Ratio of pulmonary artery diameter to ascending aortic diameter as a predictive tool for severe primary graft dysfunction in heart recipients

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Introduction

The Ratio of pulmonary artery diameter to ascending aortic diameter (PA:Ao ratio) on computed tomography is a recent predictive tool known to be associated with severity of heart failure and right heart failure after left ventricular assist device implantation. We searched for a predictive use of PA:Ao ratio in heart transplanted patients.

Methods

We collected extensive data from all heart transplanted patients in our institution from 2012 to 2018. The diameters of the ascending aorta and the pulmonary artery were defined as the diameter at the level of the artery pulmonary bifurcation in a transaxial slice before transplantation. Patients were separated into two groups: those with a PA:Ao ratio < 1 and those with a PA:Ao ratio >1. We compared the incidence of severe primary graft dysfunction (PGD) between these two groups. Results were compared with baseline characteristics and right heart and pulmonary parameters obtained by right venous catheterism.

Results

Between 2012 and 2018, 144 consecutive patients were heart transplanted. 50 had a PA:Ao ratio >1 (34,7%) and 94 had a PA:Ao ratio < 1 (65,3%). **Incidence of severe primary graft dysfunction was significantly higher in patients who had larger pulmonary arteries (48% Vs 15,9%, p< 0,0001)** and in patients who had a mPAP superior to 25 mmHg (8,3% Vs 32,4%, p=0,031). PVR superior to 2 woods was significantly associated with PA:Ao Ratio > 1 (61,4% Vs 42 %, p=0,035) but was less predictive of severe PGD (32,8% Vs 21,9%, p=0, 170).

Conclusion

PA:Ao ratio is an easy and robust tool for prediction of severe primary graft failure in heart transplantation. Further studies should explore our findings for external validation.

Table 1: Baseline Characteristics according to PA:Ao Ratio

PA:Ao ratio	<1	>1	
Total	94 (65,3%)	50 (34,7%)	p
Age			
< 45	**23 (24,5%)**	**24 (48%)**	**0,003**
>45	**71 (75,5%)**	**26 (52%)**	**0,005**
Sex			
M	73 (77,7%)	38 (76%)	0,986
F	21 (22,3%)	12 (24%)	0,808
Cardiopathy			
DCM*	31 (33,0%)	21 (42%)	0,278
ICM*	36 (38,3%)	14 (28%)	0,201
MCS*			
No MCS	69 (73,4%)	33 (66%)	0,322
ECMO*	7 (7,4%)	10 (20%)	0,079
LVAD*	11 (11,7%)	5 (10%)	0,731
TAH*	7 (7,4%)	2 (4%)	0,388
INTERMACS			
< 3	50 (53,2%)	28 (56%)	0,764
> 3	44 (46,8%)	22 (44%)	0,664
Right KT			
PVR* (n)	(81)	(44)	
< 2	**47 (58%)**	**17 (38,6%)**	**0,042**
> 2	**34 (42%)**	**27 (61,4%)**	**0,035**
CVP* (n)	(53)	(34)	
<10	32 (60,4%)	16 (47%)	0,212
>10	21 (49,6%)	18 (53%)	0,233
mPAP* (n)	(39)	(23)	
<25	**20 (51,3%)**	**5 (21,7%)**	**0,018**
>25	**19 (49,7%)**	**18 (78,3%)**	**0,020**
PAOP* (n)	(84)	(43)	
<15	**30 (35,7%)**	**8 (18,6%)**	**0,043**
>15	54 (64,3%)	34 (81,4%)	0,084
TPG* (n)	(79)	(42)	
<12	65 (82,3%)	31 (73,8%)	0,269
>12	14 (17,7%)	11 (26,2%)	0,277

Table 2: sPGD according to Baseline Characteristics.

	Total	sPGD	p
	n = 144	**n = 39 (%)**	
Age			0,446
< 45	48	11 (22,9%)	
>45	96	28 (29,2%)	
Sex			0,468
M	101	31 (30,7%)	
F	33	8 (24,2%)	
Cardiopathy			0,097
DCM*	52	9 (17,3%)	
ICM*	50	16 (32,0%)	
MCS*			
No MCS	102	23 (22,5%)	
ECMO*	17	7 (41,2%)	0,131
LVAD*	16	6 (37,5%)	0,218
TAH*	9	3 (33,3%)	0,471
INTERMACS			0,980
< 3	78	21 (26,9%)	
> 3	66	18 (27,3%)	
PA:Ao Ratio	**(144)**		**0,0001**
<1	**94**	**15 (15,9%)**	
>1	**50**	**24 (48%)**	
Right KT			
PVR (n)	(125)		0,170
< 2	64	14 (21,9%)	
> 2	61	20 (32,8%)	
CVP* (n)	(87)		0,082
<10	48	8 (16,7%)	
>10	39	13 (33,3%)	
mPAP* (n)	**(61)**		**0,031**
<25	**24**	**2 (8,3%)**	
>25	**37**	**12 (32,4%)**	
PAOP* (n)	(127)		0,713
<15	38	9 (23,7%)	
>15	89	24 (27%)	
TPG* (n)	(121)		0,232
<12	96	23 (24%)	
>12	25	9 (36%)	

*sPGD : Severe Primary Graft Dysfunction, *DCM : Dilated Cardiomyopathy, *ICM : Ischémic Cardiomyopathy *MCS : Mechanical Circulatory Assistance, *ECMO : Extracorporeal Membrane Oxygenation *LVAD : Left Ventricular Assisting Device *TAH : Total Artificial Heart *PVR: Vascular Pulmonary Resistance *CVP: Central Venous Pressure, *mPAP : Mean Pulmonary Arterial Pressure,*PAOP : Pulmonary Arterial Occlusion Pressure,*TPG : TransPulmonary Gradient