

The effect of preoperative anemia on postoperative morbidity and mortality in patients undergoing thoracic surgery

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Background and Goal of Study:

Anemia is common in patients undergoing thoracic surgery due to three main risk factors including iron deficiency anemia, chronic disease anemia, iatrogenic anemia (1), all of which can be prevented and treated. The incidence of anemia was found as 26% in a multicenter study involving patients undergoing cardiac surgery, which increased to 47% in patients having elective vascular surgery (2). However data on the incidence of preoperative anemia for thoracic surgery are limited (3). We hypothesized that the incidence of anemia may be higher than expected, which may be associated with both perioperative complications.

Materials and Methods:

After obtaining the institutional board approval, this retrospective study enrolled 107 patients older than 18 years who underwent thoracic surgery by a thoracotomy or thoracoscopy between January 2016 and July 2017. We recorded demographic features, pre- and postoperative hemograms and other laboratory tests, comorbidities, the transfusions of blood and blood products, complications, mortality, type of surgery, rate of re-exploration, length of ICU and hospital stay. The patients were classified into two groups according to the presence or absence of anemia. The anemia was defined according to the WHO criteria as a hemoglobin level < 12 g/dL in woman and < 13,0 g/dL in man (4).

Results:

The incidence of anemia was 43.9%, being higher in men with 57,4%. Compared with patients without anemia, patients with anemia had a significantly increased length of hospital stay, higher rate of ICU admission, higher levels of pre- and postoperative creatinine and lower levels of postoperative Hb and Htc and lower value of preoperative INR ($p < 0.05$, Table 1). The patients who required ICU admission significantly differed from those who did not in low levels of preoperative Hb, pre- and postoperative Htc and increased duration of operation, hospital stay and intraoperative ES use ($p < 0.05$, Table 2).

Table 1: Comparison of patient demographics, type of surgery, the duration of hospital and ICU stay, parameters for perioperative hematologic evaluation, the requirement for blood products and postoperative complications between patients with

	Anemia (-)		Anemia (+)		P
	mean±sd/n(%)	Median	mean±sd/n(%)	Median	
Age	61,37±12,20	62,50	60,89±13,79	62,00	0,967 ^m
Gender					
Female	27 (45,0%)		20 (42,6%)		0,800 ^{X²}
Male	33 (55,0%)		27 (57,4%)		
BMI	26,19±4,11	26,10	25,11±5,03	25,80	0,855 ^m
ASA	2,87±1,14	3,00	2,91±1,14	3,00	0,805 ^m
Type of surgery					
Decortication	7 (11,7%)		3 (6,4%)		
Lobectomy	46 (76,7%)		36 (76,6%)		0,591 ^{X²}
Pneumonectomy	3 (5,0%)		5 (10,6%)		
Sleeve resection	4 (6,7%)		3 (6,4%)		
Duration of surgery (h)	4,14±1,43	4,00	4,07±1,57	4,00	0,663 ^m
Hospital stay (days)	7,08±2,98	6,00	9,96±5,81	9,00	0,011 ^m
ICU stay (days)	12 (20,0%)		21 (44,7%)		0,006 ^{X²}
Preoperative Hb (g/dL)	13,74±1,07	13,60	11,10±1,36	11,60	0,000 ^m
Postoperative Hb (g/dL)	11,29±1,54	11,25	10,25±1,66	9,80	0,002 ^m
Preoperative Htc (%)	41,32±3,26	41,60	34,24±4,38	35,10	0,000 ^m
Postoperative Htc (%)	34,98±4,07	34,95	30,10±4,17	29,20	0,000 ^m
Preoperative INR	0,98±0,22	1,00	1,14±0,64	1,07	0,038 ^m
Postoperative INR	1,22±1,30	1,09	1,16±0,18	1,16	0,017 ^m
Preoperative Creatinine	0,82±0,18	0,82	1,36±4,42	0,69	0,006 ^m
Postoperative Creatinine	0,83±0,29	0,80	0,70±0,26	0,67	0,003 ^m
Preoperative Plt	279,0±101,7	252,5	279,9±114,3	260,0	0,770 ^m
Perioperative bleeding (mL)	495±378	400	383±262	360	0,155 ^m
Perioperative fluid (mL)	1385±614	1200	1306±413	1200	0,957 ^m
Perioperative urine output (mL)	417,0±231,4	400,0	405,3±243,1	375,0	0,788 ^m
Intraoperative RBC (U)	4 (6,7%)		7 (14,9%)		0,164 ^{X²}
Intraoperative FFP (U)	1 (1,7%)		3 (6,4%)		0,318 ^{X²}
Intraoperative platelet (U)	0 (0,0%)		0 (0,0%)		-
Postoperative RBC (U)	7 (11,7%)		10 (21,3%)		0,177 ^{X²}
Postoperative FFP (U)	0 (0,0%)		0 (0,0%)		-
Postoperative Platelet (U)	0 (0,0%)		0 (0,0%)		-
Postoperative MI	1 (1,7%)		0 (0,0%)		1,000 ^{X²}
Postoperative Arrhythmia	0 (0,0%)		0 (0,0%)		-
Exitus	0 (0,0%)		0 (0,0%)		-
Re-exploration	0 (0,0%)		2 (4,3%)		0,191 ^{X²}

Table 2: Comparison of patient outcomes and postoperative complications between UCU and ward patients.

	ICU stay (-)		ICU stay (+)		P
	mean±sd/n(%)	Median	mean±sd/n(%)	Median	
Age	61,78±10,61	62,00	59,76±16,99	62,00	0,957 ^m
Gender					
Female	34 (45,9%)		13 (39,4%)		0,528 ^{X²}
Male	40 (54,1%)		20 (60,6%)		
BMI	26,14±4,07		25,26±5,05		0,772 ^m
ASA	2,84±1,18	3,00	3,00±1,03	3,00	0,449 ^m
Type of surgery					
Decortication	6 (8,1%)		4 (12,1%)		
Lobectomy	60 (81,1%)		22 (66,7%)		0,188 ^{X²}
Pneumonectomy	3 (4,1%)		5 (15,2%)		
Sleeve resection	5 (6,8%)		2 (6,1%)		
Duration of surgery (h)	3,72±1,26	4,00	4,98±1,60	4,50	0,000 ^m
Hospital stay (days)	6,88±3,26	6,00	11,64±5,59	11,00	0,000 ^m
Preoperative Hb (g/dL)	12,89±1,63	12,90	11,89±1,92	11,90	0,008 ^m
Postoperative Hb (g/dL)	10,89±1,65	11,05	10,72±1,73	10,10	0,683 ^m
Preoperative Htc (%)	39,06±4,75	39,05	36,29±5,61	36,50	0,009 ^m
Postoperative Htc (%)	33,52±4,83	33,80	31,31±4,29	30,40	0,023 ^m
Preoperative INR	1,00±0,18	1,03	1,16±0,77	1,06	0,236 ^m
Postoperative INR	1,22±1,18	1,11	1,13±0,16	1,14	0,369 ^m
Preoperative Creatinine	0,77±0,20	0,74	1,71±5,26	0,77	0,410 ^m
Postoperative Creatinine	0,76±0,25	0,74	0,81±0,35	0,75	0,597 ^m
Preoperative Platelet	282,5±106,8	260,0	272,5±108,4	249,0	0,761 ^m
Perioperative bleeding volume (cc)	421,8±265,5	395,0	499,7±455,3	400,0	0,906 ^m
Perioperative fluid (mL)	1352±572	1200	1347±445	1200	0,712 ^m
Perioperative urine output (mL)	382,9±187,8	400,0	476,2±310,5	400,0	0,290 ^m
Intraoperative RBC	2 (2,7%)		9 (27,3%)		0,000 ^{X²}
Intraoperative FFP	1 (1,4%)		3 (9,1%)		0,086 ^{X²}
Intraoperative platelet	0 (0,0%)		0 (0,0%)		-
Postoperative RBC	10 (13,5%)		7 (21,2%)		0,314 ^{X²}
Postoperative FFP	0 (0,0%)		0 (0,0%)		-
Postoperative Platelet	0 (0,0%)		0 (0,0%)		-
Postoperative MI	0 (0,0%)		1 (3,0%)		0,318 ^{X²}
Postoperative Arrhythmia	0 (0,0%)		0 (0,0%)		-
Exitus	0 (0,0%)		0 (0,0%)		-
Re-exploration	1 (1,4%)		1 (3,0%)		0,524 ^{X²}

Conclusions:

Our findings suggest that the incidence of anemia is high in patients undergoing thoracic surgery. Eventhough the rate of mortality is not affected, anemia is associated with a higher rate of ICU admission and longer hospital stay. Additionally an increased intraoperative use of ES is likely to contribute to morbidity by exposing patients to transfusion-associated complications. In order to reduce anemia-induced perioperative complications the treatment of anemia during preoperative period should be considered who are candidate for thoracic surgery.

References:

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