Intraoperative blood loss, postoperative drainage, and recovery in patients undergoing lumbar spinal surgery. BMC Surg [Internet]. 2015 Jun 20;15:76. Available from: http://dx.doi.org/10.1186/s12893-015-0062-9

Conflict of Interest: NIL
Source of Support: NIL

How to Cite this Article

Shinde S, Vatkar AJ, Mhatre S, Dabholkar S, Gupta G, Keettikal EA. Postoperative Hemoglobin Change and Blood Transfusion Requirement Following Open Lumbar Surgery: A 20-Patient Case Series. Journal of Clinical Orthopaedics. January-June 2026;11(1):78-81.