



Doppler and Radionuclide Pulmonary Blood Flow Patterns After Transcatheter Closure of Patent Ductus Arteriosus

Ece İ (1), Pac F.A (1), Ballı S (1), Keçeci D. (2)

Türkiye Yüksek İhtisas Research and Education Hospital, Pediatric Cardiology (1), Nuclear Medicine (2), Ankara, Turkey

Objective

Impaired left lung perfusion (LLP) has been described after transcatheter closure of the patent ductus arteriosus (PDA). This study was conducted to evaluate impaired LLP following occlusion of persistent arterial duct with both echocardiography and radionuclide study.

Methods

Between November 2008 and December 2011, a total of 60 patients (mean age 16.5 ± 16.7 years) underwent successful transcatheter PDA occlusion. Cook detachable coil was used in 31 patients, Amplatzer duct occluder (ADO) was used in 29 patients (Table 1).

Table 1. Demographic characteristics of PDA according to treatment groups.

Variables	Group 1 (n=29)	Group 2 (n=31)	p-value
Age (years)	22.3 \pm 19.3	11.1 \pm 11.8	0.010
Gender (male/female)	5/24	8/23	0.421
Weight (kg)	45.9 \pm 27.7	29.3 \pm 17.9	0.009
Average processing time (min)	53.4 \pm 22.1	70.2 \pm 21.2	0.004
Fluoroscopy time (min)	15.8 \pm 7.8	19.3 \pm 7.4	0.080
Scintigraphy time (months)	3 (1-36)	3 (0.5-36)	0.583
DVI*	22 (8-50)	12 (8-50)	0.005

* DVI; Doppler velocity index

Echocardiography were performed to all patients in order to calculation of the Doppler velocity index (DVI) and lung scintigraphy. The DVI was calculated by the difference between the left pulmonary artery and right pulmonary artery peak flow velocities relative to the pulmonary trunk and expressed in percentage, terms. Left lung perfusion $<40\%$ was considered abnormal.

Results

Decreased LLP was found in 8 patients (Group A), 2 with Cook detachable coil (6.5 %) and 6 with ADO (20.7 %). These patients displayed greater DVI values compared with the others [median DVI= 26 (10-50) versus 15 (8-50)] ($p=0.043$) (Table 2-3).

Table 2. Comparison of PDA measurements and lung scintigrams according to treatment groups

Variables	Group 1 (n=29)	Group 2 (n=31)	p-value
**D1	3.3 (2.1-10.0)	2.2 (1.0-6.0)	<0.001
D2	14.2 (8.0-28.1)	12.6 (2.0-20.0)	0.018
L	10.0 (3.8-25.0)	9.1 (2.4-23.0)	0.452
LLP* %	43 (28-50)	45.4 (32.5-54)	0.043
LLP impaired patients (%)	6 (%20.7)	2 (%6.5)	0.140

*LLP; left lung perfusion, **D1;narrowest diameter of the PDA. D2;aortic ampulla diameter, L; axial length of the PDA.

Table 3. Evaluation of parameters in patients with impaired and normal left lung perfusion

Variables	Group A (n=8)	Group B (n=52)	p-value
Age (years)	24.4 \pm 25.5	15.3 \pm 14.9	0.358
Gender (male / female)	1/7	12/40	0.673
Weight (kg)	43.1 \pm 31.1	36.5 \pm 23.5	0.482
Scintigraphy time (months)	1.4 (1-12)	3 (0.5-36)	0.224
*D1	3.2 (2.5-5)	2.6 (1-10)	0.080
D2	17.2 (12.6-21)	12.9 (2-28.1)	0.080
L	9.5 (5.5-13)	9.8 (2.4-25)	0.723
**DVI	26 (10-50)	15 (8-50)	0.043

*D1;narrowest diameter of the PDA. D2;aortic ampulla diameter, L; axial length of the PDA.

** DVI; Doppler velocity index

When $DVI \geq 30$ is taken as the cut-off value, it is possible to estimate unimproved patients with 92.2 % sensitivity and 85 % specificity.

Conclusion

Impaired LLP may appear following transcatheter closure of PDA with various devices and DVI has high sensitivity and specificity in predicting patients with LLP deficiency.