The incidence of preoperative anemia in patients undergoing cardiac surgery

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Background and Goal of Study:

In a multicenter cohort study, the incidence of preoperative anemia in cardiac surgery patients was found to be 26% on average, up to a maximum of 30% (1). In another study of elective vascular surgery patients, the preoperative anemia incidence was 47% and the risk of mortality and cardiac events in these patients was 2.4% (2). Previous studies in cardiac surgical patients have been limited, especially with small sample numbers (3,4). Our hypothesis in this study was that the incidence of preoperative anemia may be high in patients undergoing cardiac surgery and this may be related to mortality and perioperative complications. We believe that the awareness of preoperative anemia can be increased according to the results of this study, that elective patients can undergo surgery with preoperative anemia treatment. Thus consequently blood and blood product transfusion requirement and related complications can be reduced.

Materials and Methods:

Following Ethics Committee approval, adult patients undergoing bypass surgery due to ischemic heart disease between 2014 and 2017 were evaluated retrospectively. Patient demographics, cardiac reserves, preoperative and postoperative Htc values, transfusion volume of blood and blood products, complications and mortality rates were recorded. Other laboratory tests, type of surgery, re-exploration frequency, intensive care and hospital stay were recorded. According to the World Health Organization, for women to have anemia, the Hb value should be <12.0 g/dL, and for men, <13.0 g/dL (5). Preoperative anemia was diagnosed based on these sub-values in our study.

Table 1: Patient demographics, transfusion rates and complications

		min-max	median	mean±sd/n(%)
Age (years)		37,0 - 89,0	64,0	64,3 ± 10,0
Gender	Female			57 17,1%
	Male			276 82,9%
BMI		22,5 - 31,6	26,0	26,6 ± 1,9
Duration of surgery (min)		25,0 - 300,0	210,0	217,1 ± 35,0
CPB time		25,0 - 220,0	80,0	84,7 ± 21,8
CX time		10,0 - 135,0	65,0	64,8 ± 18,6
Drainage in ICU (mL)		150,0 - 2500,0	450,0	446,1 ± 254,7
Stay in ICU	1 day			271 81,4%
	≥ 2 days			62 18,6%
Stay in hospital	7 days			259 77,8%
	8 days			72 21,6%
Mortality rate	(-)			331 99,4%
	(+)			2 0,6%
RBC		1,0 - 10,0	2,0	2,9 ± 1,7
RBC	Not transfused			43 12,9%
	Transfused			290 87,1%
FFP		1,0 - 56,0	2,0	3,7 ± 5,9
FFP	Not transfused			166 49,8%
	Transfused			167 50,2%
Platelet		2,0 - 124,0	16,0	29,3 ± 30,0
Platelet	Not transfused			285 85,6%
	Transfused			48 14,4%
Cryoprecipitate	Not transfused			327 98,2%
	Transfused			6 1,8%
Perioperative bleeding (mL)		100,0 - 3400,0	600,0	715,7 ± 452,3
EF (%)		38,0 - 60,0	50,0	50,7 ± 5,1
Postoperative DVT	(-)			333 100,0%
	(+)			0 0,0%
Postoperative stroke	(-)			333 100,0%
	(+)			0 0,0%
Reexploration	(-)			324 97,3%
	(+)			9 2,7%

Results:

In total the data of 333 patients were evaluated. The incidence of anemia was 43%. 265 patients received RBC transfusions (79.6%) and 75% of blood transfusions were found in the anemic group compared to the RBC transfusions in the non anemic group and 89% in the anemia group (p=0.005, Table 1,2). Perioperative bleeding ranged from 100 mL to 3400 mL with a mean of 715.7±452.3 mL, and the mean amount of bleeding was significantly higher in the anemic group than in the non-anemic group (p=0.000). Postoperative Hb, Htc and platelet values decreased at the end of the surgery compared to preoperative values in all patients. Statistically significant increase in creatinine values was detected (p <0.005, Table 3). Nine patients were reexplored. The use of FFP in the anemic group was higher than in nonanemic patients (60.0%, 45.9%, respectively, p = 0.019). There was no difference between the two groups in terms of mortality, hospital and ICU stay. There was no difference in terms of drainage and hospital mortality in ICU.

Table 2: Outcomes in anemic vs non-anemic patients

		Anemia (-)		Anemi a(+)		P
		meantsd/n-%	Median	meantsd/n-%	Median	
Age (years)		63,9 ± 10,2	64,0	65,2 ± 9,6	64,5	0,251 m
Gender	Female	44 18,9%		13 13,0%		0,191 x ²
	Male	189 81,1%		87 87,0%		
BMI		26,6 ± 1,9	26,0	26,6 ± 1,7	26,0	0,914 m
Duration of surgery		215,6 ± 36,0	210,0	220,5 ± 32,6	210,0	0,464 m
CPB time		84,6 ± 20,5	80,0	84,9 ± 24,7	80,0	0,892 m
CX time		64,9 ± 18,8	65,0	64,7 ± 18,4	67,5	0,993 m
Drainage in ICU (mL)		442,1 ± 272,4	450,0	455,6 ± 208,6	450,0	0,166 m
Stay in ICU (days)	1 Gün	186 79,8%		85 85,0%		0,266 x ²
	≥ 2 Gün	47 20,2%		15 15,0%		
Stay in hospital (days)	7 Gün	181 77,7%		78 78,0%		0,943 x ²
	8 Gün	50 21,5%		22 22,0%		
Mortality rate	(-)	231 99,1%		100 100,0%		1,000 x ²
	(+)	2 0,9%		0 0,0%		
RBC		2,9 ± 1,8	2,0	2,9 ± 1,7	2,0	0,593 m
RBC	-	32 13,7%		11 11,0%		0,495 x ²
	+	201 86,3%		89 89,0%		
FFP		3,9 ± 6,5	2,0	3,3 ± 4,8	2,0	0,056 m
FFP	-	126 54,1%		40 40,0%		0,019 x ²
	+	107 45,9%		60 60,0%		
PLT		28,5 ± 29,4	16,0	31,1 ± 32,1	16,0	0,991 m
PLT	-	200 85,8%		85 85,0%		0,842 x ²
	+	33 14,2%		15 15,0%		
CRYO	-	229 98,3%		98 98,0%		1,000 x ²
	+	4 1,7%		2 2,0%		
Perioperative bleeding (mL)		766,7 ± 456,7	680,0	596,8 ± 420,7	500,0	0,000 m
EF (%)		50,7 ± 5,1	50,0	50,9 ± 5,3	50,0	0,766 m
Postoperative DVT	(-)	233 100,0%		100 100,0%		-
	(+)	0 0,0%		0 0,0%		
Postoperative stroke	(-)	233 100,0%		100 100,0%		-
	(+)	0 0,0%		0 0,0%		
Reexploration	(-)	226 97,0%		98 98,0%		0,604 x ²
	(+)	7 3,0%		2 2,0%		

m Mann-whitney u test / x² Ki-kare test

Conclusions:

Despite the published guidelines, the incidence of anemia in the preoperative period was high in our study similar to the literature. Although our study did not lead to an increase in complications statistically, the risks associated with RBC and FFP transfusion in the perioperative period exists. In order to reduce this, anemia treatment should be included in the preoperative preparation of cardiac patients.