Predictive Factors and Outcomes in Patients With Severe Postoperative Anemia Following Total Joint Arthroplasty

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Introduction

- Perioperative allogenic blood transfusions (ABT) have demonstrated associations with poor outcomes and increased complication rates following total joint arthroplasty (TJA)[1]
- Recent strides in blood conservation methods have been made, including multimodal blood management, tranexamic acid (TXA) use, and restrictive transfusion strategies in order to reduce risk associated with transfusion[2]
- While the literature on transfusions and outcomes is extensive, the consequences of low postoperative hemoglobin is less well defined
- This study aimed to identify factors and consequences associated with severe anemia (hemoglobin <8g/dL) following primary TJA.

Materials and Methods

- A retrospective review was conducted of all the elective primary TJA at a single tertiary care medical center from January 2017 to December 2018
- One thousand six hundred and thirty-five cases were stratified based on the development of severe postoperative anemia, and compared based on patient preoperative hemoglobin, comorbidities, demographics, intraoperative variables, and postoperative outcomes
- Logistic regression was used to identify independent predictors of severe postoperative anemia.

Results

Variable	OR (95% CI)	P-value
Preoperative hemoglobin level	3.0 (2.4–3.7)†	<0.001
Hip arthroplasty	2.1 (1.3–3.4) ‡	0.004
Surgical duration	2.0 (1.6–2.6)§	<0.001
Female sex	1.4 (0.77–2.5)	0.274
General anesthesia	1.1 (0.55–2.4)‖	0.717
CCI value	1.1 (0.99–1.3)¶	0.072
Age	1.1 (0.92–1.2)#	0.443
Body mass index value	0.90 (0.86–0.94)**	<0.001
Tranexamic acid use	0.42 (0.20–0.85)	0.016

Table 1. Multivariable odds of severe postoperative anemia* after primary total joint arthroplasty in 1,583 cases from 2017–2018
CCI, Charlson Comorbidity Index; CI, confidence interval; OR, odds ratio.
*Defined as hemoglobin level < 8 g/dL. †Per 1-g/dL decrease. ‡Referent is knee arthroplasty. §Per 30-minute increase. ‖Referent is neuraxial anesthesia. ¶Per 1-point increase. #Per 5-year increase. **Per 1-unit increase.

Outcome	N (%)			P-value
	All Cases (n = 1,583)	Severe Postoperative Anemia (n = 98)	No Severe Postoperative Anemia (n = 1,485)	
Lowest postoperative hemoglobin level (g/dL)	10 ± 1.5	7.3 ± 0.6	11 ± 1.3	<0.001
Any transfusion administered	27 (2)	24 (24)	3 (<1)	<0.001
Duration of hospital stay (h)	41 ± 27†	82 ± 69†	38 ± 18†	<0.001
Acute kidney injury	33 (2)	8 (8)	25 (2)	<0.001
ED visit/readmission within 90 d	79 (5)	12 (15)	67 (5)	0.001
After Excluding Transfused Patients				
Duration of hospital stay (hours)	40 ± 20†	70 ± 39†	38 ± 18†	<0.001
Acute kidney injury	30 (2)	5 (7)	25 (2)	0.002
ED visit/readmission within 90 d	76 (5)	9 (12)	67 (5)	0.003

Table 2. Postoperative outcomes of 1,583 primary total joint arthroplasty cases from 2017–2018, by development of severe postoperative anemia*
ED, emergency department; pRBC, packed red blood cells. *Defined as hemoglobin level < 8 g/dL.
†Expressed as mean ± standard deviation.

- Surgical duration (per 30 minute increase), preoperative hemoglobin (per 1g/dL decrease), and THA vs. TKA were independently associated with severe postoperative anemia **(Table 1)**
- Use of TXA and body mass index (per 1kg/m^2 increase) were protective against it (**Table 1)**
- Severe postoperative anemia was associated with acute kidney injury (AKI), longer length of stay (LOS), and 90-day emergency department visits/readmissions (**Table 2)**

Conclusions

- Longer duration of surgery, lower preoperative hemoglobin, and THA are all associated with severe postoperative anemia, and lead to complications of AKI, increased LOS, and higher readmission rates
- As the incidence of fast-track TJA and outpatient surgery steadily increase, reducing the extent of postoperative anemia is essential for patient outcomes.

References:

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2. Derzon JH, Clarke N, Alford A, Gross I, Shander A, Thurer R. Restrictive Transfusion Strategy and Clinical Decision Support Practices for Reducing RBC Transfusion Overuse. 2019;152(5):544-57.