Preoperative Anemia is an Independent Risk Factor for Increased Complications and Mortality after Total Hip Arthroplasty, Regardless of Postoperative Blood Transfusion

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INTRODUCTION:

Preoperative anemia has been associated with postoperative complications and healthcare costs following total hip arthroplasty (THA). Still, there is a lack of consensus regarding treatment of anemia prior to THA. Our primary aim was to create pseudo-randomized cohorts of anemic vs. non-anemic patients to identify the association between anemia and postoperative complications, mortality, and hospital length of stay (LOS) among patients undergoing elective THA, independent of the need for perioperative allogeneic red blood cell transfusion.

METHODS:

A national database was utilized to identify patients from 2010 to 2020 undergoing elective primary THA. Patients were identified with preoperative anemia (Hb <12g/dL for females, <13g/dL for males) who did not receive a blood transfusion perioperatively. 1:1 propensity score matching was used to create a matched cohort of patients without preoperative anemia who also did not receive a perioperative blood transfusion. Groups were matched based on the Charlson Comobidity Index (CCI), American Society of Anesthesiology (ASA) classification, age, sex, and prevalence of bleeding disorders. Outcomes of interest were compared using Chi-squared analysis.

RESULTS:

A total of 30,176 patients were included in both the anemic and non-anemic groups. Overall mean age 67 ± 12, 49% female. 1:1 matching was successful, with similar CCI, ASA classification, age, sex, and prevalence of bleeding disorders among groups (all, p>0.05). 1,470 (4.9%) of the anemic cohort sustained a major complication vs. 946 (3.1%) of the non-anemic cohort, p<0.001. There was an extended length of stay in 14% (4,234) of the anemic cohort versus 6.9% (n=2,081) of the non-anemic cohort (P<0.001). The 30-day mortality rate was 0.1% (n=42) in the non-anemic cohort versus 0.3% (n=102) in the anemic cohort (p<0.001). Patients in the anemic cohort also had increased 30-day rates of prosthetic dislocation, wound infection, acute renal failure, pneumonia, and myocardial infarction (all, p<0.001).

DISCUSSION AND CONCLUSION:

In a propensity-matched cohort of anemic vs. non-anemic patients undergoing THA, all who did not receive postoperative blood transfusion, anemic patients had higher rates of major and minor complications, prolonged length of stay and mortality. These findings strengthen the idea that optimization of preoperative anemia may reduce these numerous adverse outcomes following elective THA which are independent of demographics, CCI, ASA classification, and concomitant bleeding disorders.

FIGURE 1. Cohort Selection Flowchart and 1:1 Matching

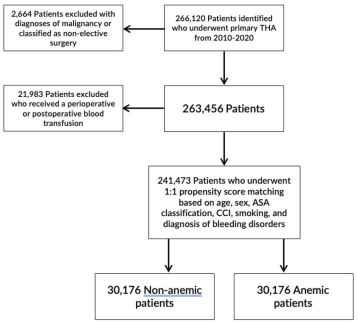

TABLE 1. Baseline Patient Characteristics Among 1:1 Matched Cohorts of Anemic and Non-anemic Patients Undergoing Total Hip Arthroplasty

	Non-anemic, N=30,176		Anemic, N=30,176		
Characteristics	**N (%)**	**Mean ± SD**	**N (%)**	**Mean ± SD**	***P****
Age		67.2 ± 12.0		67.1 ± 12.1	0.310
Male sex	15,407 (51)		15,419 (51)		0.922
CCI		0.32 ± 0.55		0.33 ± 0.57	0.785
ASA Classification					
1	418 (1.4)		424 (1.4)		0.908
2	11,597 (38)		11,580 (38)		
3	16,972 (56)		16,949 (56)		
4	1,189 (3.9)		1,223 (4.1)		
Smoking history	3,907 (13)		3,818 (13)		0.278
Diagnosed bleeding disorder	1,206 (4.0)		1,218 (4.0)		0.804

**T-test for continuous variables, Chi-Squared test for categorical variables*
CCI indicates Charleston Comorbidity Index; ASA, American Society of Anesthesiology; SD, Standard deviation.

TABLE 2. Comparison of 30-Day Complications, Mortality, and Extended Length of Stay Between Anemic and Non-anemic 1:1 Matched Cohorts

	Overall, N=60,352	Non-anemic, N=30,176	Anemic, N=30,176	
Characteristics	**N (%)**	**N (%)**	**N (%)**	***P****
Major complication	2,416 (4.0)	946 (3.1)	1,470 (4.9)	**<0.001**
Minor complication	1,827 (3.0)	829 (2.8)	998 (3.3)	**<0.001**
Mortality	144 (0.2)	42 (0.1)	102 (0.3)	**<0.001**
30-day readmission	1,992 (3.9)	756 (3.3)	1,236 (4.3)	**<0.001**
Extended LOS	6,315 (11)	2,081 (6.9)	4,234 (14)	**<0.001**
DVT	285 (0.5)	131 (0.4)	154 (0.5)	0.172
Deep infection	101 (0.2)	13 (0.01)	88 (0.3)	**<0.001**
Wound dehiscence	103 (0.2)	43 (0.1)	60 (0.2)	0.094
Pneumonia	309 (0.5)	119 (0.4)	190 (0.6)	**<0.001**
Pulmonary embolism	177 (0.3)	92 (0.3)	85 (0.3)	0.598
Prosthetic dislocation	169 (0.3)	50 (0.2)	119 (0.4)	**<0.001**
Cardiac arrest	54 (0.1)	22 (0.1)	33 (0.1)	0.173
Myocardial infarction	170 (0.3)	63 (0.2)	107 (0.4)	**0.001**
Reintubation	137 (0.2)	64 (0.2)	73 (0.2)	0.441
Acute Renal Failure Requiring Dialysis	47 (0.08)	15 (0.1)	32 (0.1)	**0.013**
Non-Home Discharge	43,717 (72)	8,357 (28)	8,278 (27)	0.472

**T-test for continuous variables, Chi-Squared test for categorical variables*
LOS, Length of Stay; DVT, Deep Venous Thrombosis