

Cardiac CT and Transcatheter Closure of ASD



*Sejong Cardiovascular Center
Sejong General Hospital*

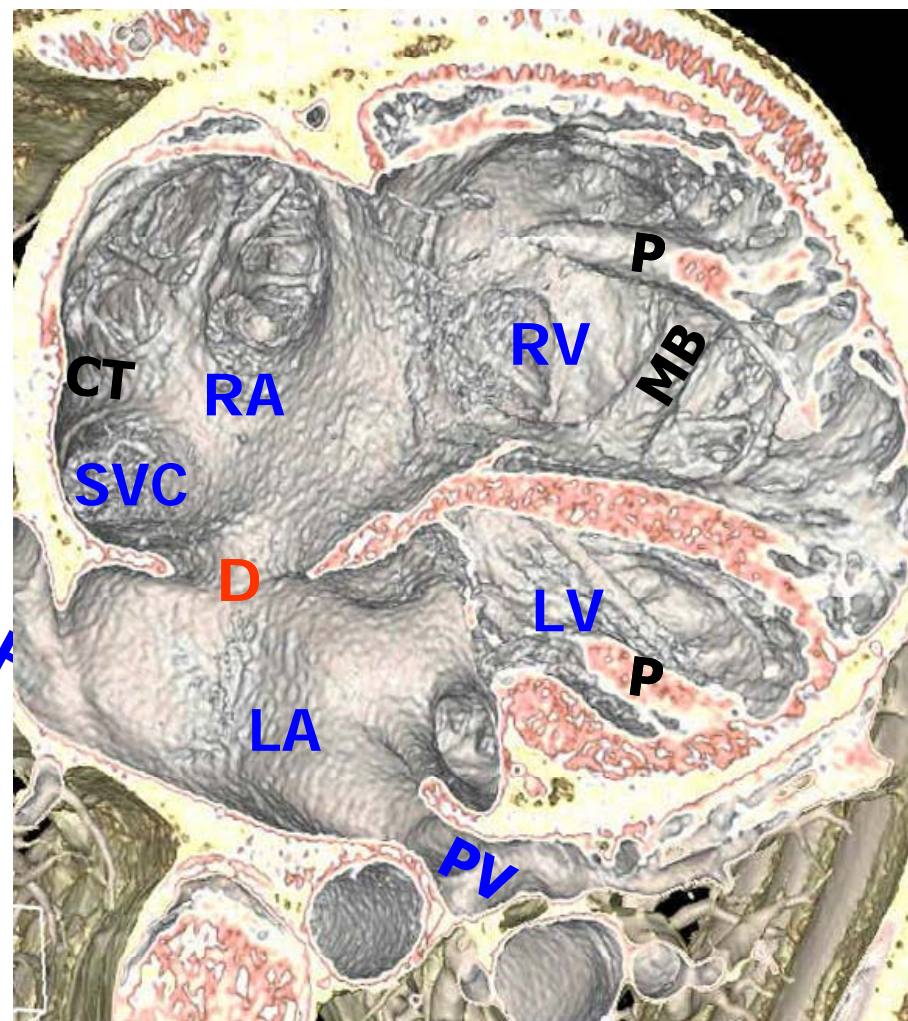
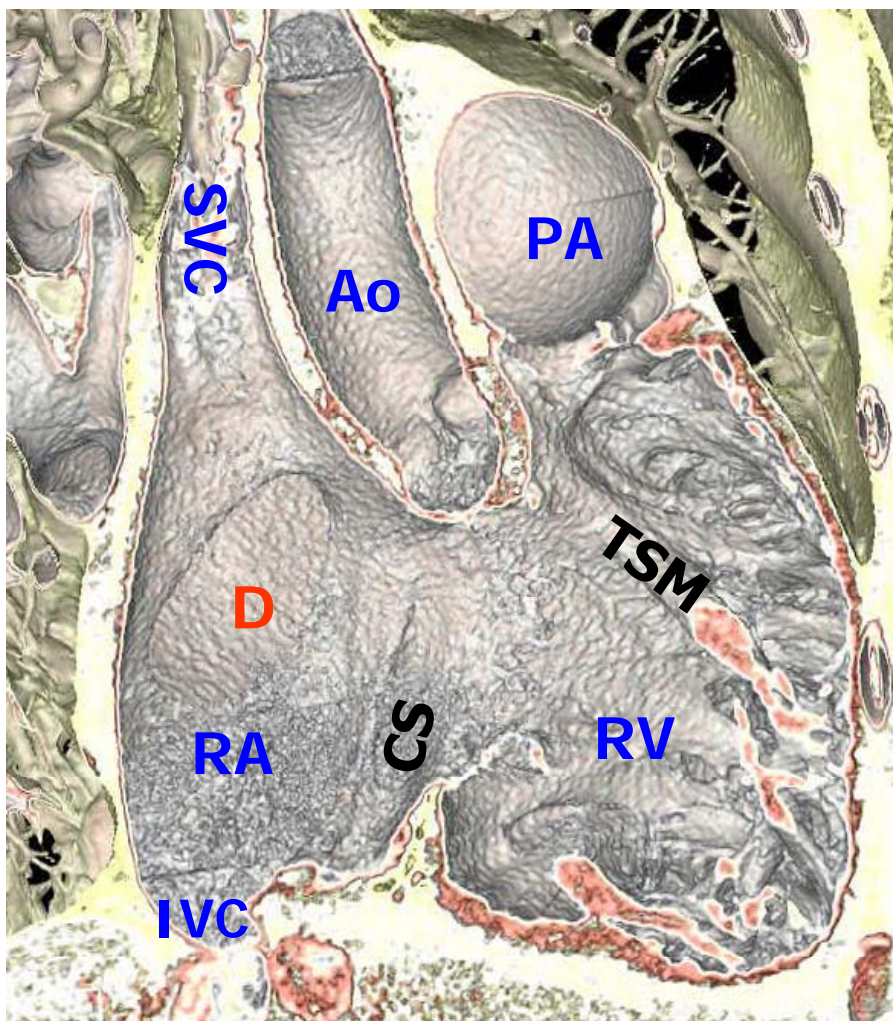
*Jinyoung Song
Department of Pediatrics
Sejong General Hospital, Buchoen, Korea*

What we should know before....

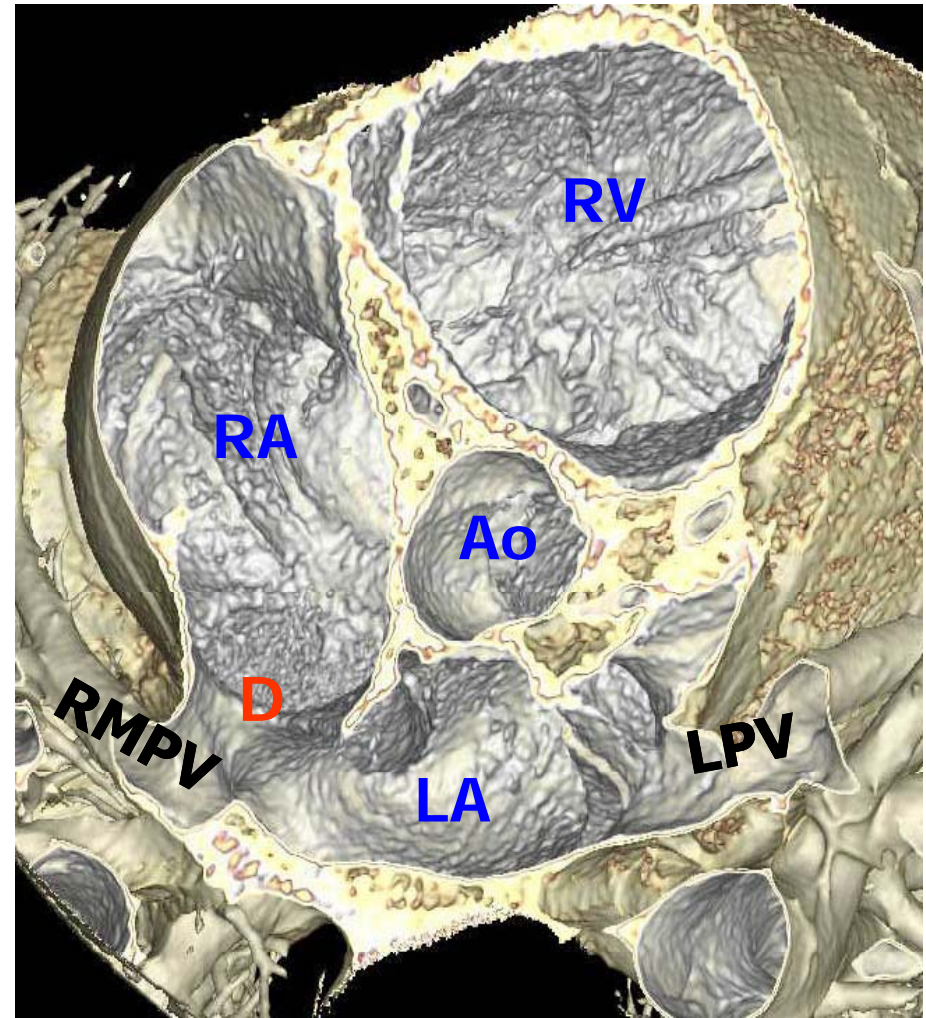
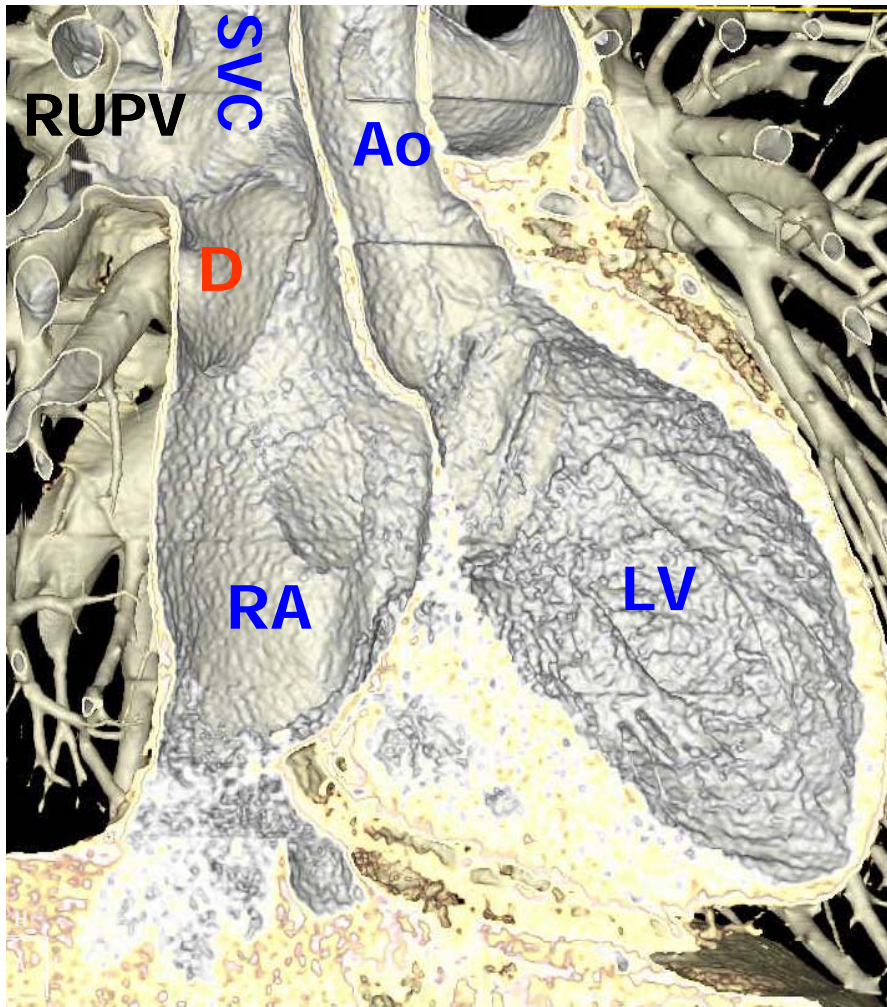
- 1. The size of the defect : maximum size**
- 2. The location of the defect**
- 3. Rim deficiency : esp, posterior-inferior rim**
- 4. Multiple defects and the distance**
- 5. The relationship to the adjacent cardiac and vascular structure**
- 6. Coexisting abnormalities**

- *Between November 2009 and February 2011, we performed cardiac CT for percutaneous transcatheter closure with ASO in 44 patients. (9 males and 35 females).*
- *We measured the longest diameter (a) and the shortest diameter (b) of each defect. In terms of the noncircularity, the eccentricity was defined as $\sqrt{1-(b^2/a^2)}$. We measured the lengths of 5 rims on CT images: anterior superior rim, anterior inferior rim, posterior rim, posterior superior rim and posterior inferior rim. Transcatheter closure was performed under the guide of an intracardiac echocardiogram or transesophageal echocardiogram.*

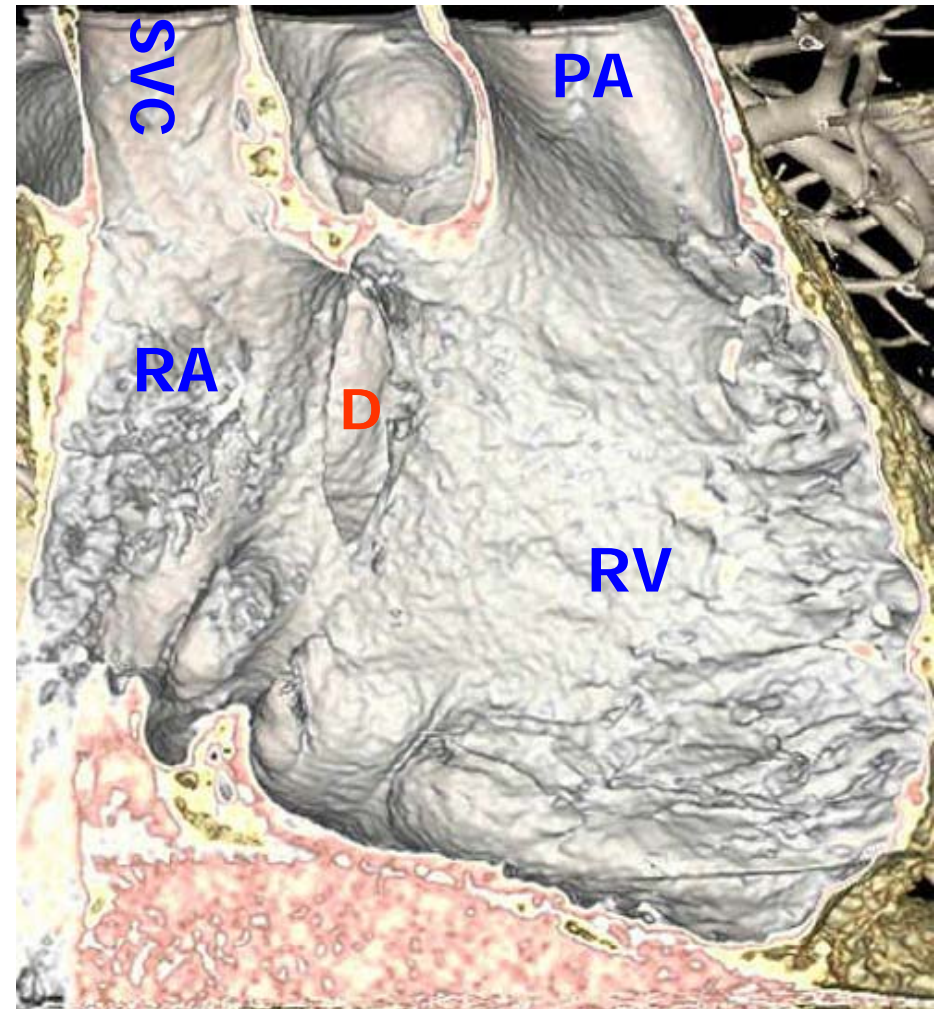
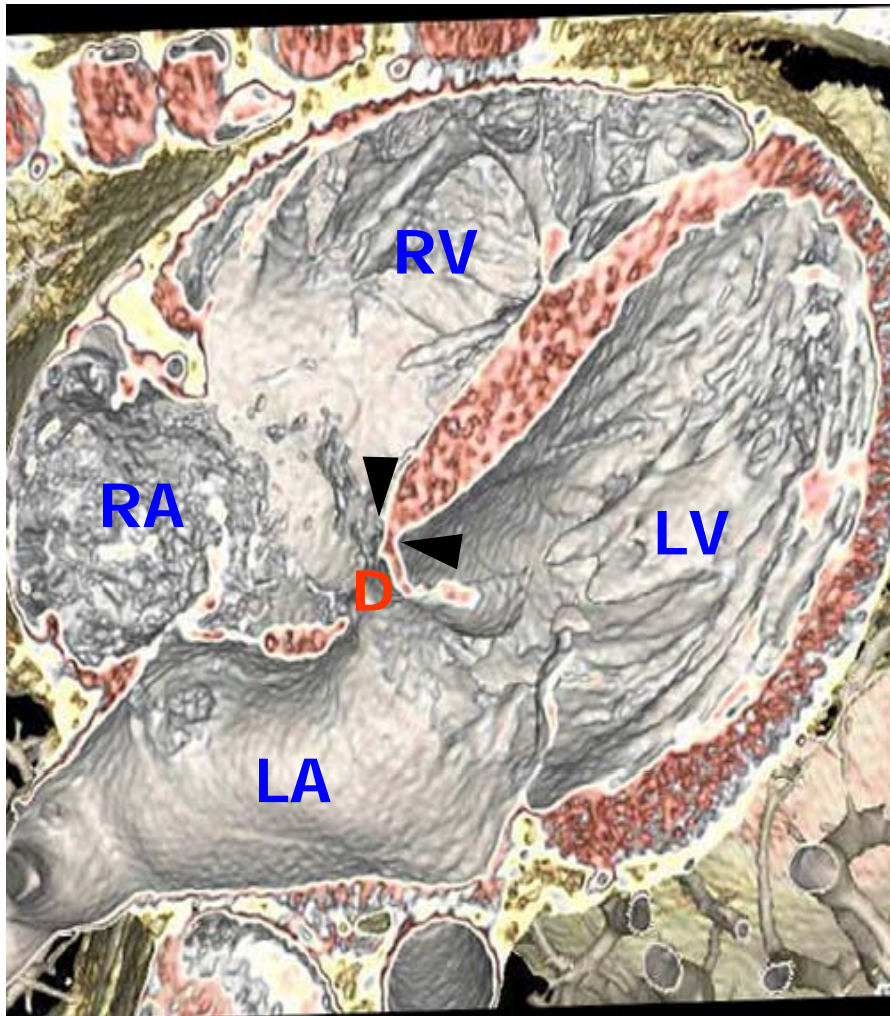
Secundum ASD



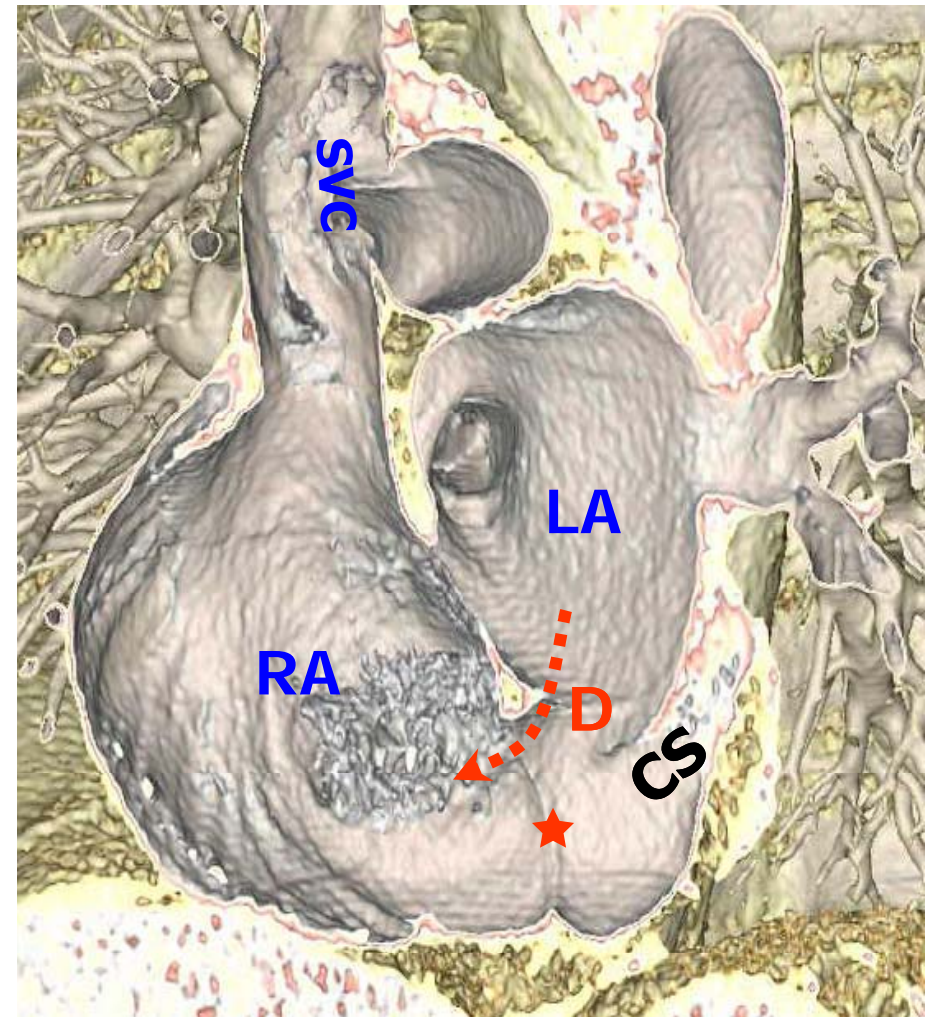
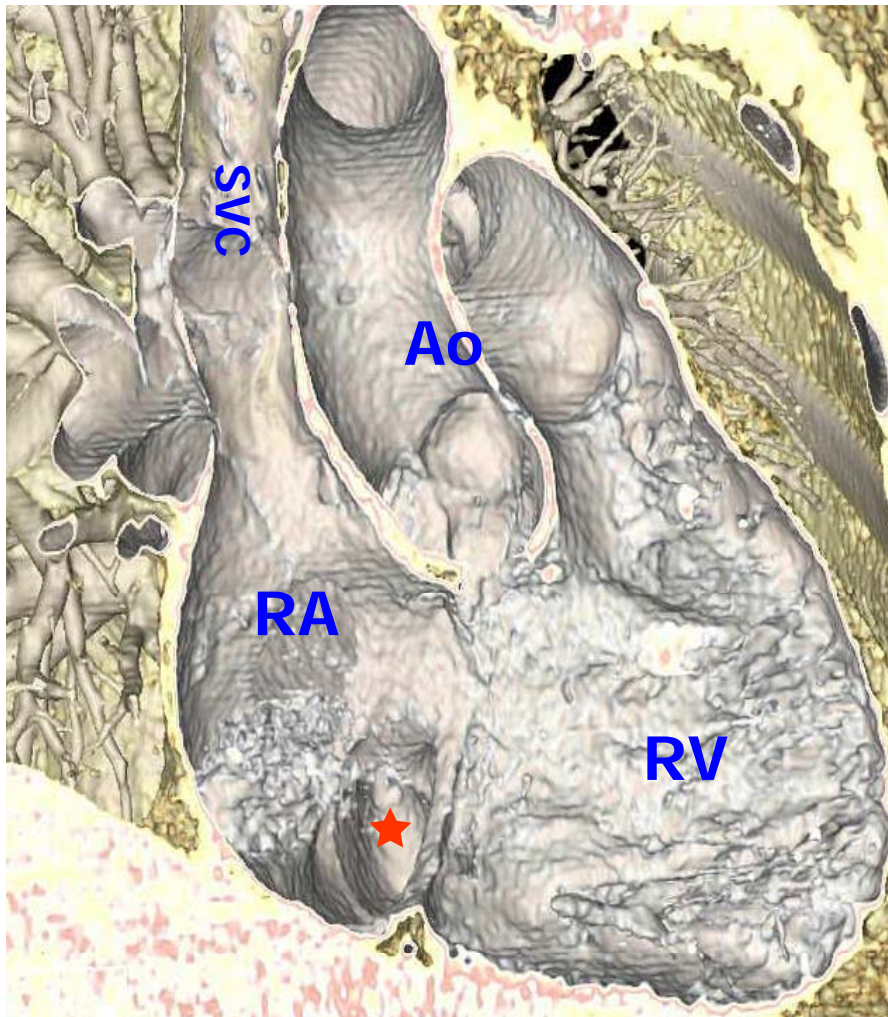
Sinus venosus defect with PAPVR



Primum ASD

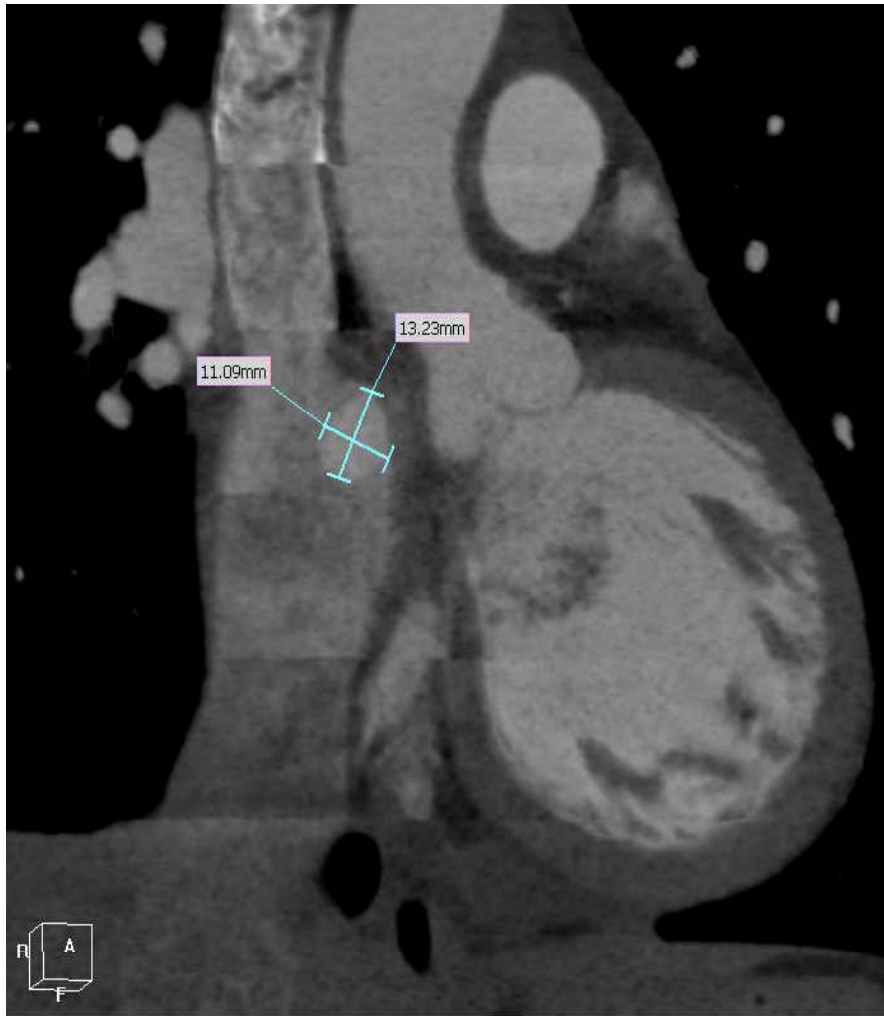


Coronary sinus defect



The sizing of the defect

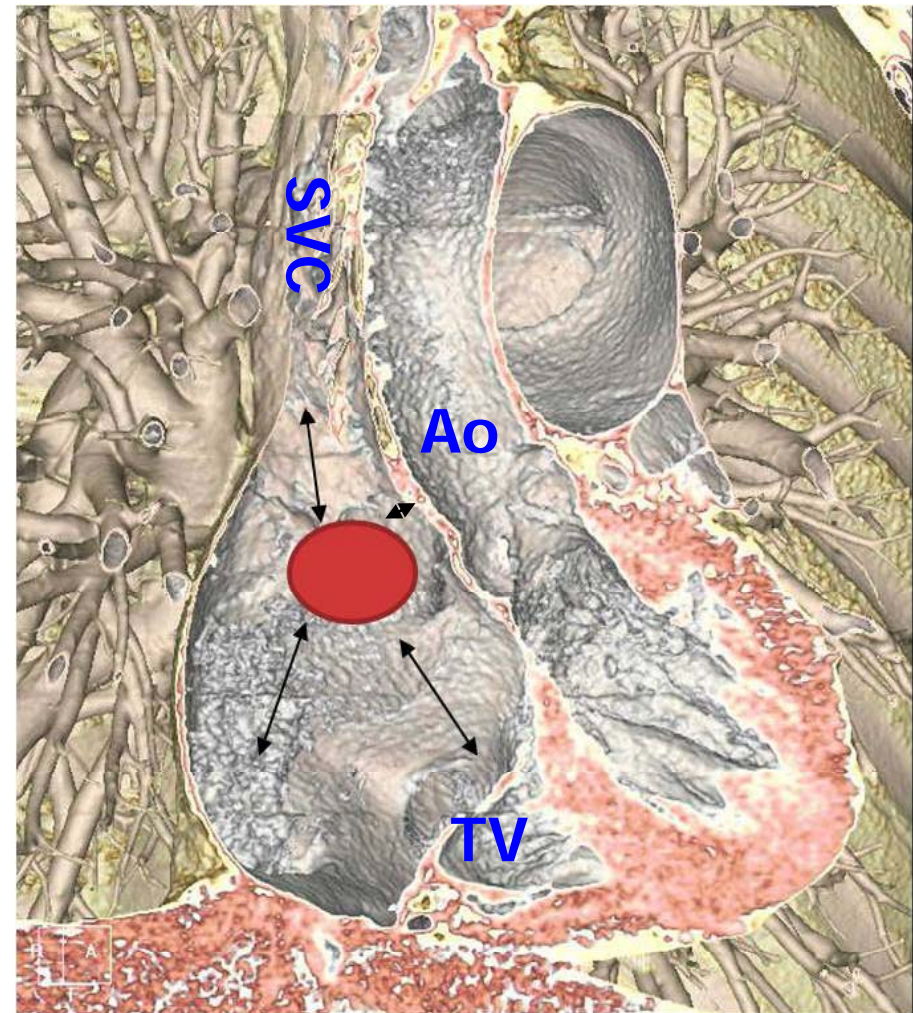
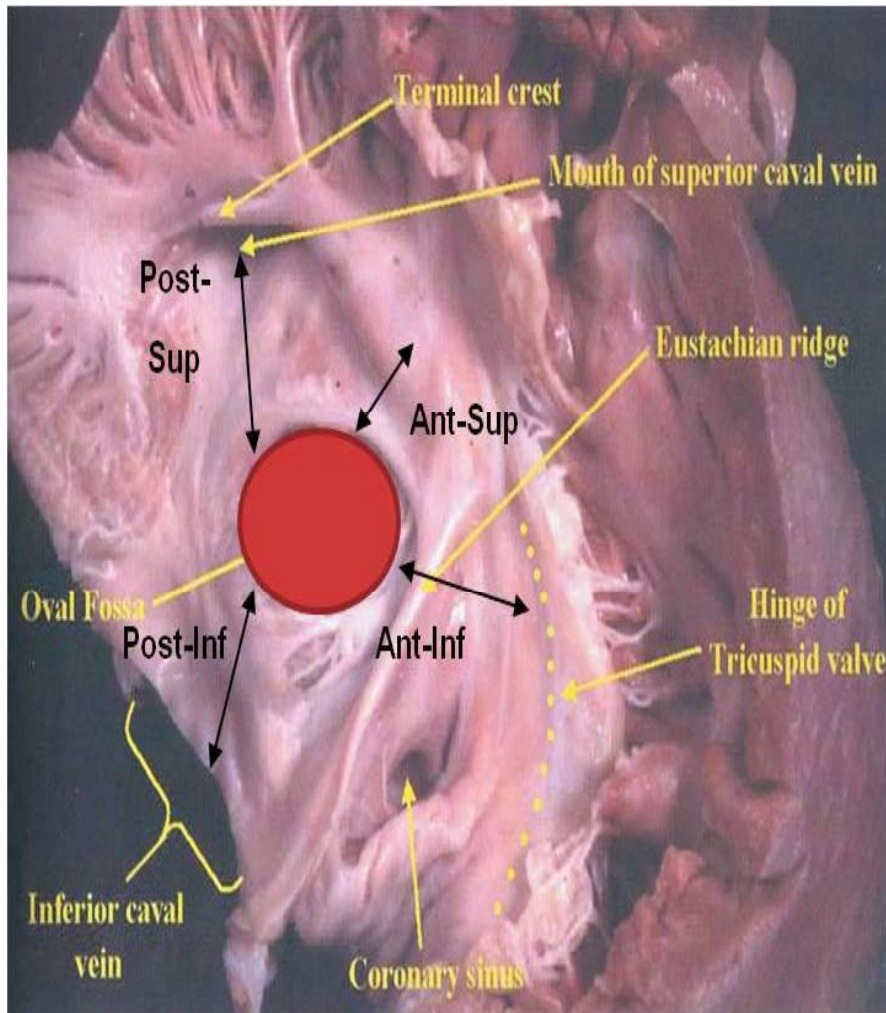
Diastole



Systole



The rims on CT

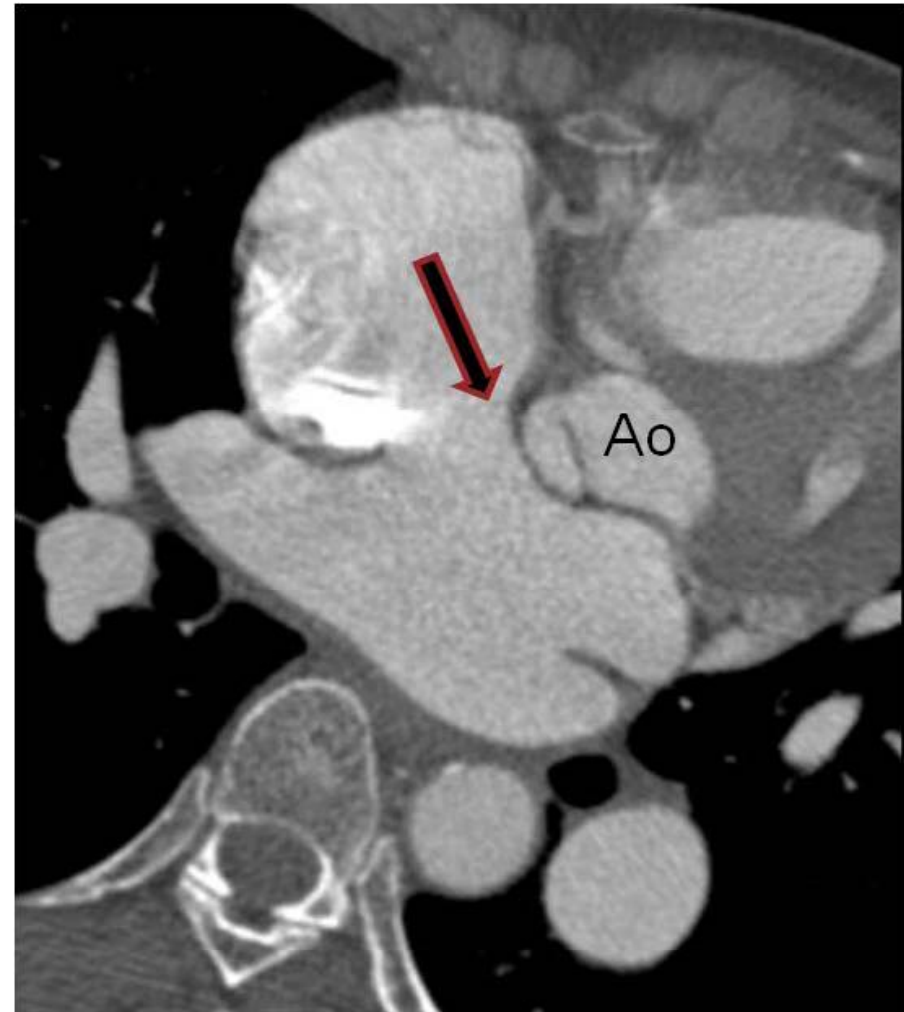


Rim deficiency

Posterior

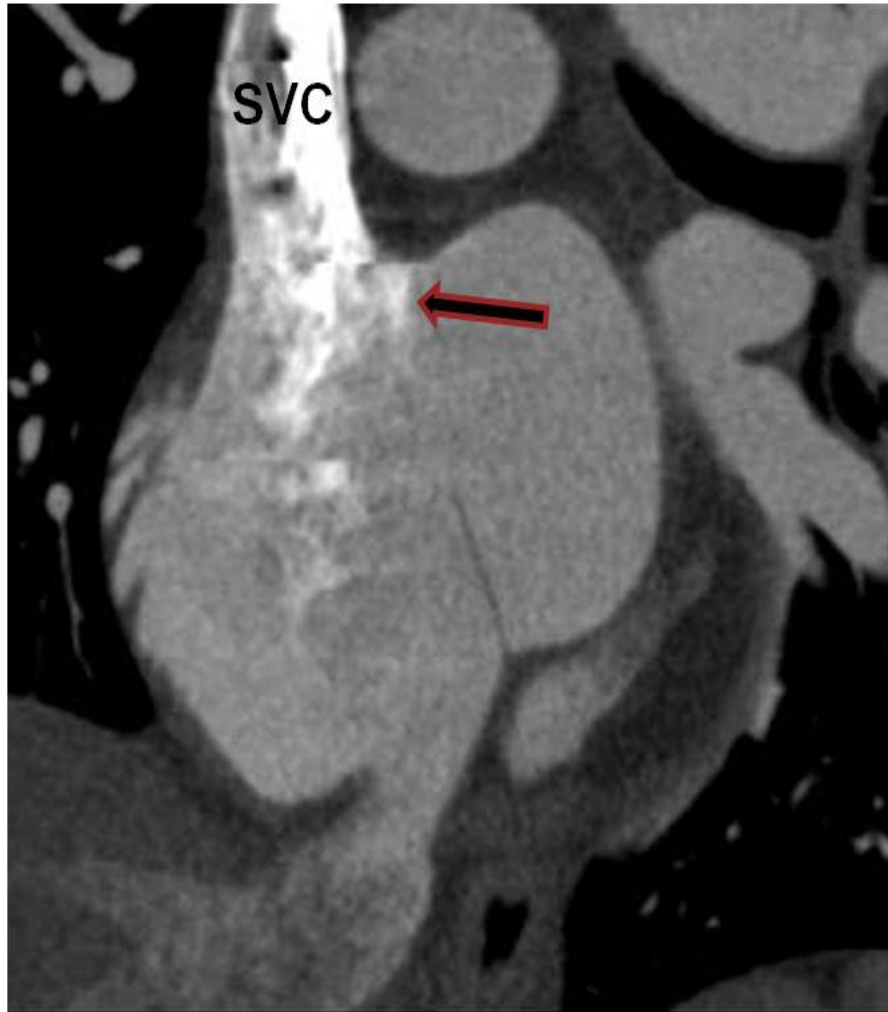


Anterior-Superior



Rim deficiency

Posterior-Superior



Posterior-Inferior



The importance of PI rim

Table 2. Comparison of patients who had successful transcatheter closure (group A) with patients who were excluded from transcatheter closure (group B)

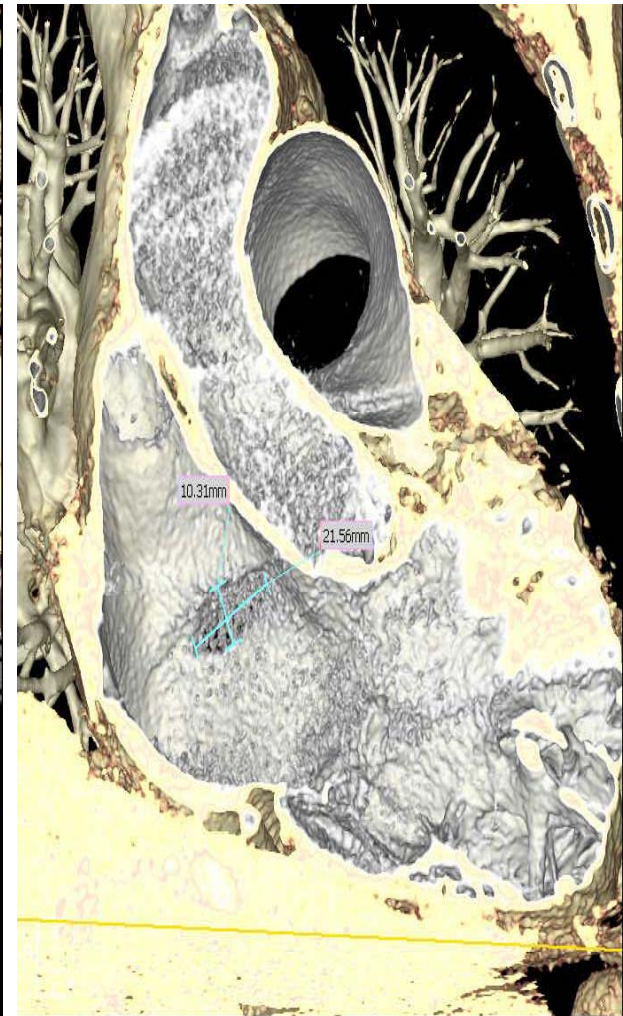
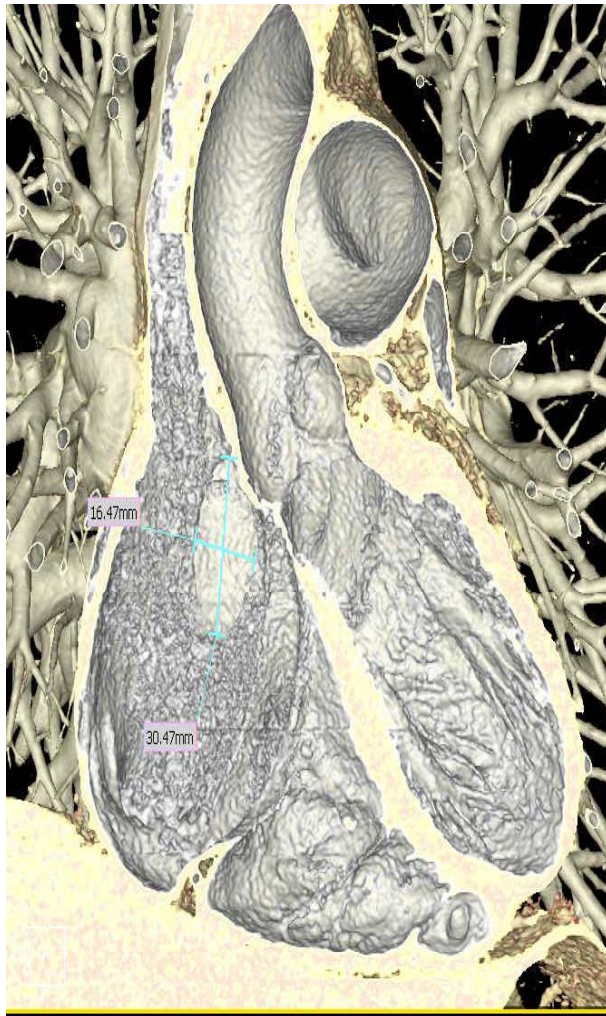
Variable	Group A (n = 52)	Group B (n = 14) ^a	p value
Age (years)	37.1 ± 16.1	29.1 ± 12.2	0.056
Weight (kg)	52.5 ± 12.8	50.7 ± 14.5	0.674
MRI major axis (mm)	25.9 ± 5.6	30.2 ± 4.6	0.012*
MRI minor axis (mm)	19.5 ± 5.4	22.1 ± 5.8	0.201
MRI AS (mm)	4.7 ± 3.5	3.4 ± 4.1	0.301
MRI AI (mm)	17.3 ± 5.3	18.1 ± 8.8	0.750
MRI PS (mm)	14.1 ± 4.5	12.2 ± 4.3	0.172
MRI PI	16.1 ± 4.7	10.2 ± 6.1	0.004*
TEE major axis (mm)	21.9 ± 5.8	28.0 ± 8.5	0.112
TEE minor axis (mm)	18.1 ± 4.3	24.3 ± 2.5	0.007*
TEE AS (mm)	4.9 ± 2.9	5.5 ± 0.7	0.513
TEE AI (mm)	14.4 ± 4	13.4 ± 1.9	0.511
TEE PS (mm)	15.9 ± 3.8	12.5 ± 4.7	0.180
TEE PI (mm) ^b	16.7 ± 4.3	16.4 ± 1.7	0.805
Q _p :Q _s	3.0 ± 1.0	3.4 ± 1.5	0.682

Predictors of Successful Transcatheter Closure of Atrial Septal Defect by Cardiac Magnetic Resonance Imaging

K. Durongpisitkul,¹ N.L. Tang,² J. Soongswang,¹ D. Laohaprasitiporn,¹ A. Nanai¹

Pediatr Cardiol 25:124–130, 2004

Eccentricity



The characteristics of the defects

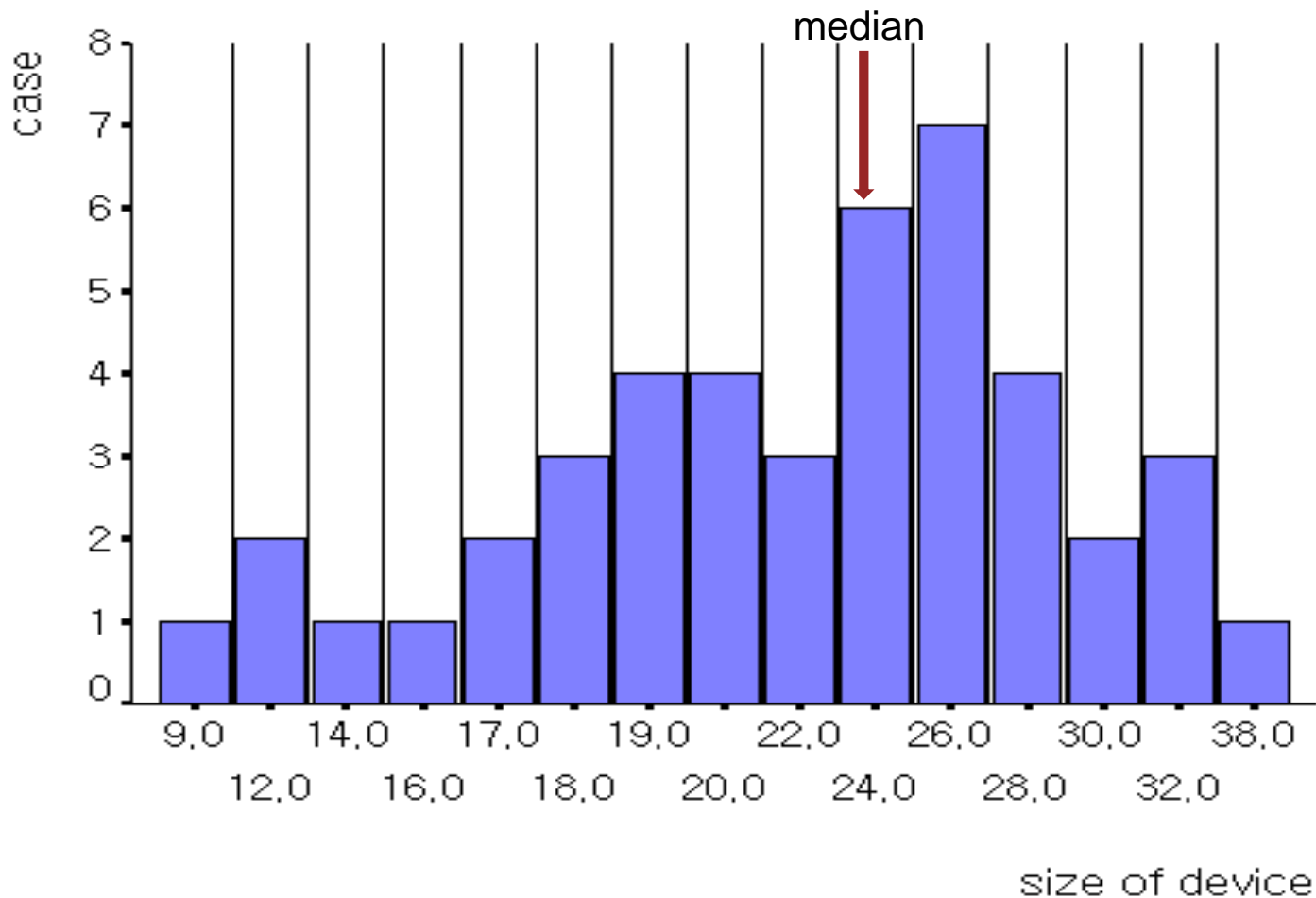
	Min	Max	Mean	S.D
Age (yr)	10.0	77.0	41.3	15.4
Body weight (kg)	32	77	57.7	9.2
Qp/Qs	1.0	6.0	2.7	1.0
Long axis (mm)	8.0	34.0	19.6	6.5
Short axis (mm)	4.0	31.0	15.5	5.3
Eccentricity	0.0	0.9	0.57	0.20
Defect area (mm ²)	25.1	827.4	262.3	163.7
Rims (mm)	AS	<p><i>The anterior superior rim was absent in 29 defects and the posterior inferior rims were less than 10 mm in only 2 patients.</i></p>		
	AI			
	PS			
	PI			
	Post			

Eccentricity = $\sqrt{1 - (\text{short axis}^2 / \text{long axis}^2)}$, defect area = $3.14(\text{long axis}/2)(\text{short axis}/2)$

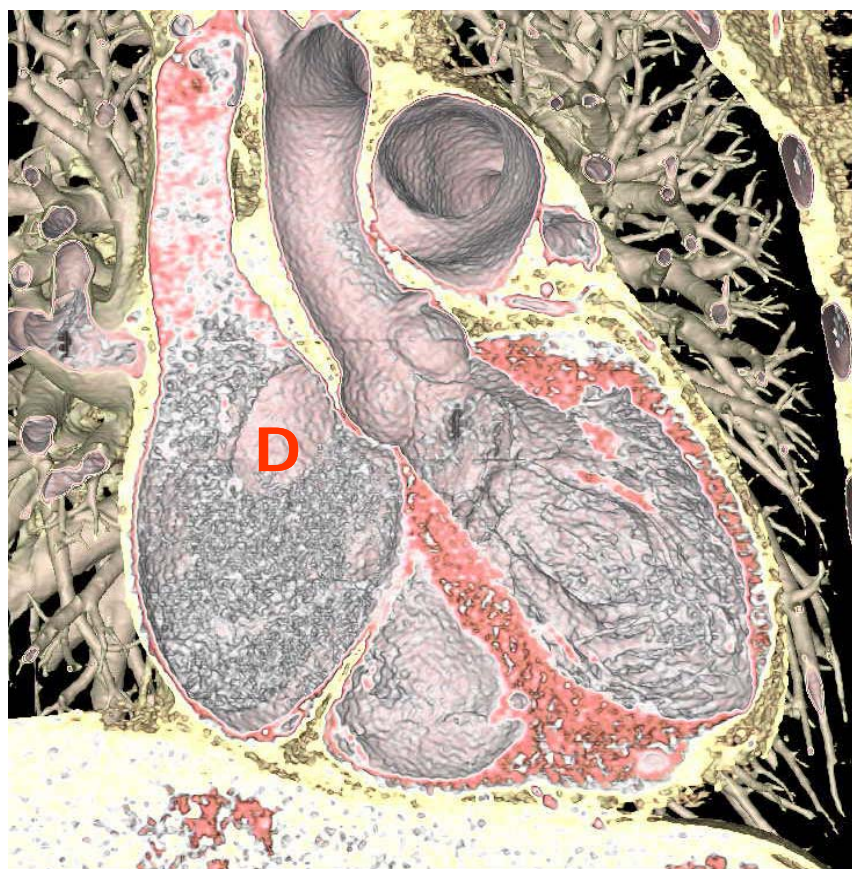
AS : anterior-superior, AI : anterior-inferior, PS : posterior-superior, PI : posterior-inferior, Post : posterior

The size of the device

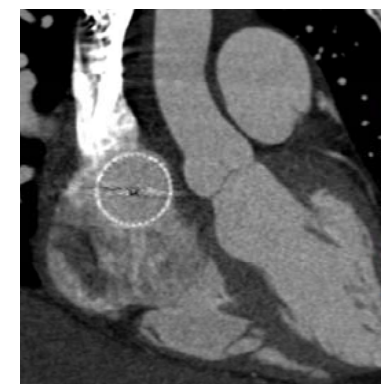
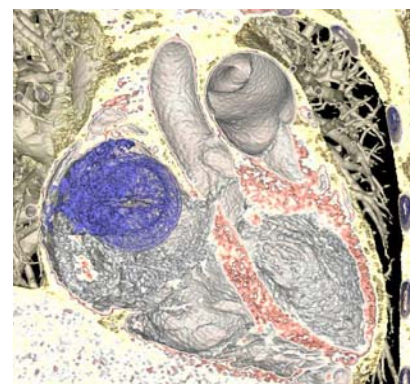
The device size depended on the longest diameter on the cardiac CT or the stretched balloon diameter.



Change of the defect after the closure of the ellipsoid defect



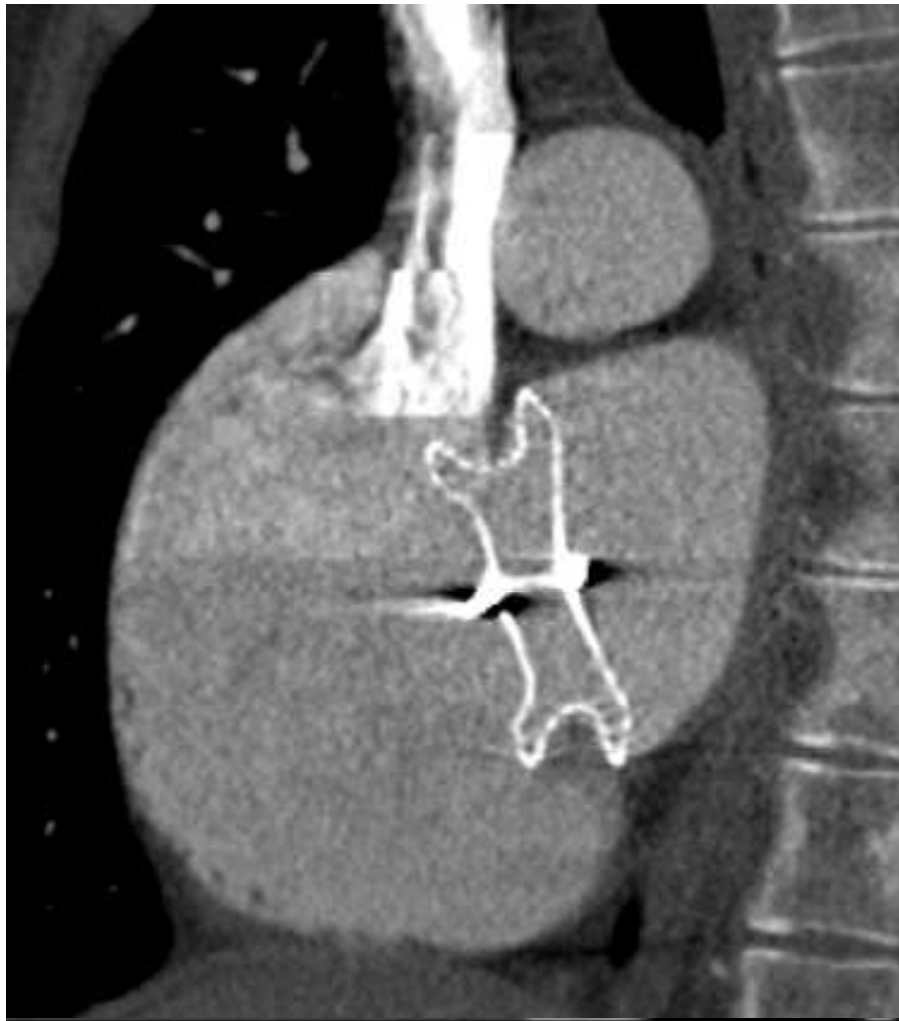
32mm
→



A	B	Eccentricity
24	17	0.7

Large ASD

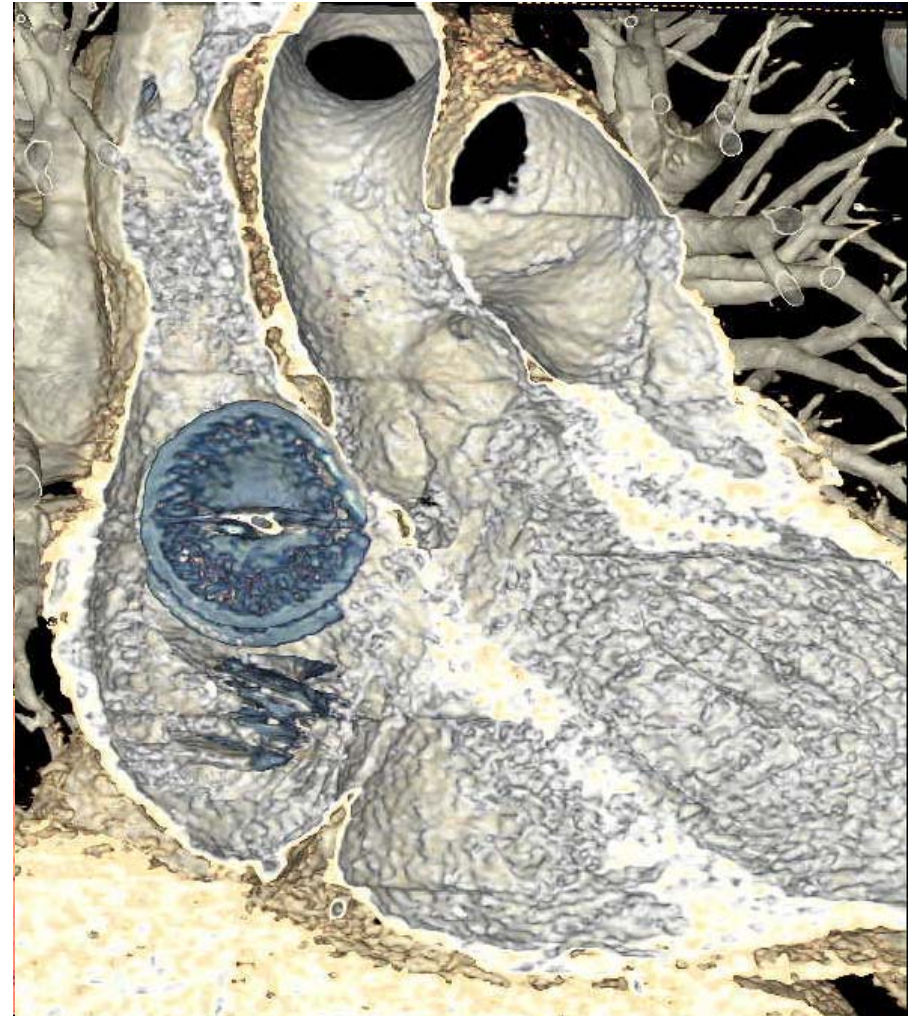
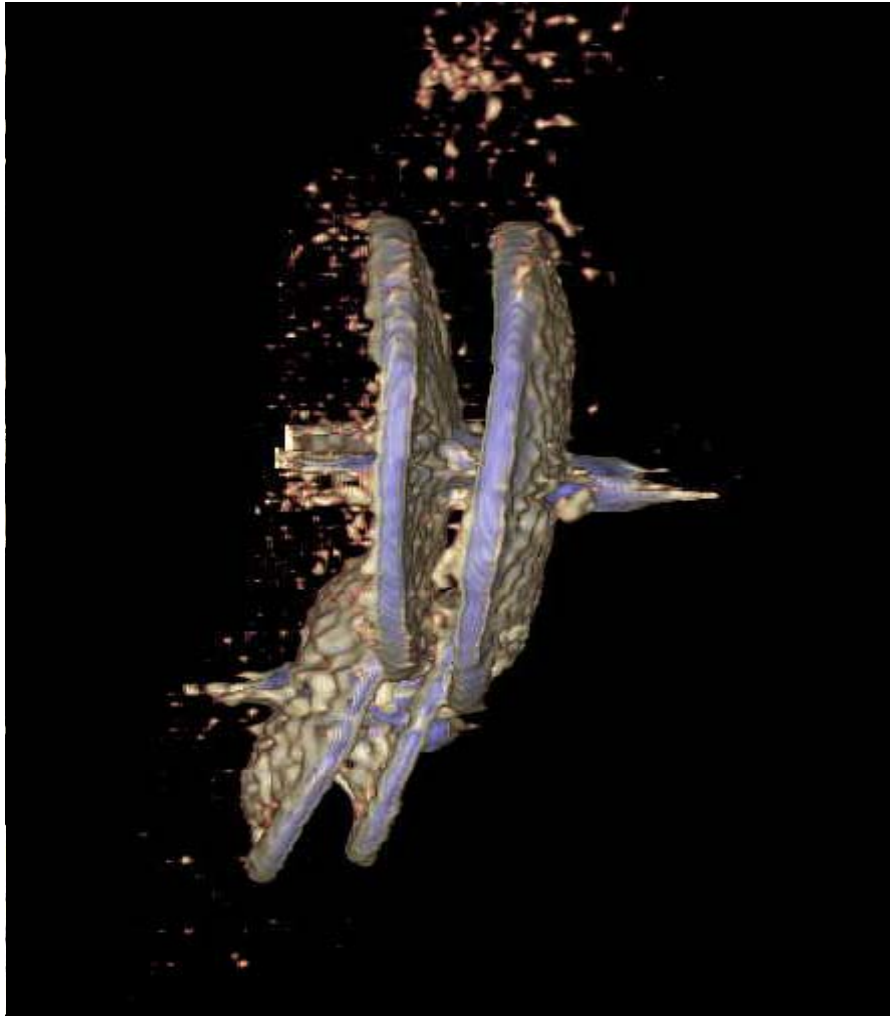
32 mm ASO



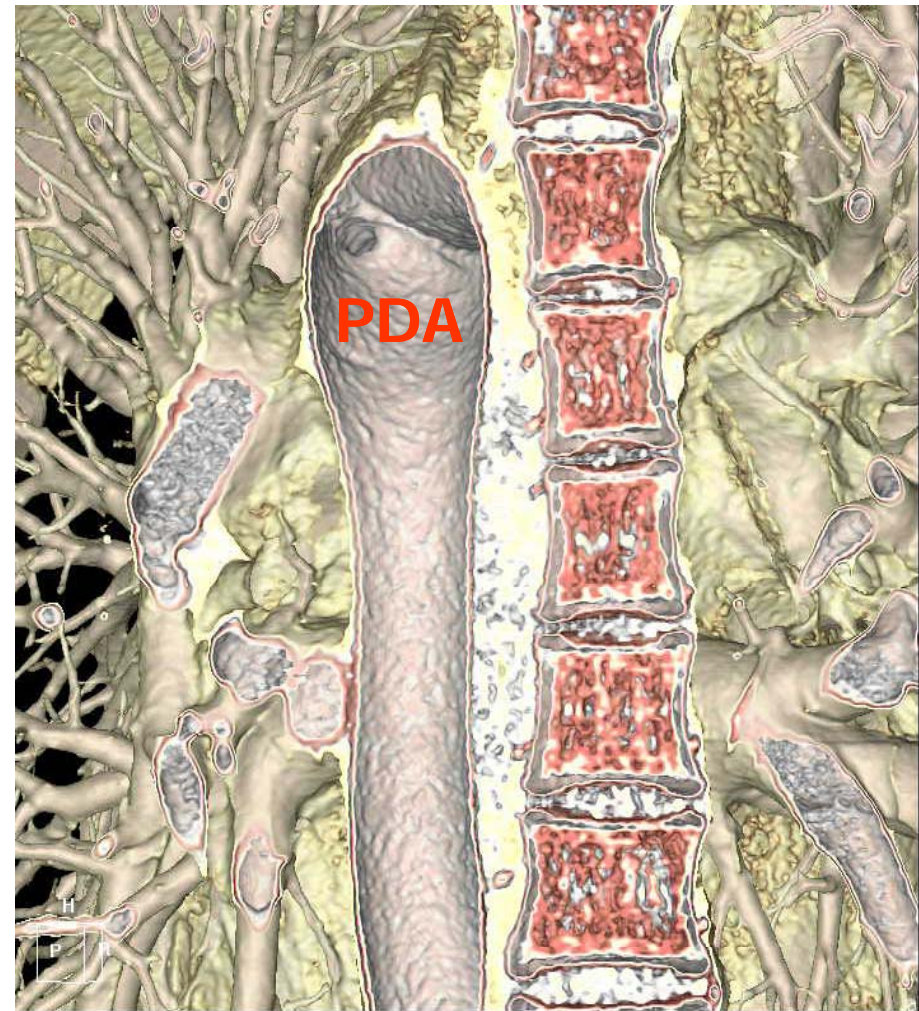
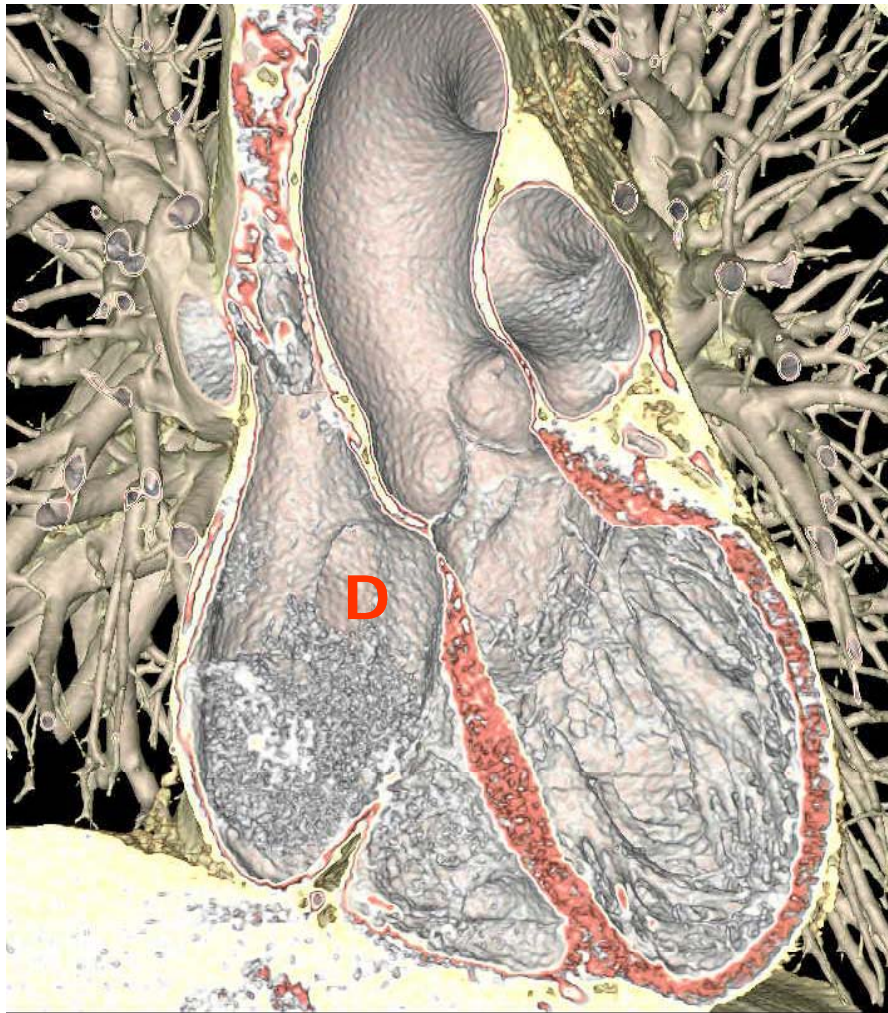
38 mm ASO



Multiple ASD



Concomitant procedure : PDA closure

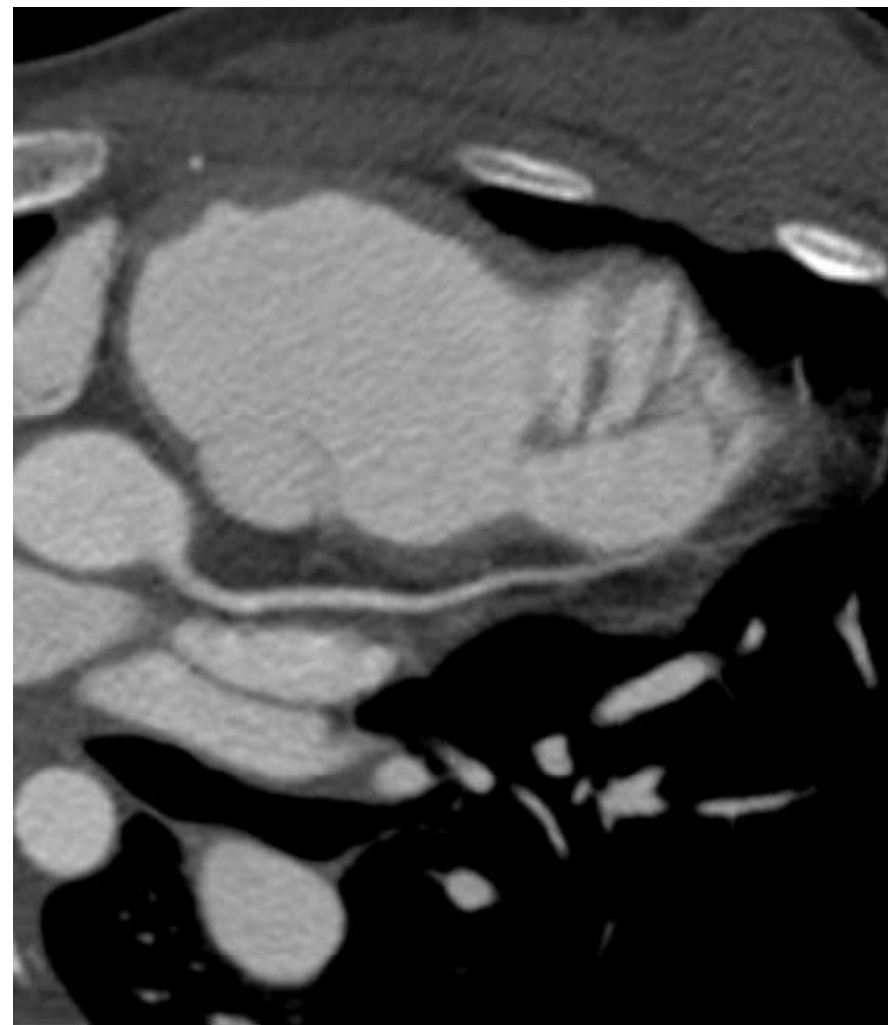


*Concomitant procedure :
coronary intervention*

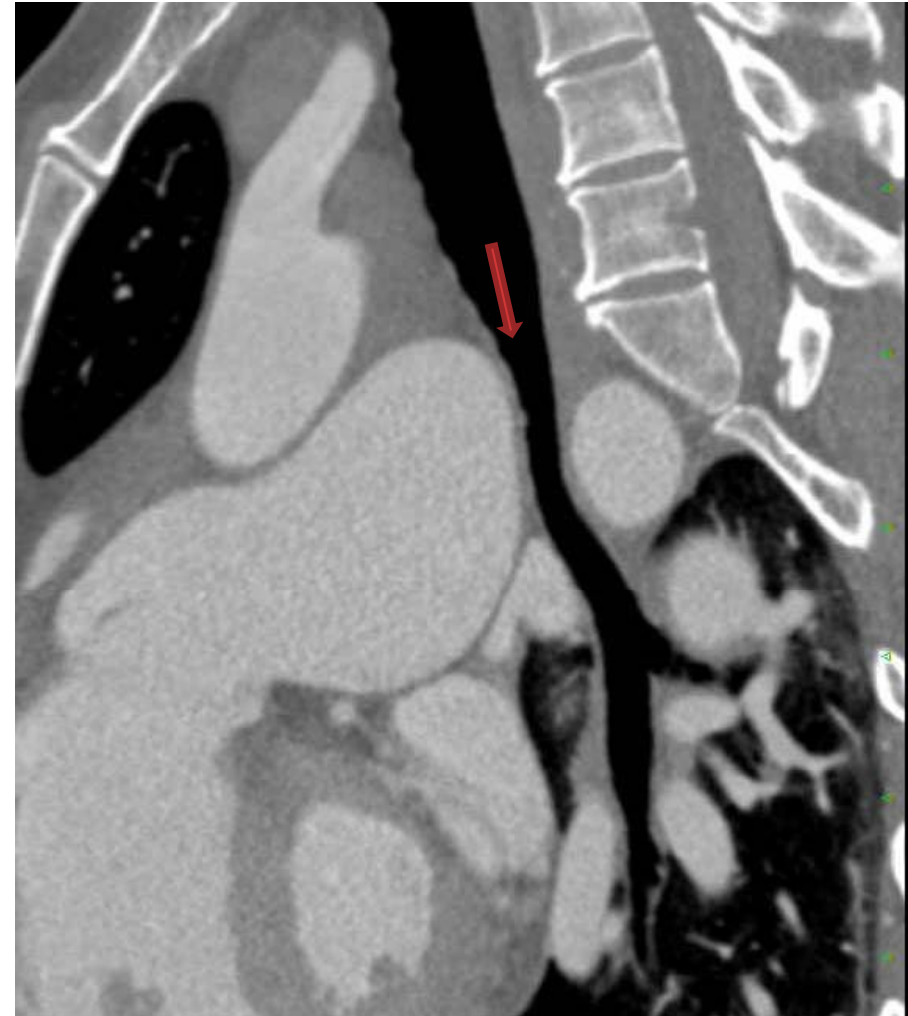
Artheroma



Myocardial bridge



Airway evaluation



Mass lesion



Procedural results

- *No serious complications*
- *Balloon assisted technique (1)*
- *Change of device (1)*
- *No significant leakage*

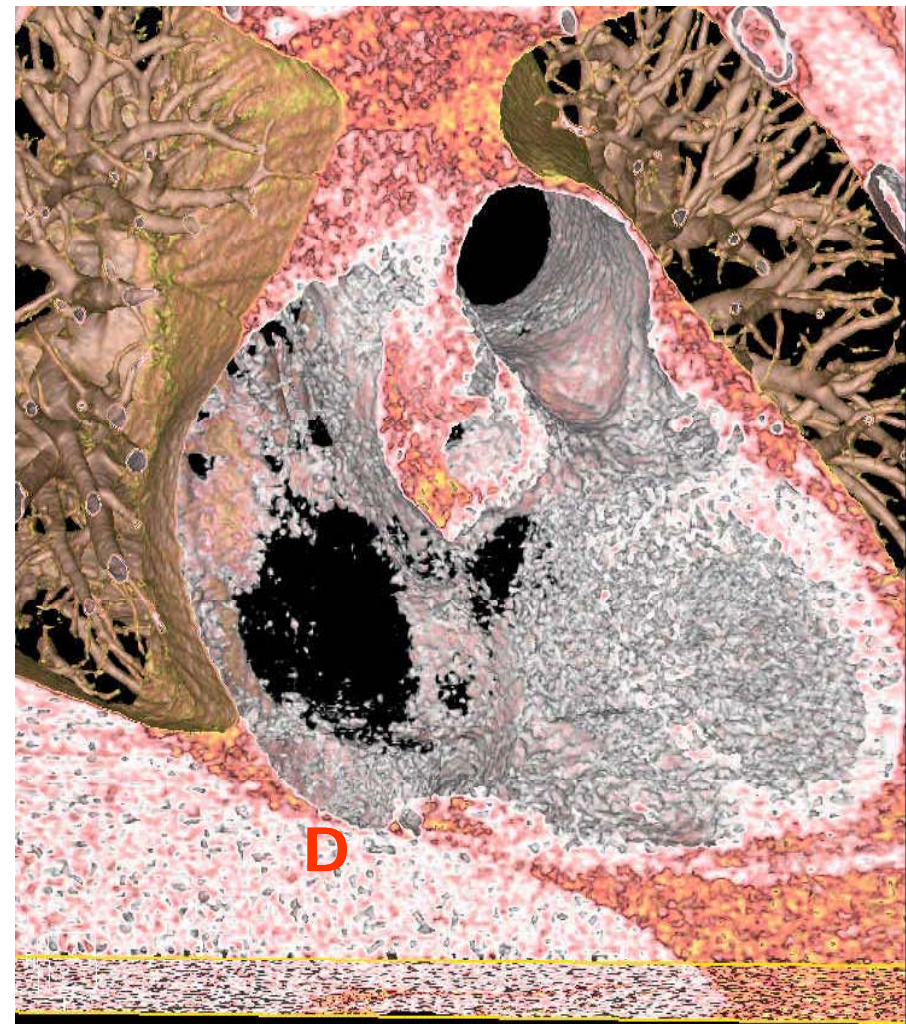
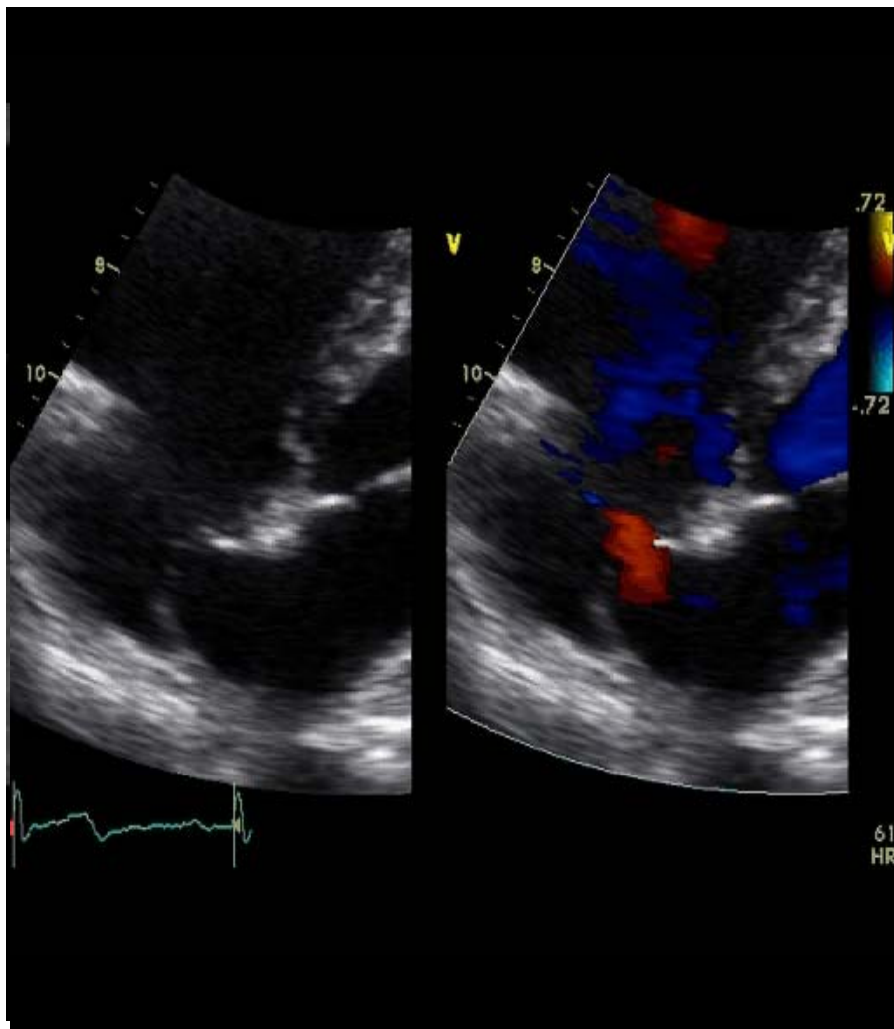
Difference between two groups

The patients were divided into two groups: not using a balloon sizing technique (group 1, n=24), and using a balloon sizing technique (group 2, n=20) during transcatheter device closure.

	Group 1		Group 2		<i>P</i>
	mean	S.D	mean	S.D	
Long axis (mm)	22.1	6.0	16.6	5.8	0.005
Short axis (mm)	17.6	4.9	12.9	4.7	0.003
Eccentricity	0.55	0.20	0.58	0.20	0.563
Defect area (mm ²)	325.5	170.7	186.6	119.4	0.003
Ratio of area	1.6	0.3	2.2	0.9	0.006
Ratio of diameter	1.1	0.1	1.3	0.2	0.019

Ratio of area = area of device waist/defect area, Ratio of diameter= device size/long axis

Thin aneurysm



- *Cardiac CT can be a good modality for the evaluation of the size and the location of an ASD and the appropriateness for transcatheter closure of ASD with ASO.*
- *In spite of the small number of cases and lack of long-term data, cardiac CT as a size measuring method instead of balloon sizing for the selection of ASO is worthy of further study.*
- *The thin septal membrane is easy to be wiped out on cardiac CT.*

Thank you !

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