Transesophageal Echocardiography of Intracardiac Thrombus in Congenital Heart Disease and Atrial Flutter:

The Importance of Thorough Examination of the Fontan

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BACKGROUND

Transesophageal echocardiography (TEE) is used in atrial flutter/ fibrillation atrial flutter/fibrillation (AFF) prior to cardioversion (DCC) to detect intracardiac thrombus (ICT). Prior reports emphasize TEE of the left atrial appendage (LAA) as the common site of ICT in 8% of Patients without congenital heart disease . In practice we have noticed a significant incidence of ICT in other structures in patients with congenital heart disease and AFF.

In congenital heart disease right sided ICT embolization may have serious consequnces due to either pulmonary embolus, or to systemic embolus in those with persistent right to left shunt. The former may have particularly deleterious effect in the Fontan circulation.

AIMS

1. Use TEE to determine the incidence and location of ICT in patients with congenital heart disease requiring DCC of AFF
2. Compare the ability of TEE versus transthoracic echo (TTE) to detect ICT in this population

METHODS

- Retrospective review of TEE and TTE findings in 26 patients with congenital heart disease who had DCC of AFF
- The diagnosis, presence and location of ICT were determined
- TEE versus TTE results were compared

RESULTS

- The 26 patients with 32 episodes of AFF and DCC were 2 to 72 years (21 yrs.); 17 – 100 kg (65 kg.)
- This includes all of the last 26 patients presenting to us with congenital heart disease, AFF and DCC with 0 exclusions
- ICT was present in 15% (4/26) overall and 50% (3/6) of Fontan patients with AFF
- Of the 3 Fontan patients 2/3 had ICT in the atrio-pulmonary Fontan (Fig.1A&B) and 1/3 had ICT in the right atrial remnant which connected to the pulmonary venous atrium in an extracardiac Fontan (Fig.1C). None of the 3 Fontan related ICT was seen on TTE
- There was 1 ICT in the left atrial appendage (Fig.1D) in a patient with congenital mitral valve regurgitation which was also seen on TTE

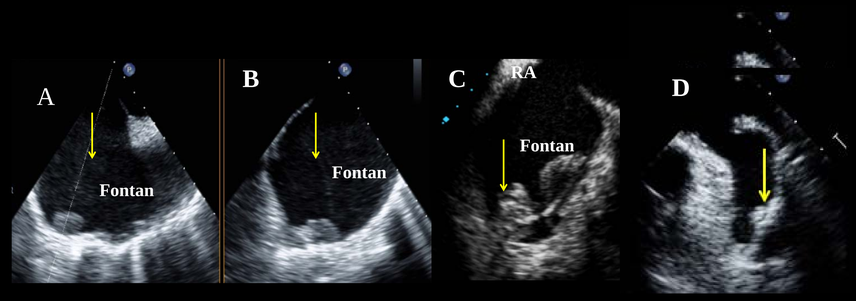
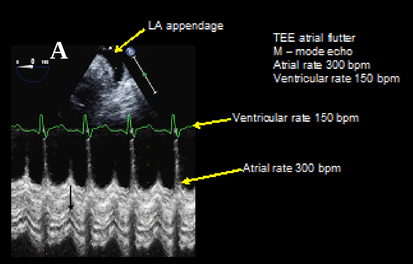


Fig.1 2D TEE A&B: ICT in Fontan (biplane). C: ICT in the right atrial remnant in ECF. D: ICT in the left atrial appendage in congenital mitral valve regurgitation



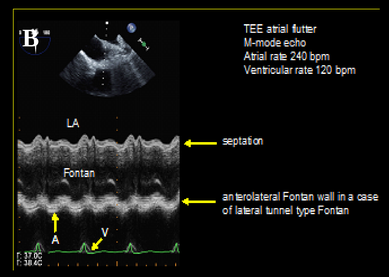


Fig.2 TEE/M-mode echo in patients with atrial flutter. A: LA appendage. B: Fontan

Diagnosis	Repair/Palliation	Number of patients	Age (yrs.)	Number of intracardiac thrombi	Intracardiac thrombus location	Seen on TTE
Tricuspid atresia	atrio-pulmonary Fontan	3	21,25,39	1	Fontan	no
Tricuspid atresia	extracardiac Fontan	1	16	1	Right atrial remnant	no
Double inlet LV	atrio-pulmonary Fontan	1	21	1	Fontan	no
Double inlet LV	extracardiac Fontan	1	36	0		
Congenital mitral valve dysplasia	valvuloplasty and ring	1	5	1	Left atrial appendage	yes
Tetralogy of Fallot	repair	3	22,17,24	0		
Ebstein's anomaly	valvuloplasty	2	16,18	0		
D –TGA	Mustard	2	39,53	0		
D – TGA	arterial switch	2	16,16	0		
L- TGA	Mustard /Rastelli	1	10	0		
AV septal defect	2 patch repair	2	16,17	0		
Aortic valve stenosis	Ross	1	2	0		
Double outlet RV	switch, VSD patch	1	9	0		
Atrial septal defect	patch	2	72, 63	0		
Pulmonary atresia & VSD	Rastelli	1	17	0		
Truncus arteriosus	Rastelli	1	21	0		
TAPVR	Repair of TAPVR	1	2	0		
Total		26		4/26		1/26

Table 1: Summary of patients diagnosis, repair/palliation, and ICT on TEE/TTE

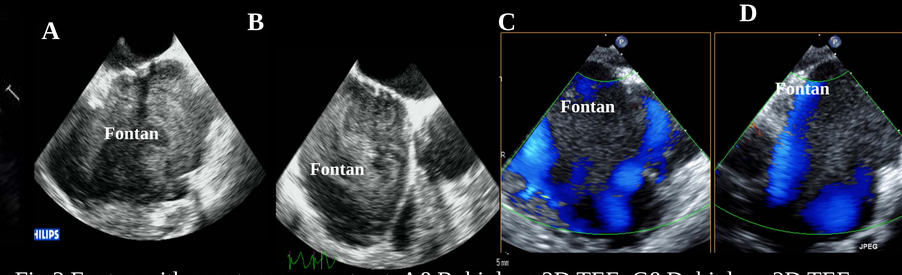


Fig.3 Fontan with spontaneous contrast. A&B: biplane 2D TEE. C&D: biplane 2D TEE with color

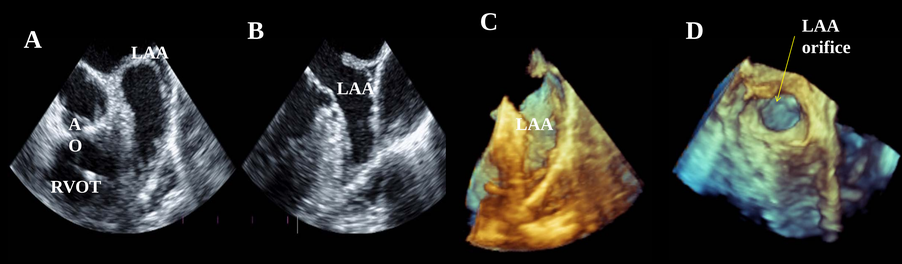


Fig.4 Normal Left atrial appendage. A&B: biplane TEE. C&D: live 3D TEE

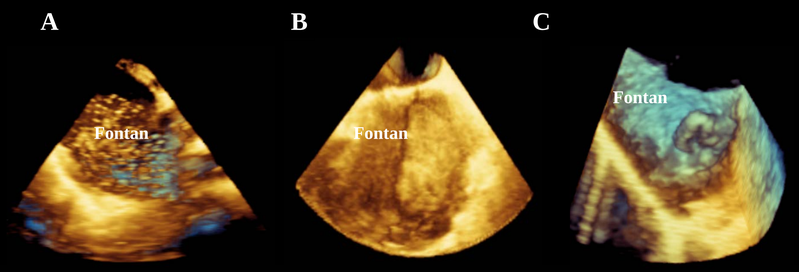


Fig.5 live 3 D TEE in Fontan. A: spontaneous echo contrast (smoke) . B: sludge. C: thrombus

CONCLUSIONS

In congenital heart disease with atrial flutter/fibrillation:

1.There is a high incidence of intracardiac thromus in Fontan patients which may be difficult to detect by TTE

2. Thorough examination of the Fontan and related structures with TEE is indicated prior to DCC of atrial fibrillation and flutter

3.The incidence of intracardiac thrombus with congenital heart disease is double that reported in non – congenital heart disease patients