TETRALOGY OF FALLOT PULMONARY REGURGITATION AND MONOCUSP

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Pulmonary Regurgitation post TOF

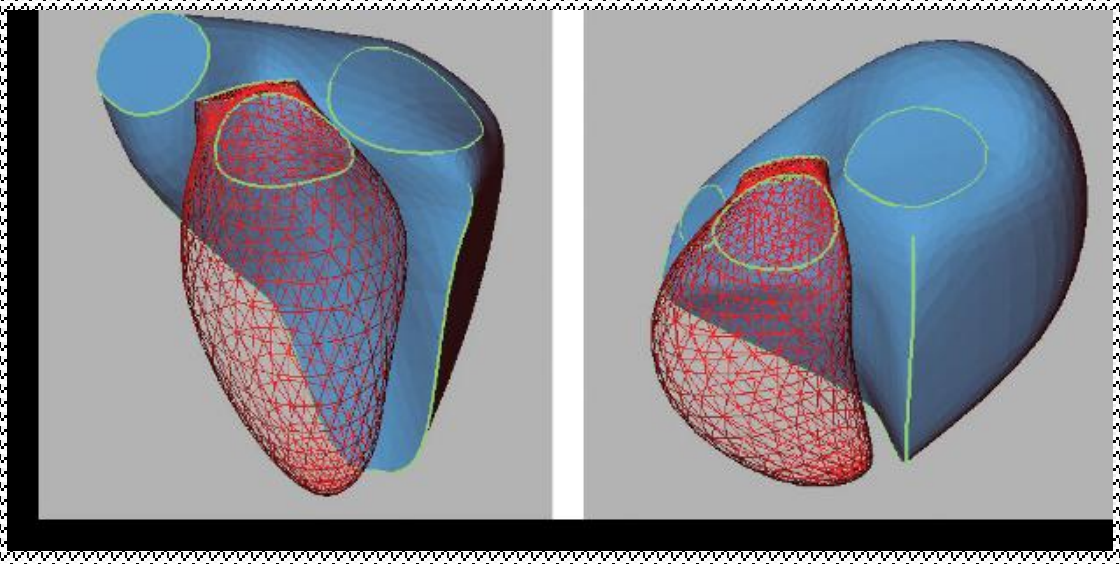
Clinical

- Symptomatic at age 30 years
- Exercise intolerance
- Right heart failure
- Arrhythmia-VT- 11.9% 35 years after surgery
- Sudden death -8.3%
- QRS duration > 0.18msc correlates to remodeling, dilatation of RV and arrhythmia -sudden death (increase in 3ms/year)

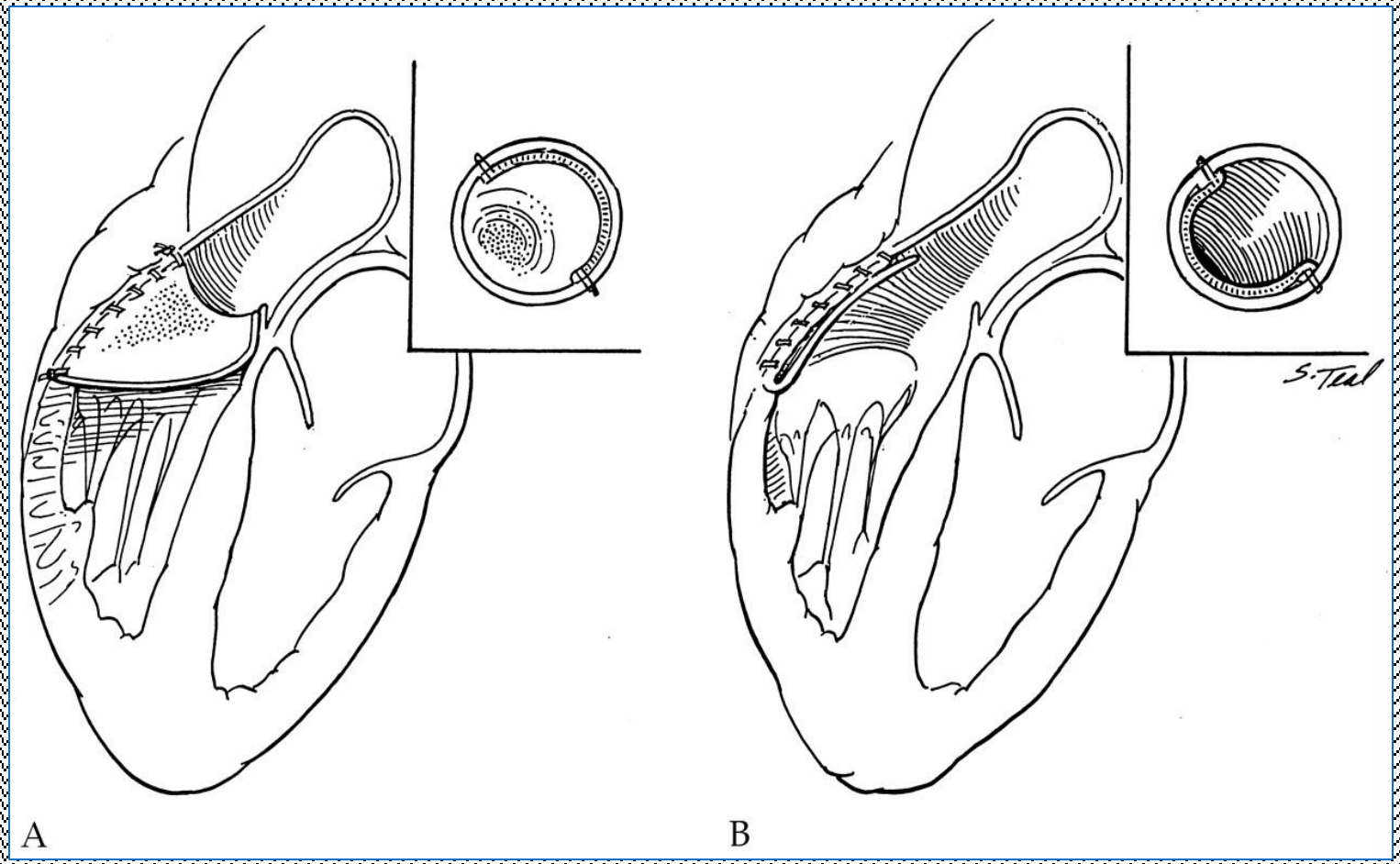
ELECTROMECHANICAL INTERACTION

Technics

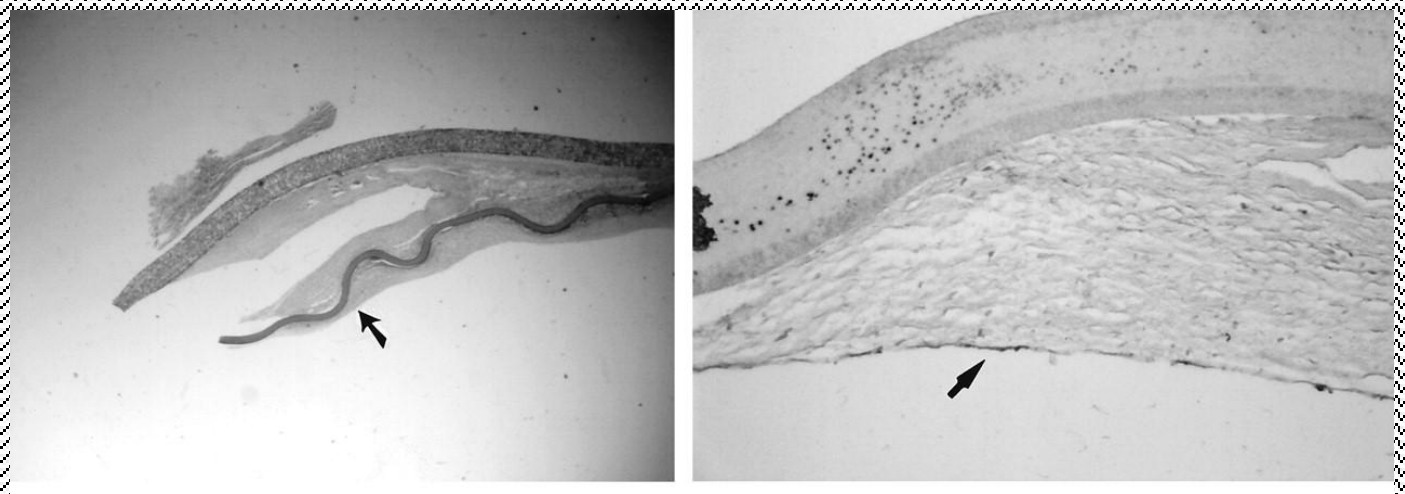
- Trans annular patch
- Homograft
- Xenograft
  - Mounted
  - Unmounted
- PTFE (gortex) monocusp
- Pericardial monocusp
- Homograft monocusp
- PTFE (gortex) bileaflet valve



Polytetrafluoroethilen PTFE Monocusp



Polytetrafluoroethylene (PTFE) monocusp *histology: (A) monocusp (arrow) and roof patch covered by thin vascularized fibrocollagenous layer; Milligan's trichrome, original magnification x2.5; (B)* flow surface of PTFE monocusp demonstrating endothelial cell layer (arrow); Factor VIII stain, original magnification x50



A B

Turrentine M. W. et al.; Ann Thorac Surg 2002;73:871-880

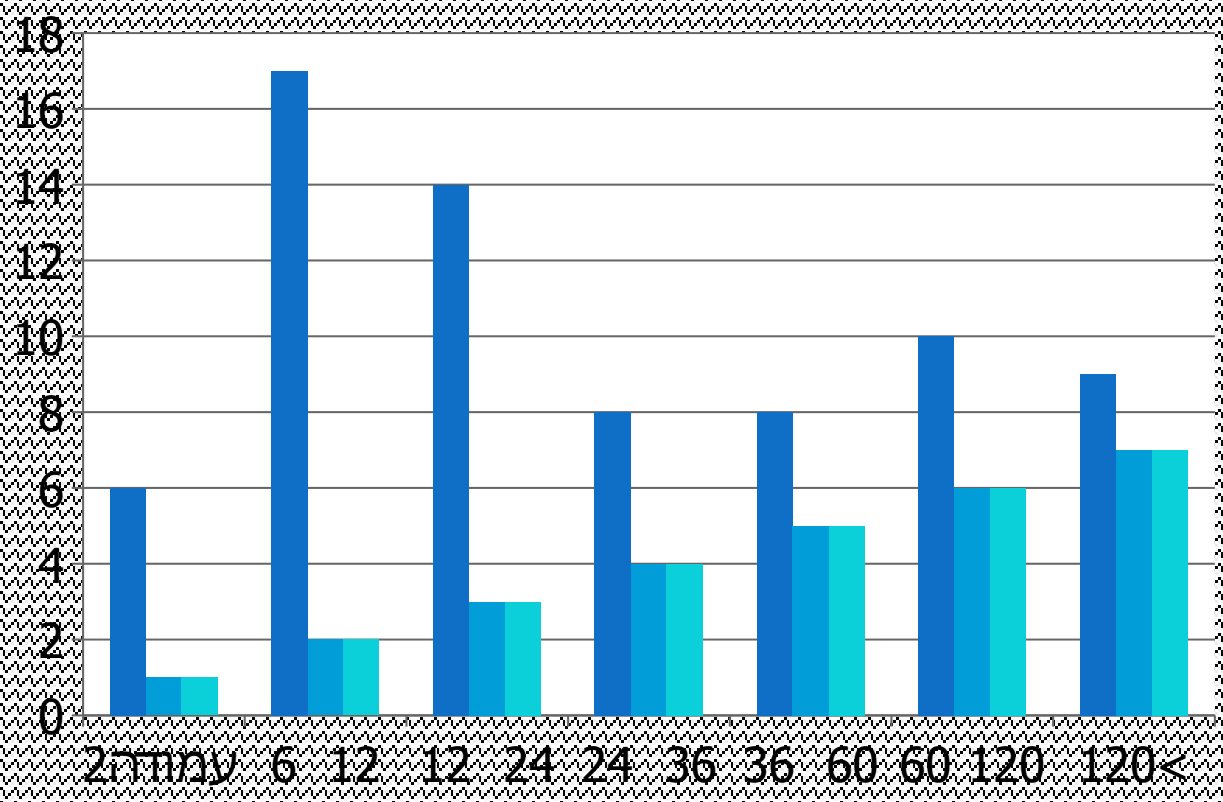
TOF Wolfson experience 2003-5.2009

C trans annular patch	B monocusp	A valve preservation	group
20(12%)	75(45%)	69 (42%)	No
27(1-192)	20 (0-196)	36(3-226)	Age-months
13/7	39/36	43/26	m/f
8.7±3.4	7.9±3	11.4±3.3	P.V annulus
-3.1 (-5)-(-0.5)	-4 (-7)-(-1)	0 (-2)-(1)	P.V Z value
-	8	2	Prior shunt
-	5	-	Prior RVOT

Operative data

C	B	A	
157±48	140±42	137±38	CPB (min)
112±36	127±31	103±30	X Clamp(min)
1	21	4	Peripheral pulmonary augmentation
20(1-50)	11(0-36)	14 (0-38)	RVOT pressure gradient mmHg
0.47 (0.26-0.7)	0.5 (0.26-0.8)	0.48 (0.22-0.8)	RV/LV PRESSURE

Monocusp group



Post operative data

C TAP	B Monocusp	A PVP	
1.5(1-30)	1(1-18)	1(1-13)	Ventilation
6(3-19)	4.5(2-19)	4(1-14)	Drains
8(2-36)	4(2-45)	4 (2-18)	PICU stay
2(11%)	5(7%)	8(12%)	RVOT reopen
-	1	1	Early reopen -vsd
-	1	-	Diaphragm plication
-	1(1.3%)	3(4.3%)	ECHMO
-	2(2.6%)	3(4.3%)	death

Early post op echo results at discharge*

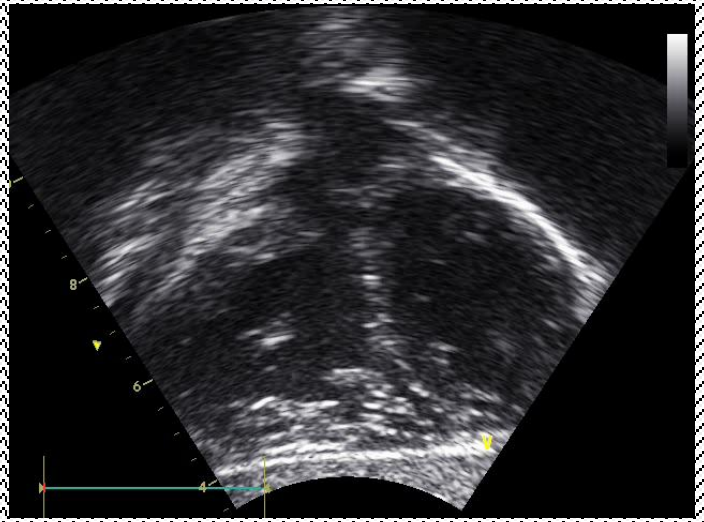
C TAP	B Monocusp	A PVP	
Mod – 11	Mod** – 3	None	Tricuspid regurgitation
Mod – 17 Severe – 33	Mod – 6 Severe – 3	Mod – 8 Severe – 0	Pulmonary regurgitation
None	None	None	RVOT stenosis

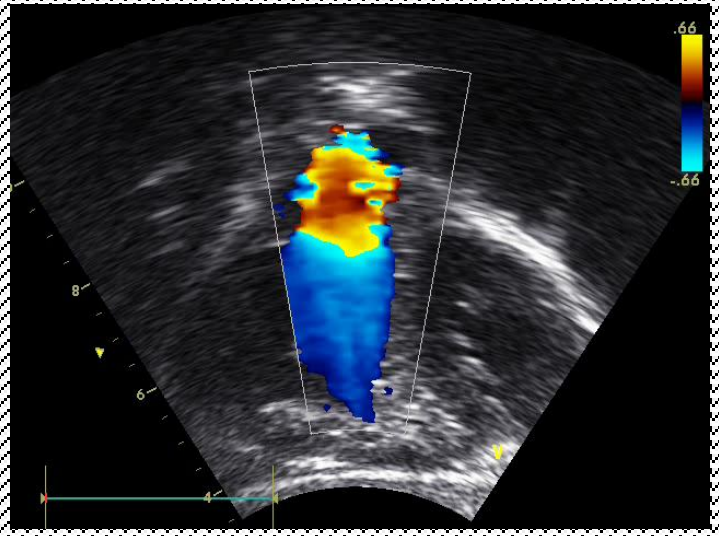
* Numbers in percentages
** Mod - Moderate

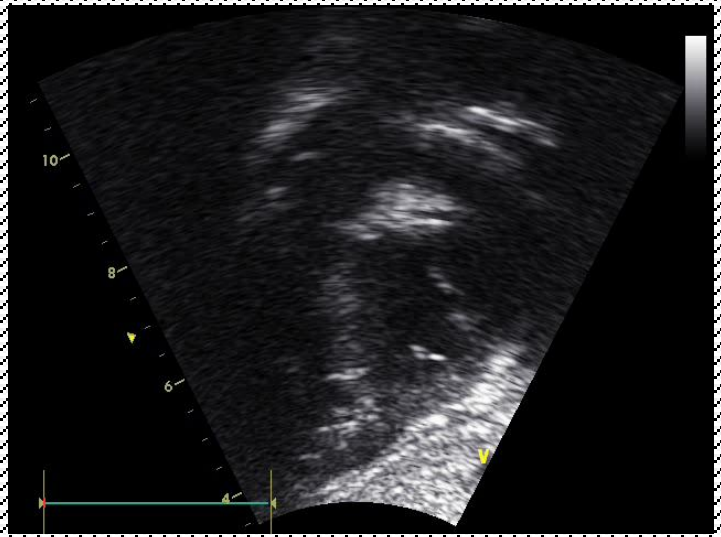
Monocusp late follow up 30pt 27±14m

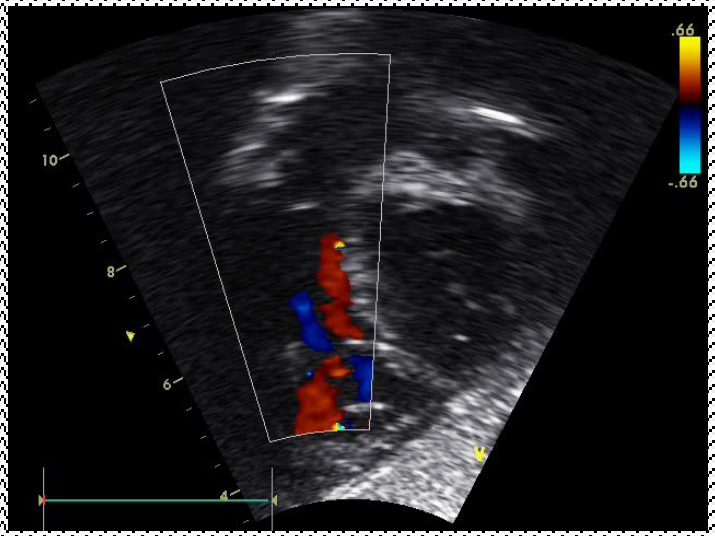
Pulmonary stenosis	Pulmonary regurgitation	Tricuspid regurgitation	
96.3%	62.9%	92.5%	None mild
0	22.2%	7.4%	moderate
3.7%	14.8%	0	severe

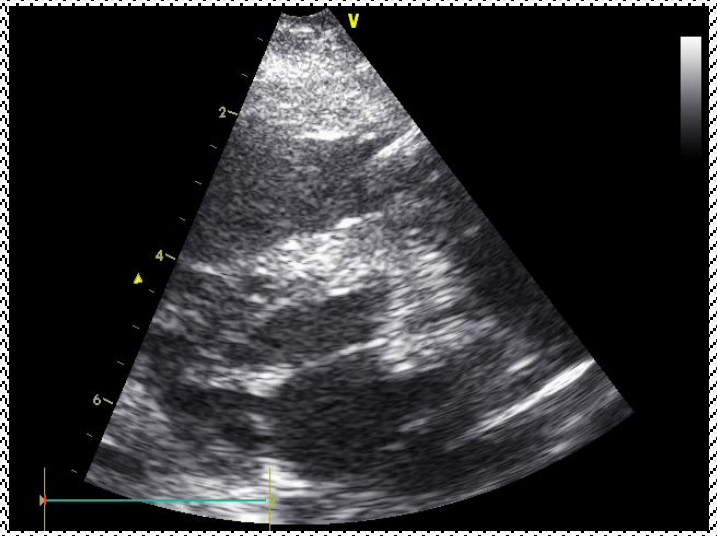
* Numbers in percentages

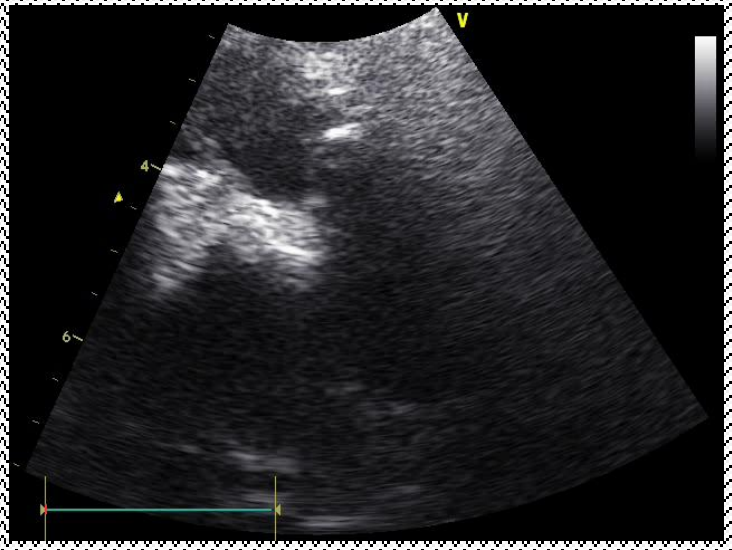

8
6
4

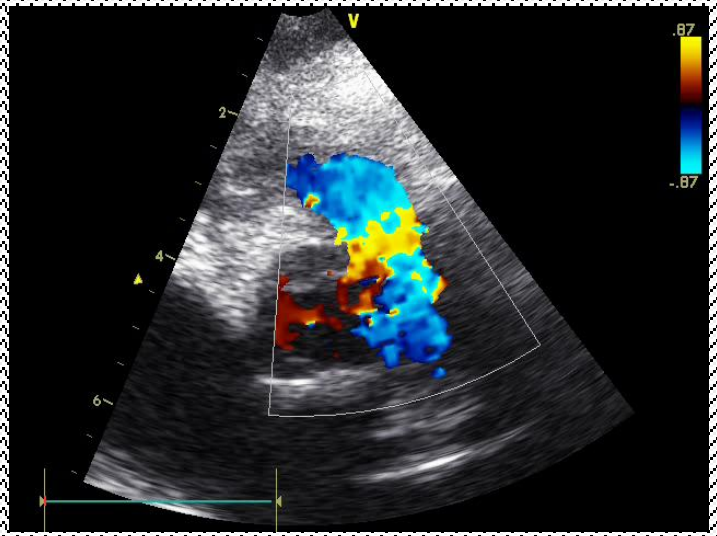

.66
-.66
8
6
4

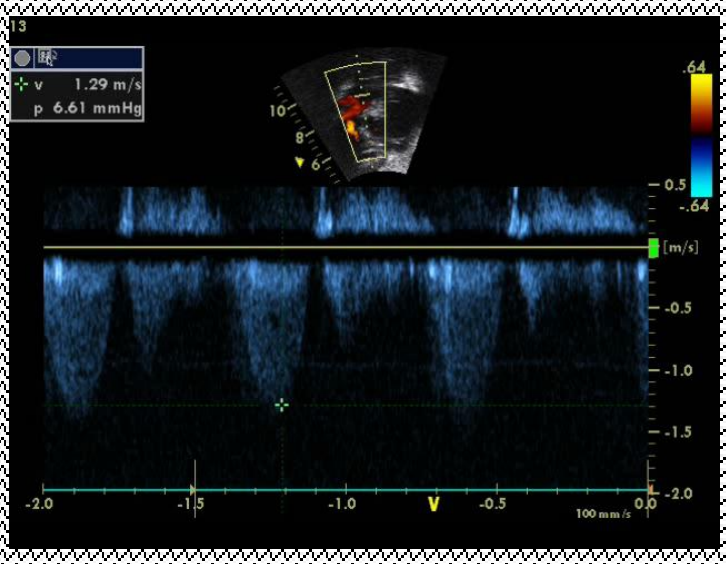

10
8
6
4

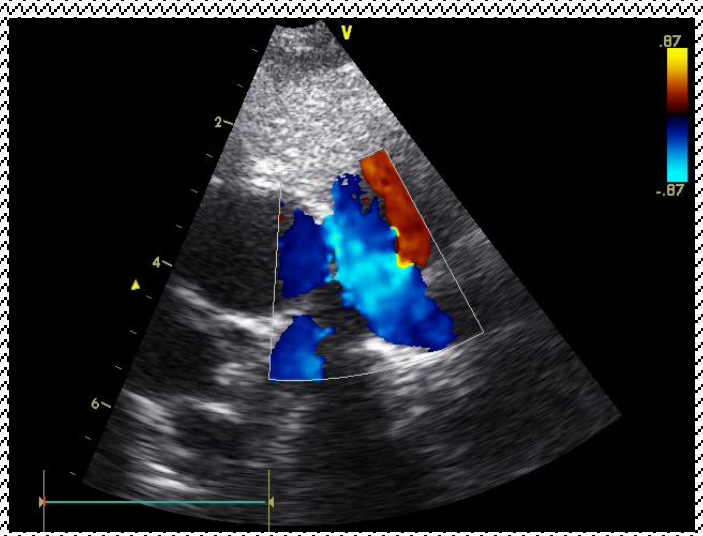

.66
-.66
10
8
6
4





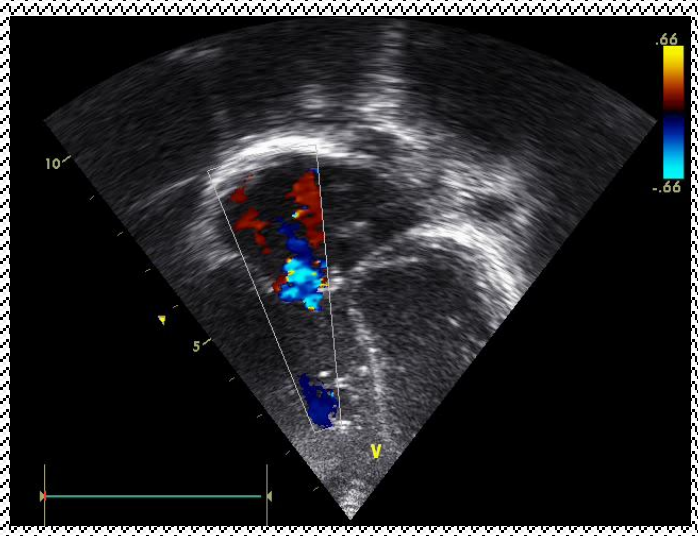



13
v 1.29 m/s
p 6.61 mmHg
.64
-.64
0.5
[m/s]
-0.5
-1.0
-1.5
-2.0
100 mm/s

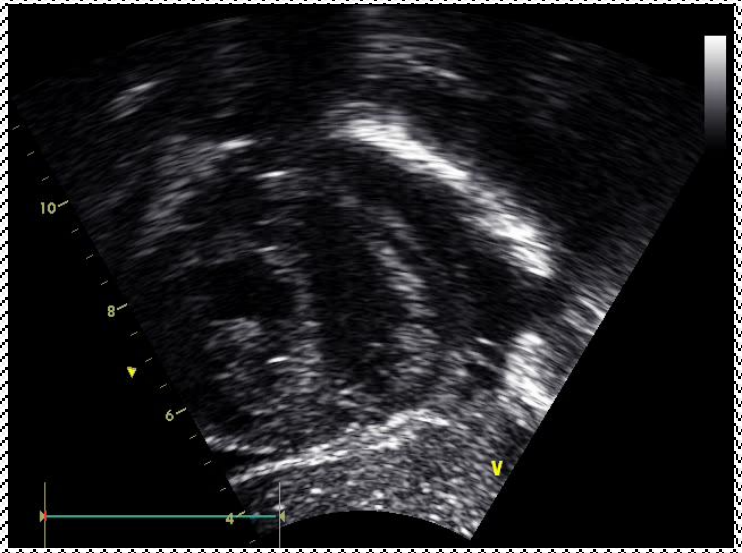

V
.87
-.87
2
4
6

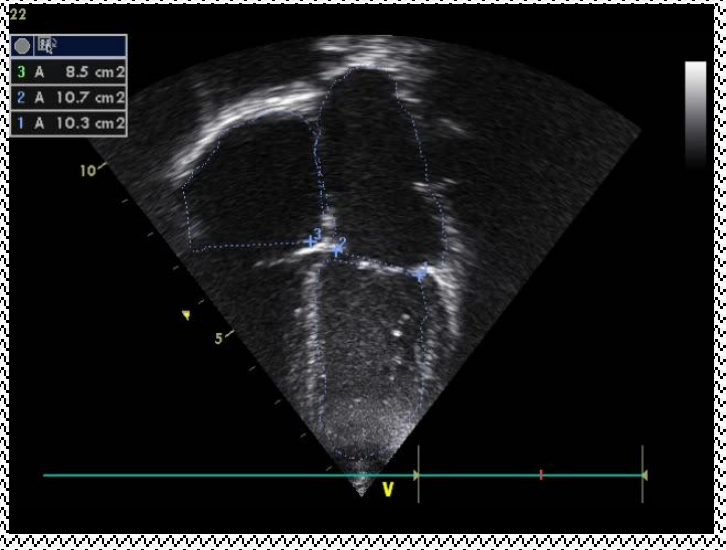

22
4 L 3.8 cm
3 L 2.7 cm
2 L 1.4 cm
1 L 2.0 cm
5
V

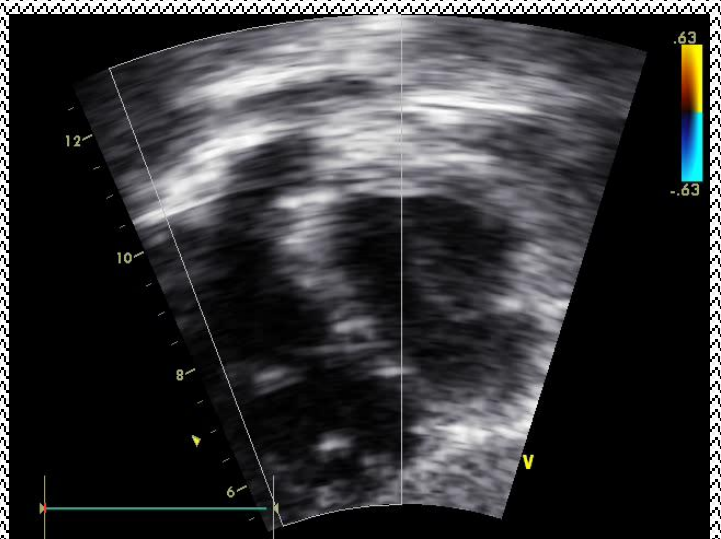

10
5
V

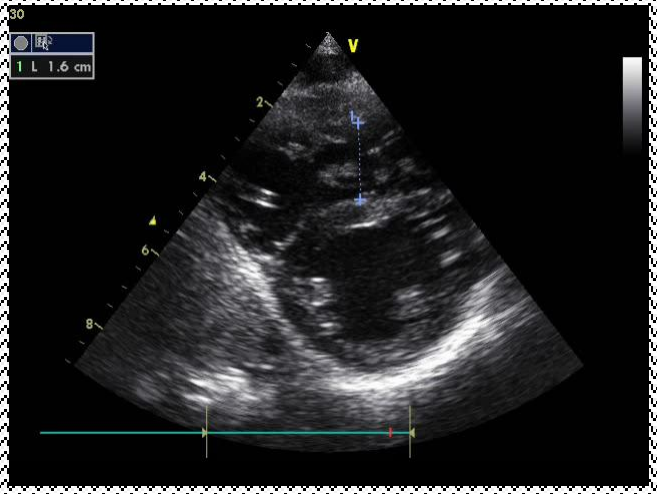

.66
-.66
10
5
V

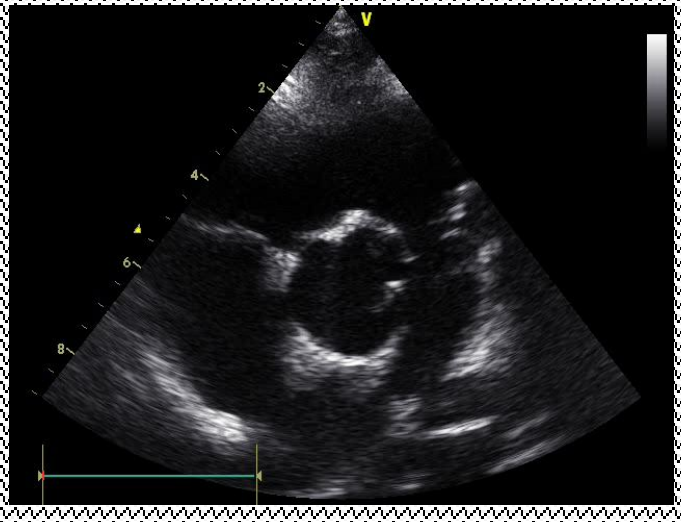
4 year old monocusp

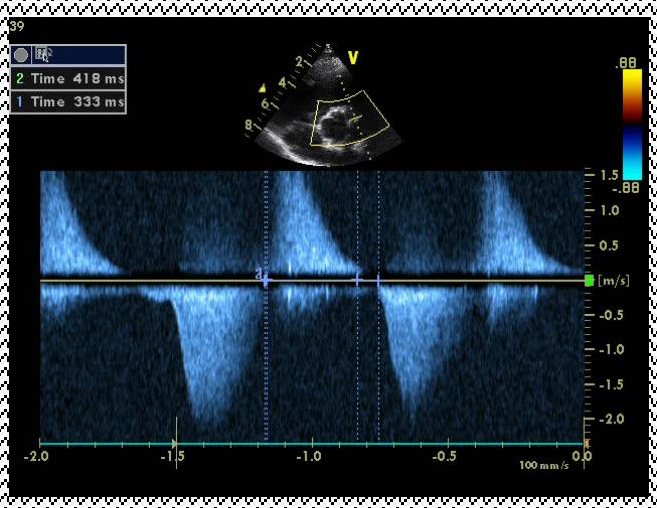


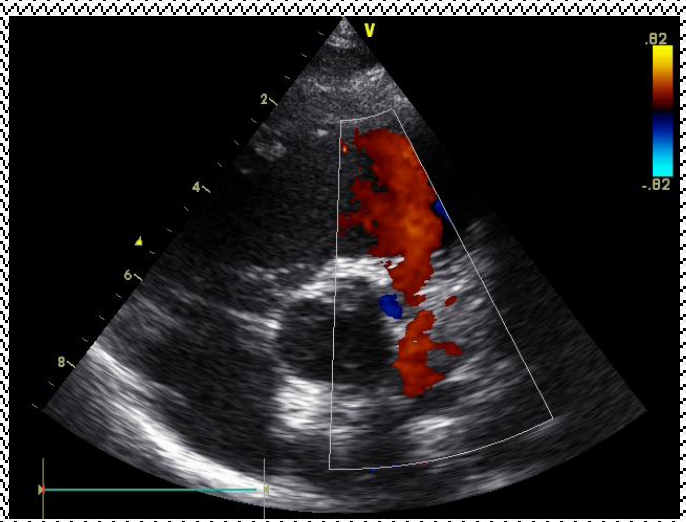


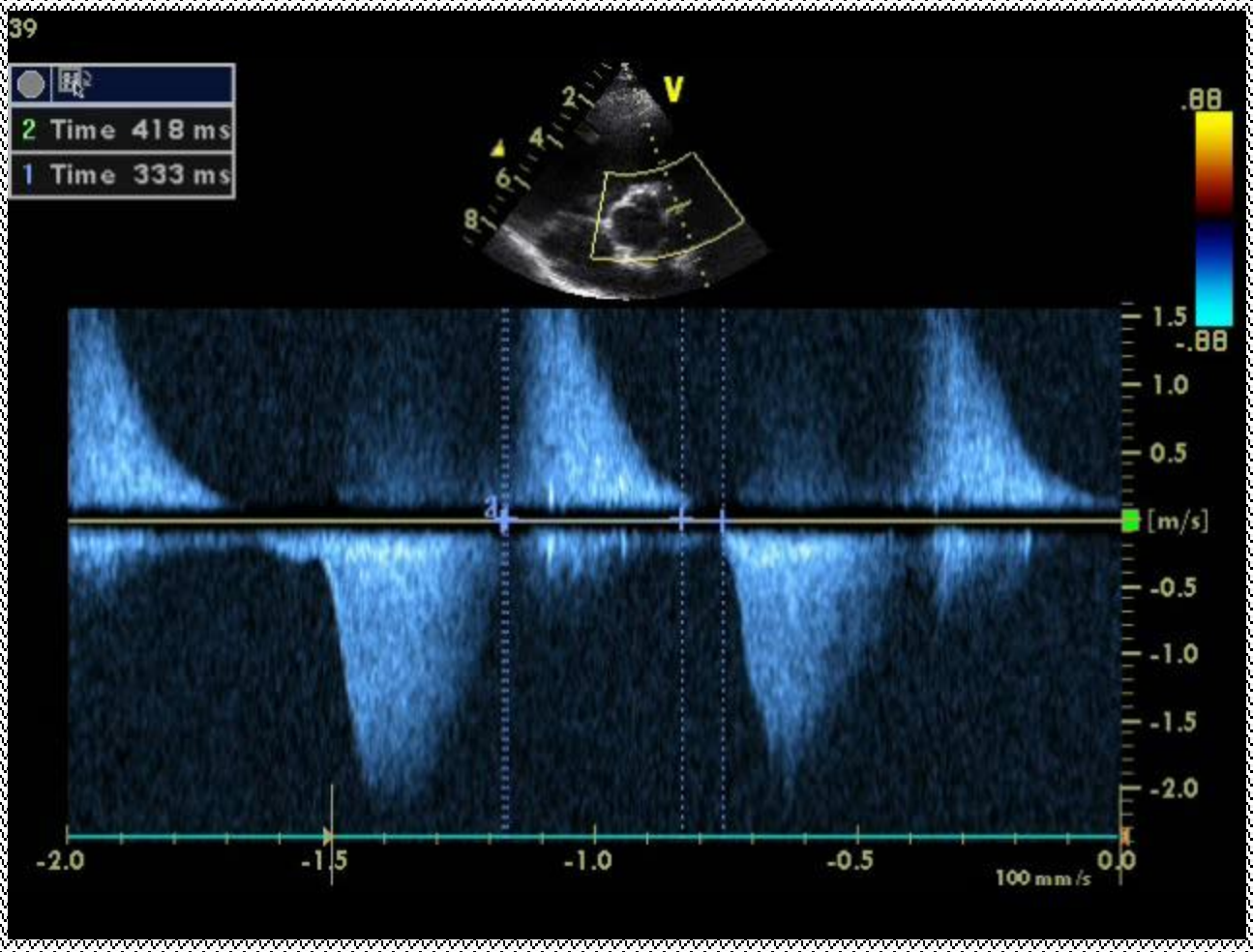


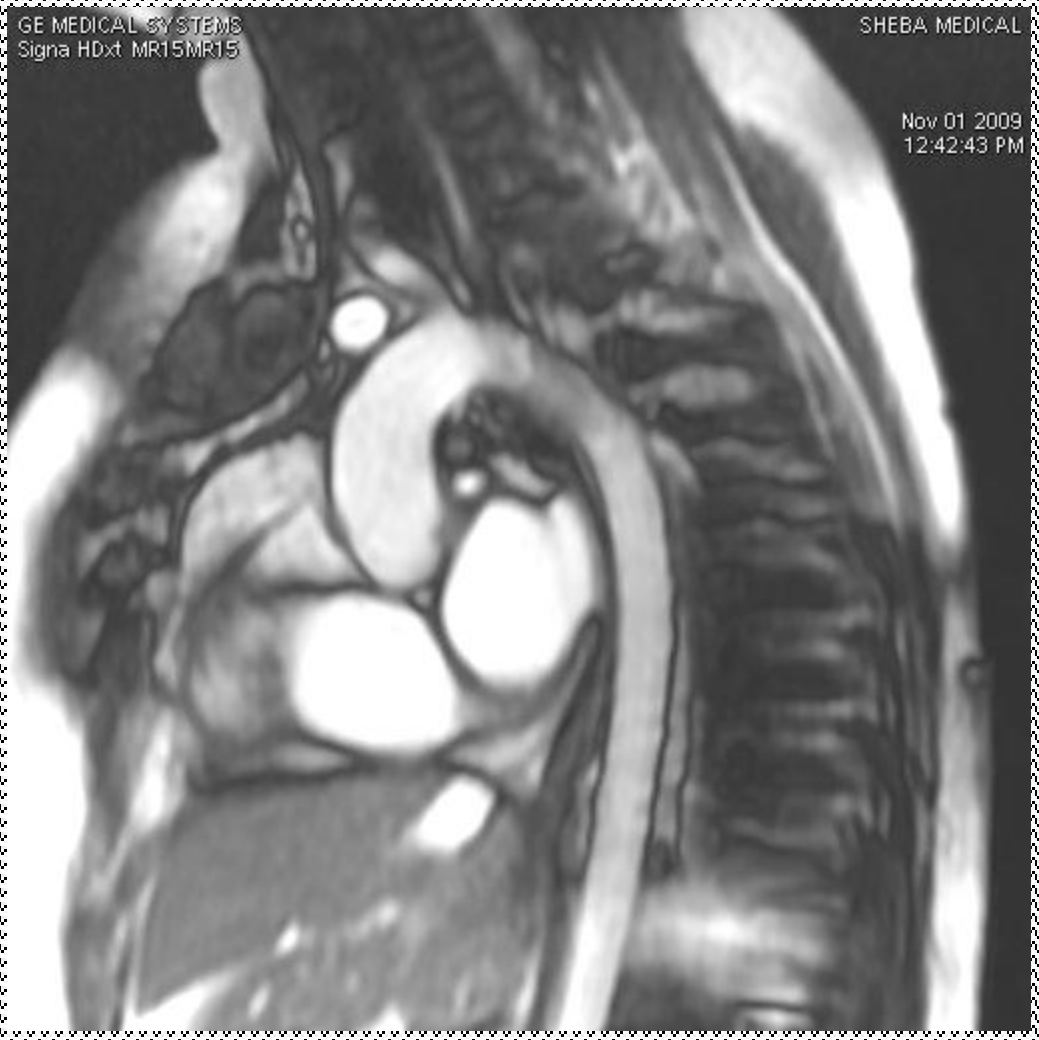

1 L 1.6 cm




2 Time 418 ms
1 Time 333 ms
[m/s]
100 mm/s




39
2 Time 418 ms
1 Time 333 ms
V
.88
-.88
1.5
1.0
0.5
[m/s]
-0.5
-1.0
-1.5
-2.0
-2.0
-1.5
-1.0
-0.5
0.0
100 mm/s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PTFE-Monocusp

Right ventricular outflow tract reconstruction with a polytetrafluoroethylene monocusp valve: A twelve-year experience

John W. Brown, MD, Mark Ruzmetov, MD, PhD,

Palaniswamy Vijay, PhD, MPH, Mark D. Rodefeld, MD, and

Mark W. Turrentine, MD

The Journal of Thoracic and Cardiovascular Surgery ● May 2007

Indianapolis Indiana

PTFE-Monocusp-Turrentine

192 pt 1994-2006

Age 3.3 ±5.0 years (6d-35y)

Follow 4.9 ±3.1 years (6m-12y)

4 early , 5 late death – 5%

Outflow gradient 71 ⇒ 23

Freedom from pulmonary insufficiency>moderate

86% (1y) , 68% (5y) , 48% (10y)

35 reoperations in 25 pt 4.2 ± 3.1 y

freedom from reoperation 96%, 89%, 82%

Reoperation rate was higher in group 2 (redu of RVOT)

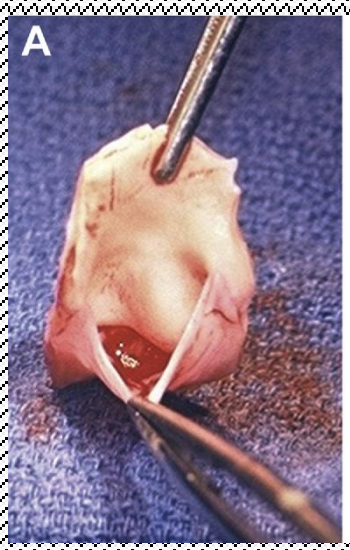
Homograft monocusp

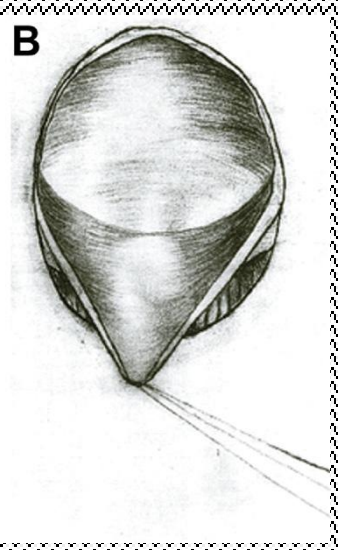
Pulmonary homograft monocusp reconstruction of the right ventricular outflow tract: outcomes to the intermediate term.

Nath DS, Nussbaum DP, Yurko C, Ragab OM, Shin AJ, Kumar SR, Starnes VA, Wells WJ.
Ann Thorac Surg. 2010 Jul;90(1):42-9. Los Angeles

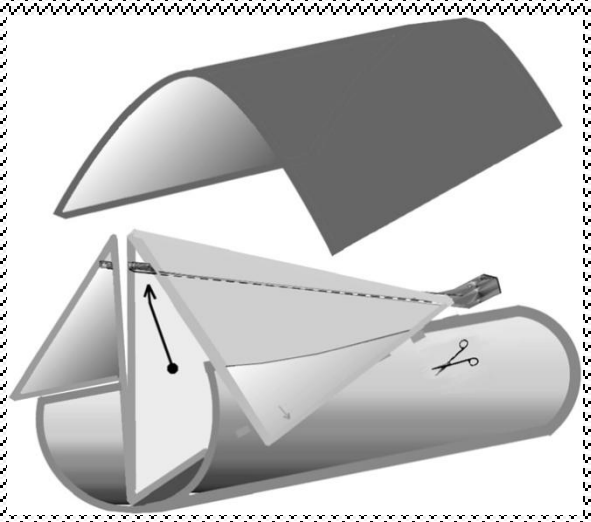
- 1996-2007 131 pt. 108 TOF
- Age 7.6 m. (1d-14y)
- Hospital mortality 2%
- At discharge
  - RVOT gradient 16 mmHg (4-64)
  - Pulmonary regurgitation : Mod 16% severe 2%
- Late FU 91% 5y (1-12y)
  - 5 death survival 96±3.7% (1y) 94±4.6%(5y) 89 ±9.2%(10y)

Different cusps





homograft monocusp



Bi-leaflet PTFE

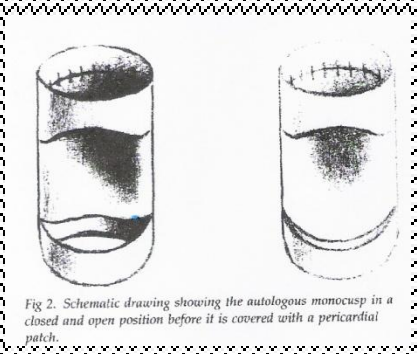


Fig 2. Schematic drawing showing the autologous monocusp in a closed and open position before it is covered with a pericardial patch.

Autologus monocusp

Late follow up

LATE PR>MOD	PR AT DISCHARGE> MOD	Re-OP	death	Hosp death	age	pt		
37%	3%	-	-2.6	2.6%	20.5 m	75	PTFE monocusp	Sasson WMC
48% (7%)		35/25 pt	2.5 %	2.5%	3.3±5 y	192	PTFE monocusp	Turrentine Brown
73%	18%	24	4%	2%	7.6m	131	Homograft Mono	Nath LA
81%		4	5% ?	5%	0.88± 1.4y	22	Pericard mono	Nunn Australia
7.4%					0.94 ±1.1Y	25	Bi-leaflet PTFE	

Pulmonary regurgitation diagnosis

- ECHO DOPPLER
- 1984 Video densitometry
- 1988 cathlab –pressure volume loops and angiography or conductance catheter
- MRI
- 3D echo