



The 65th ASH Annual Meeting Abstracts

POSTER ABSTRACTS

332.THROMBOSIS AND ANTICOAGULATION: CLINICAL AND EPIDEMIOLOGICAL

Recurrent Thromboembolism in Patients with Congenital Heart Disease and Prior Thromboembolism: A Prospective Cohort Study

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Introduction:

Patients with congenital heart disease (CHD) are at increased risk of thromboembolism (TE) due to changes in blood flow, type of cardiac lesion, exposure to cardiopulmonary bypass, and cardiac catheterization. There are limited data describing the rate of and risk factors associated with recurrent TE in pediatric patients with CHD and prior TE. Therefore, the primary aim of this study was to describe the rate of recurrent TE in pediatric patients with CHD and a prior episode of TE. Secondary aims included: characterize the type of index and recurrent TE and site, as well as compare characteristics and risk factors of patients with CHD and history of index TE who developed recurrent TE versus to those who did not develop a recurrent TE.

Methods:

Patients in this study were enrolled and prospectively followed in the Johns Hopkins All Children's (St. Petersburg, FL) Institution-wide Prospective, Inception Multi-Cohort Study of Pediatric TE anytime between 2013 to present. For this analysis, patients were eligible for inclusion if they were <21 years of age, presented with an index TE, and had a diagnosis of CHD. Data collection included patient characteristics, clinical laboratory testing, radiologic results, type and site of TE, acute and chronic risk factors, and treatment agents. Frequencies/proportions were compared between groups by chi-squared or Fisher's exact test, as appropriate.

Results:

Thirty patients with CHD and index TE were included in this study. Of these, 11 (36.7%) patients had a total of 23 recurrent TEs. Five (45.5%) patients had one recurrent TE, 3 (27.3%) had two recurrent TEs, and another 3 patients had >2 recurrent TEs. Of the 23 recurrent TE, 3 events (13%) were arterial and 20 (87%) were venous. All 3 (100%) arterial TEs were provoked, and catheter related. Of the 20 venous TEs, 16 (80%) were provoked and of these, 15 (93.8%) were catheter related. When compared to those who did not develop recurrent TE, patients who developed recurrent TE were more likely to have immobility ($p=0.005$), an arterial TE ($p=0.041$), or a lower extremity deep venous thrombosis ($p=0.045$) at the time of index TE. A greater proportion of patients with recurrence had a central catheter-associated TE compared to those with no recurrent TE but this difference was not statistically significant (73% vs 55%, $p=0.057$).

Conclusions:

In this single center prospective cohort we describe a high rate of recurrent TE (37%) among children with CHD and history of prior TE, and identified risk factors for TE recurrence. The vast majority of recurrent TE was provoked and catheter associated. Identified risk factors include immobility, and type and location of the index TE. Future multicenter prospective cohort studies are needed to validate these findings and identify additional risk factors.

Disclosures Betensky: Janssen Pharmaceuticals: Consultancy, Honoraria. **Goldenberg:** Astra Zeneca: Consultancy; Bayer: Consultancy; Boehringer-Ingelheim: Consultancy; Chiesi: Consultancy; Novartis: Other: Data and Safety Monitoring Committee; Daiichi Sankyo: Consultancy; University of Colorado-affiliated Academic Research Organization CPC Clinical Research: Other: Serves on clinical trials oversight committees for pharma studies; Anthos Therapeutics: Consultancy.

Table 1. Overall TE recurrence

Variable at the time of index TE	Thromboembolism without recurrent event(s) (arterial and venous) (patients=19)	Thromboembolism with recurrent event(s) (arterial and venous) (patients=11)	p-value
Weight, kg median (min, max)	4.5 (1.3-8.3)	3.6 (2.5-19.7)	0.197
Height, cm median (min, max)	56.5 (38.5-158)	52 (48.3-110)	0.481
Congenital heart disease n (%)			
Single ventricle	10 (52.6)	7 (63.6)	0.798
Bi-ventricular	8 (42.1)	4 (36.4)	0.999
Heart Transplant	1 (5.3)	0 (0)	0.999
Index TE type n (%)			
Classification			
Arterial	6* (31.6)	6* (54.5)	0.216
Venous	13* (68.4)	7* (63.6)	0.789
Provoked	15 (78.9)	11 (100)	0.268
Catheter related	18 (94.7)	11 (100)	0.999
Index TE site n (%)			
Upper extremity			
Deep venous thrombosis	5 (26.3)	1 (9.1)	0.372
Lower extremity			
Arterial thrombosis	6 (31.6)	4 (36.4)	0.999
Deep venous thrombosis	6 (31.6)	7 (63.6)	0.132
Inferior vena cava	2 (10.5)	1 (9.1)	0.999
Cardiac	3 (15.8)	1 (9.1)	0.999
Other arterial thrombosis	0 (0)	3 (27.3)	0.041
Index TE risk factors n (%)			
Cardiac catheterization	9 (47.4)	3 (27.3)	0.443
Cardiac surgery	9 (47.4)	7 (63.7)	0.466
Central venous catheterization	6 (31.6)	8 (72.7)	0.057
Diabetes type 2	1 (5.3)	0 (0)	0.999
Positive antiphospholipid antibodies	7 (36.8)	3 (27.3)	0.215
Flare of chronic condition	2 (10.5)	0 (0)	0.519
Immobility	1 (5.3)	6 (54.5)	0.005
Hospitalization	6 (31.6)	7 (63.6)	0.132
Trisomy 21	2 (10.5)	1 (9.1)	0.999

* 2 patients had both arterial and venous thromboembolism as index event

Table 2. Arterial and Venous TE

Variable	Patients without recurrent TE (arterial) (patients=6)	Patients with recurrent TE (arterial) (patients=6)	p-value	Variable	Patients without recurrent TE (venous) (n=13)	Patients with recurrent TE (venous) (n=7)	p-value
Weight, kg median (min, max)	4 (1.3-7.4)	3.5 (2.7-5)	0.936	Weight, kg median (min, max)	5.9 (2.9-8.3)	3.7 (2.5-19.7)	0.267
Height, cm median (min, max)	54.8 (38.5-65)	51.4 (49.5-61)	0.936	Height, cm median (min, max)	64 (47-158)	52 (48.3-110)	0.503
Congenital heart disease n (%)				Congenital Heart Disease n (%)			
Single ventricle	3 (50)	2 (33.3)	0.999	Single ventricle	7 (53.8)	5 (71.4)	0.642
Bi-ventricular	3 (50)	4 (66.7)	0.999	Bi-ventricular	5 (38.5)	2 (28.6)	0.648
Heart Transplant				Heart Transplant	1 (7.7)	0 (0)	0.999
Index TE type n (%)				Index TE type n (%)			
Provoked	6 (100)	6 (100)	0.999	Provoked	12 (92.3)	7 (100)	0.999
Catheter related	6 (100)	6 (100)	0.999	Catheter related	9 (69.2)	7 (100)	0.263
Index TE site n (%)				Index TE site n (%)			
Lower extremity				Upper extremity			
Arterial thrombosis	6 (100)	3 (50)	0.182	Deep venous thrombosis	5 (38.5)	1 (14.2)	0.354
Deep venous thrombosis	0 (0)	2 (33.3)	0.455	Lower extremity			
Inferior vena cava	0 (0)	0 (0)	0.999	Arterial thrombosis	0 (0)	2 (28.6)	0.111
Cardiac	1 (16.7)	2 (33.3)	0.999	Deep venous thrombosis	6 (46.2)	7 (100)	0.045
Other arterial thrombosis	0 (0)	3 (50)	0.182	Inferior vena cava	2 (15.4)	1 (14.2)	0.999
Index TE risk factors n (%)				Index TE risk factors n (%)			
Cardiac catheterization	5 (83.3)	3 (50)	0.546	Cardiac catheterization	4 (30.8)	2 (28.6)	0.999
Cardiac surgery	4 (66.7)	4 (66.7)	0.999	Cardiac surgery	5 (38.5)	5 (71.4)	0.349
Central venous catheterization	0 (0)	3 (50)	0.182	Central venous catheterization	6 (46.2)	6 (85.7)	0.158
Immobility	2 (33.3)	3 (50)	0.999	Diabetes mellitus 2	2 (15.4)	0 (0)	0.521
Hospitalization	2 (33.3)	3 (50)	0.999	Positive antiphospholipid antibodies	0 (0)	2 (28.6)	0.351
Positive antiphospholipid antibodies	0 (0)	1 (16.7)	0.999	Flare of chronic condition	1 (7.7)	0 (0)	0.999
Trisomy 21	1 (16.7)	1 (16.7)	0.999	Immobility	4 (30.8)	5 (71.4)	0.159
				Hospitalization	4 (30.8)	6 (85.7)	0.051
				Trisomy 21	3 (23.1)	0 (0)	0.521

Figure 1

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