RISK FACTORS ASSESSMENT FOR POSTOPERATIVE BLEEDING IN PEDIATRIC CARDIAC SURGERY

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Introduction

Cardiac surgery with (CPB) is often associated with excessive blood loss, morbidity, early and late mortality, prolonged hospitalization, and costs. Outcome may further be worsened by the presence of pre-existing cofactors (e.g.anaemia), massive transfusion, and exploration for bleeding. Excessive blood loss often results from the development of a perioperative coagulopathy which can be triggered by several factors such as contact between blood and non-endothelial surfaces, anticoagulation using unfractioned heparin (UFH), protamine over dosage, and hypothermia. The cyanotic children might have decreased platelet aggregation, alteration in the fibrinogen activity, prolonged bleeding with normal platelet count, and even mild chronic disseminated intravascular coagulation (DIC). The severity of these hematologic alterations is directly related to the degree of polycythemia, a greater surgical complexity, degree of hypothermia, and heparin dosage.

Aim of the work

The aim of the present studywas to assess multiple risk factors for bleeding in postoperative pediatric cardiac surgery.

Subjects and Methods

The study included 100 cases admitted in Cardiothoracic Surgery Department, Alexandria Faculty of Medicine in New University Hospital, Alexandria, Egypt for congenital heart surgery.

The study was reviewing and comparing risk factors assessment for bleeding in postoperative pediatric cardiac surgery. A significant bleeding was defined as 84 mL/kg or more total for the first 12 hours postoperatively, or surgical exploration for bleeding or cardiac tamponade physiology in the first 12 hours. Univariate and multivariate logistic regression analyses were performed to determine variables independently associated with bleeding. These variables were used to calculate a probability for each individual to develop postoperative bleeding.

Results

Table 1: Comparison between no-bleeding and bleeding according to patients' characteristics, operative and postoperative data

	Total (n = 100)	No-bleeding (n = 66)	Bleeding (n = 34)	Test of Sig.	p
Gender					
Male	44 (44%)	30 (45.5%)	14 (41.2%)	χ^2= 0.167	0.683
Female	56 (56%)	36 (54.5%)	20 (58.8%)		
Age (months)					
Mean ± SD.	12.95 ± 9.50	14.22 ± 10.62	10.48 ± 6.24	U= 918.0	0.137
Median (Min. – Max.)	12.0 (0.16 – 60.0)	12.0 (0.16 – 60.0)	12.0 (0.66 – 24.0)		
Weight (kg)					
Mean ± SD.	7.60 ± 2.39	7.68 ± 2.48	7.45 ± 2.22	t= 0.449	0.654
Median (Min. – Max.)	8.0 (2.50 – 14.0)	8.0 (2.50 – 14.0)	8.35 (3.20 – 10.50)		
Height (cm)					
Mean ± SD.	66.82 ± 9.50	67.36 ± 10.11	65.76 ± 8.23	t= 0.795	0.428
Median (Min. – Max.)	68.0(45.0 – 90.0)	67.50(48.0 – 90.0)	68.0 (45.0 – 77.0)		
Cyanotic	51 (51%)	27 (40.9%)	24 (70.6%)	χ^2=7.910	0.005*
Chromosomal anomalies	10 (10%)	6 (9.1%)	4 (11.8%)	χ^2=0.178	FEp=0.731
Previous sternotomy	5 (5%)	3 (4.5%)	2 (5.9%)	χ^2=0.084	FEp=1.000
Heart lung machine	54 (54.0%)	27 (40.9%)	27 (79.4%)	χ^2=13.392*	<0.001*
Total bypass time (min.)					
Mean ± SD.	76.17 ± 21.04	77.07 ± 20.64	75.26 ± 21.79	t= 0.314	0.755
Median (Min. – Max.)	69.0 (43.0 – 120.0)	68.0 (50.0 – 120.0)	76.0 (43.0 – 118.0)		
Cross clamp	47 (47.0%)	26 (39.4%)	21 (61.8%)	χ^2=4.508*	0.034*
Cross clamp time (min.)					
Mean ± SD.	48.96 ± 11.47	47.50 ± 11.81	50.76 ± 11.05	t= 0.968	0.338
Median (Min. – Max.)	46.0 (30.0 – 78.0)	45.0 (30.0 – 78.0)	55.0 (30.0 – 68.0)		
Mechanical ventilation time (hr.)	88 (88.0%)	54 (81.8%)	34 (100.0%)	χ^2=7.025*	FEp=0.007*
Mean ± SD.	22.91 ± 23.55	16.72 ± 14.83	32.74 ± 30.77	U= 452.0*	<0.001*
Median (Min. – Max.)	22.0 (1.0 – 192.0)	11.0 (1.0 – 72.0)	30.0(1.0 – 192.0)		
ICU length (day)	98 (98.0%)	64 (97.0%)	34 (100.0%)	χ^2=1.051	FEp=0.547
Mean ± SD.	7.57 ± 3.23	6.72 ± 2.04	9.18 ± 4.33	U= 584.0*	<0.001*
Median (Min. – Max.)	7.0 (3.0 – 25.0)	6.0 (3.0 – 11.0)	8.0 (6.0 – 25.0)		

SD: **Standard deviation**
χ^2: **Chi square test**
No-bleeding and **Bleeding**
t: Student t-test
FE**: Fisher Exact**
*: Statistically significant at p ≤ 0.05
U: Mann Whitney test
p: p value for comparing between

Table 2: Studied factors influencing incidence of postoperative bleeding

	Univariate		#Multivariate	
	p	OR (95%C.I)	p	OR (95%C.I)
Female	0.683	1.190 (0.515 – 2.750)		
Age (months)	0.066	0.951 (0.901 – 1.003)		
Weight (kg)	0.650	0.961 (0.807 – 1.143)		
Height (cm)	0.161	0.973 (0.937 – 1.011)		
Cyanotic	0.006*	3.467 (1.429 – 8.408)	0.024*	3.068 (1.158 – 8.129)
Chromosomal anomalies	0.674	1.333 (0.350 – 5.087)		
PDA	0.405	.691 (0.289 – 1.649)		
TOF	0.007*	3.553 (1.413 – 8.930)		
VSD	0.584	1.266 (0.544 – 2.949)		
Pulmonary atresia	0.779	0.816 (0.197 – 3.377)		
TGA	0.578	0.625 (0.119 – 3.277)		
CAVSD	0.268	2.103 (0.564 – 7.843)		
ASD	0.791	1.143 (0.425 – 3.070)		
Tricuspid valve atresia	0.999	–		
CoA	0.674	1.333 (0.350 – 5.087)		
Single ventricle	0.980	0.970 (0.085 – 11.091)		
PHTN	0.749	1.148 (0.493 – 2.672)		
Previous sternotomy	0.772	1.312 (0.209 – 8.257)		
Blood transfusion pre	0.327	2.067 (0.483 – 8.835)		
Chest infection pre	0.268	2.103 (0.564 – 7.843)		
Intubated pre	0.999	–		
Hemoglobin Pre	0.014*	0.681 (0.502 – 0.925)	0.236	0.811 (0.574 – 1.147)
Heart lung machine	<0.001*	5.571 (2.122 – 14.628)	0.007*	4.355 (1.503 – 12.616)
Cross clamp	0.036*	2.485 (1.062 – 5.814)		
Blood products intra operative (ml)	0.037*	1.017 (1.001 – 1.033)	0.535	1.006 (0.988 – 1.023)
Mechanical ventilator time (hr.)	0.999	–		
Activated clotting time (sec)	<0.001*	1.071 (1.038 – 1.106)		

Conclusion

This study showed that cyanotic disease and performing surgery on heart lung machine are best predictors of bleeding in the pediatric population after cardiac surgery. The combination of these two factors could be used to estimate the probability of postoperative bleeding. This allows the detection of subgroups of patients with a higher risk of postsurgical bleeding, making possible an appropriate treatment.