

ASD with Pulmonary Hypertension Debate

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32 Year-old Male

Large (=28 mm) central secundum ASD with severe PH

**Aorta 120/70(90) mmHg, MPA 95/50(70) mmHg,
Rp= 8.2 WU/m², Rp/Rs=0.33, normal sinus rhythm**

1	PAP with O ₂	PAP Test occ.	Qp/Qs	Rp basal	Rp with O ₂	Rp Test occ	Rp/Rs
28)	88/20 (38)	NA	1.1	12.2	2.6	NA	0.76
26 3)	88/26 (48)	81/30 (47)	2.0	12.9	8.7	16	0.29
26)	75/25 (43)	81/27 (46)					
36)	69/33 (48)	67/34 (47)					
26)	73/24 (44)	59/23 (36)					
29)	81/28 (48)	61/23 (39)					

- Usually much higher PVR in patients with large ASD and PAP of 95/50 mmHg & normal BP
- Need for comprehensive evaluation
 - No data for CXR, PaO₂ or SpO₂ at rest or during exercise, Qp/Qs, vasodilator test or test occlusion

Early symptomatic improvement does not guarantee long term outcome. (O'Donnell C, 2010)

Risk of late rise of PAP or high PVR after ASD closure

Long-term prognosis, not just immediate improvement

Closure guidelines ?

- Old study, incomplete or inadequate preoperative evaluation data
- Kirklin and Barratt-Boyes (Textbook, 1993) noted **PVR > 6 U*M2 as major risk factor** for surgical closure and **>12 U*M2 predicted pulmonary vascular disease to be 'irreversible'**.
- **"Modest elevation of PVR" and the presence of L-to-R shunt (Qp:Qs > 1.5:1) are reassuring.** (O'Donnell C,2010)

**New guidelines in the era of advanced PH therapy;
not yet**

**Only a few reports of successful closure of ASD,
surgically or non-surgically, in patients with PH, but
no long term data**

Risk versus benefits

“Treatment & repair”

Surgical or trans-catheter closure of ASD without fenestration

Surgical or trans-catheter closure of ASD with fenestration

**relatively safe; at least no
bid aggravation**

**pect remodelling of
lmonary vasculature &
crease of PVR**

Only a few anecdotal reports

Cons

- **If the patient is in opera
condition**
 - **May delay repair**
 - **May increase L-R shunt &
aggravate PH**

ASD (pre-TV) with PH vs VSD/PDA with PH

- **Less risk of defect closure, esp. with fenestration**

Those who underwent surgical correction and had a preoperative PVR between 9 and 14 Wood units/M² showed no signs of disease progression and those between 7 and 9 Wood units/M² improved. (Steele et al. 1987)

is invasive
Rapid recovery
is atrial arrhythmia
is expensive
shorter hospital stay

Cons

- Unable to correct associated problems such as significant TR
- Difficult to adjust fenestration size
- Uncertain for long-term patency or keeping the initial size
 - Only a few case reports about long-term patency
 - Balloon-dilated fenestrations in the Amp device tend to close spontaneously during follow-up (Kretschmar O, 2010)
- Unknown risk for thrombo-embolism
 - Patch with punch hole vs device with fenestration

**repair associated
blems
adjust fenestration
ter patency of the
estration?**

Cons

- **Surgical risk**
- **Higher risk of atrial arrhythm**
- **More expensive**
- **Longer hospital stay**

SMC experience

July 2004 ~ June 2009

M : F = 5 : 13 (total 18 patients)

Age : median 31.3 yrs (3.5 Mo ~ 57.6 yrs)

Hemodynamic data (baseline)

- **Systolic PAP : 82 (58~119) mmHg**
- **P(PA/Ao) : 0.70 (0.52 ~ 1.02)**
- **Qp/Qs : 2.1 (1.1 ~ 2.7)**
- **Rp : 9.5 (3.9 ~ 16.7) Wood unit / M²**

Op criteria

- **PAP decrease \geq 20% or
PAP decrease \geq 10% & Qp/Qs \geq 1.5**

SMC experience

Operation

ASD size : 25 (14~35) mm

Fenestration size : 6 (4~8) mm

Concomitant procedures		No. of pts (21/18)
TR repair	Ring annuloplasty	10
	DeVega or Kay	4
Maze op.		2
PDA ligation		1
MR repair		1
RPA angioplasty		1
PV commissuroplasty		1
MPA translocation		1

SMC experience

No early or late deaths

No immediately problems

Complications during FU in 2 patients

- **Constrictive pericarditis**
- **Pericardial effusion**

No significant arrhythmia

Follow up duration

- 32.5 (9.0 ~ 59.7) Mo

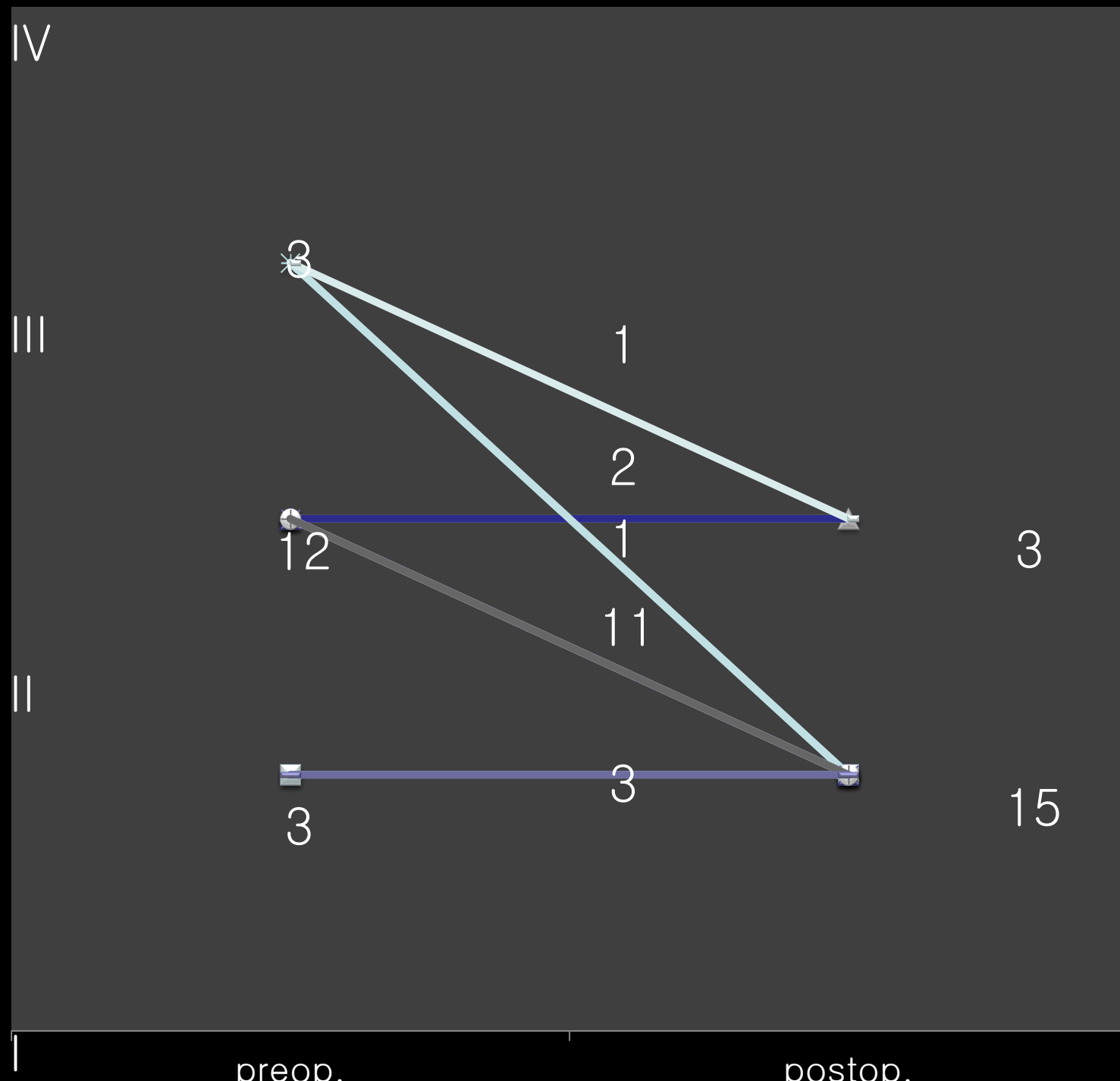
Status of the fenestration on echocardiogram

➤ Before discharge

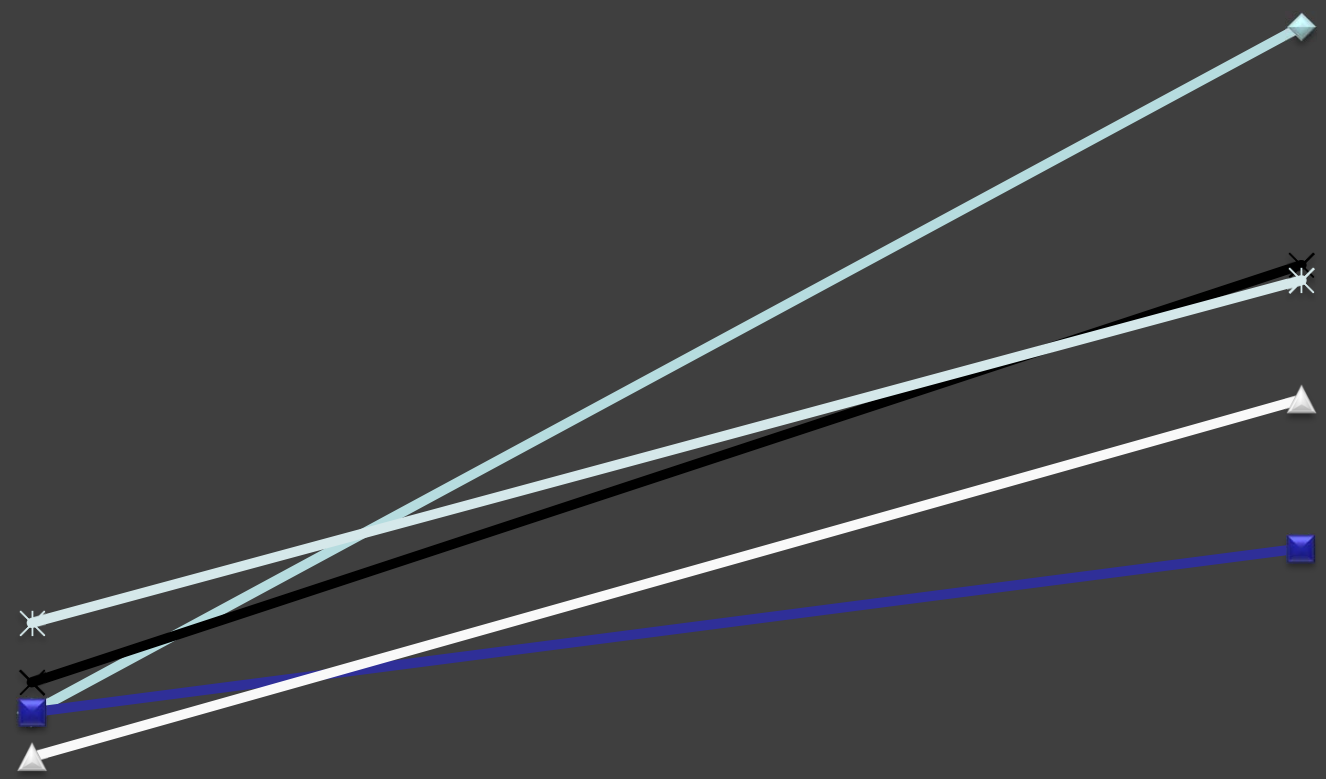
- ✓ L-R 15
- ✓ R-L 1
- ✓ Bidirectional 1
- ✓ Invisible 1

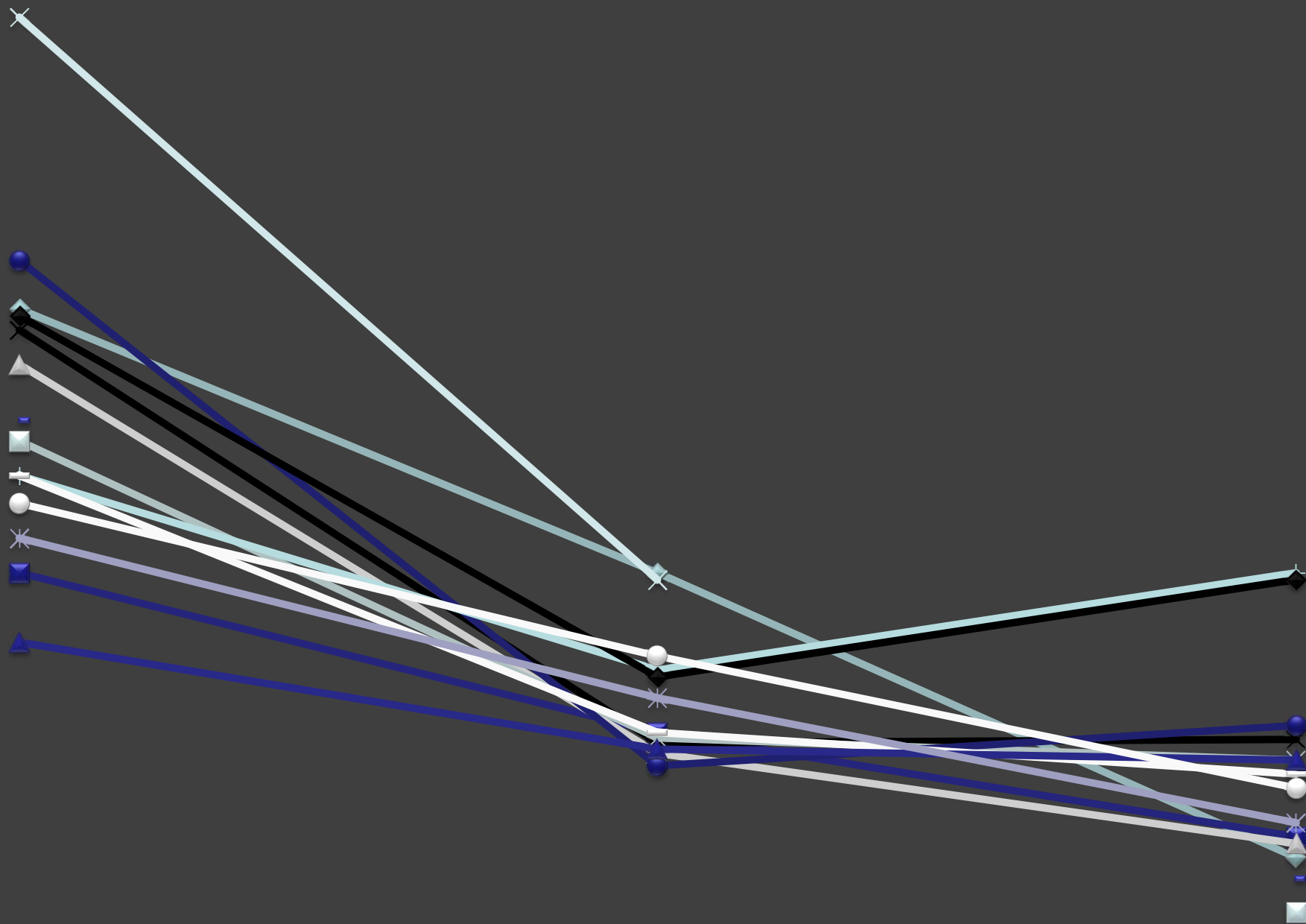
➤ Last F/U: patent in all

- ✓ L-R 17
- ✓ Closed during pericardiectomy 1

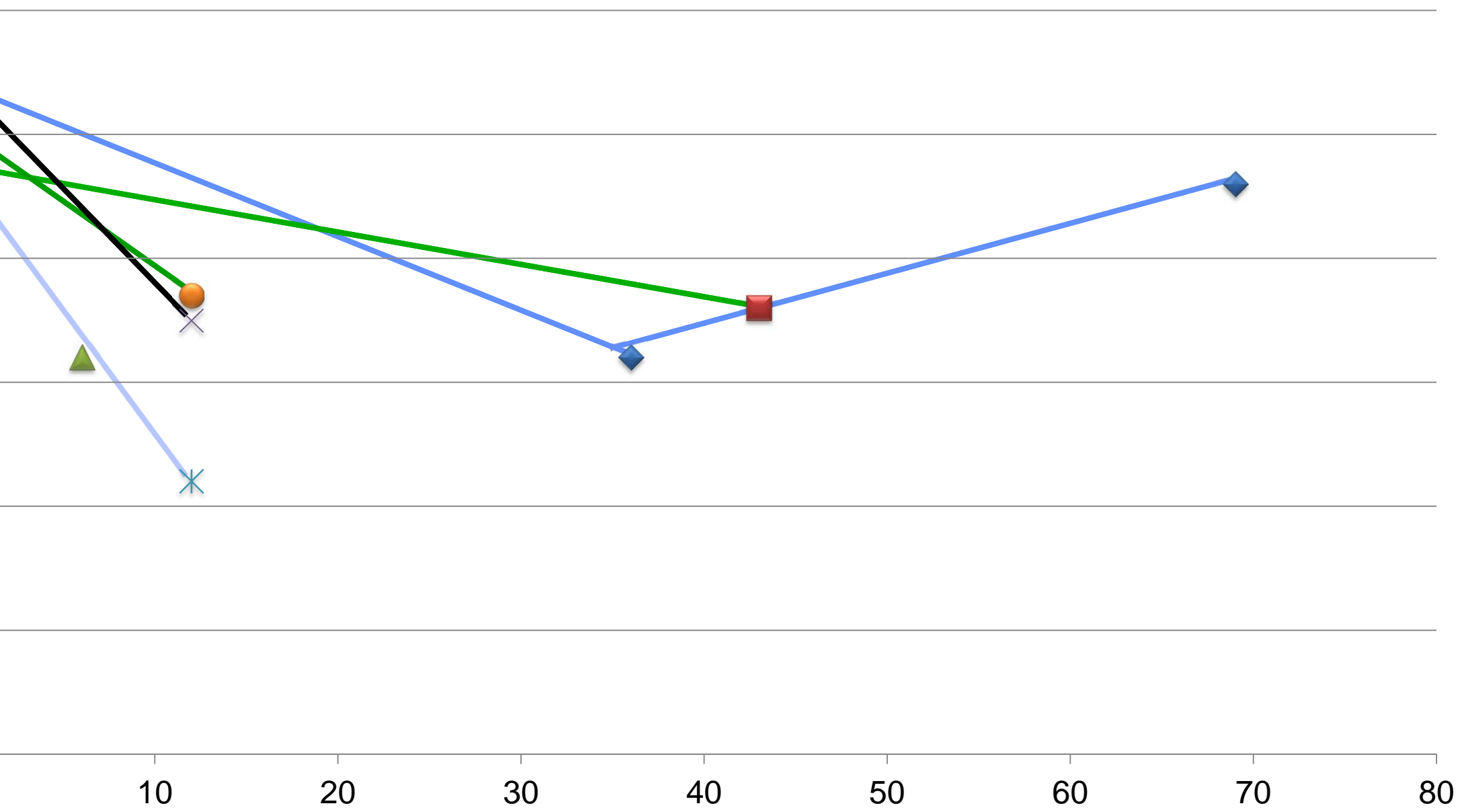


- ### NYHA FC
- III → IV
 - III → III
 - III → II
 - II → II
 - I → I

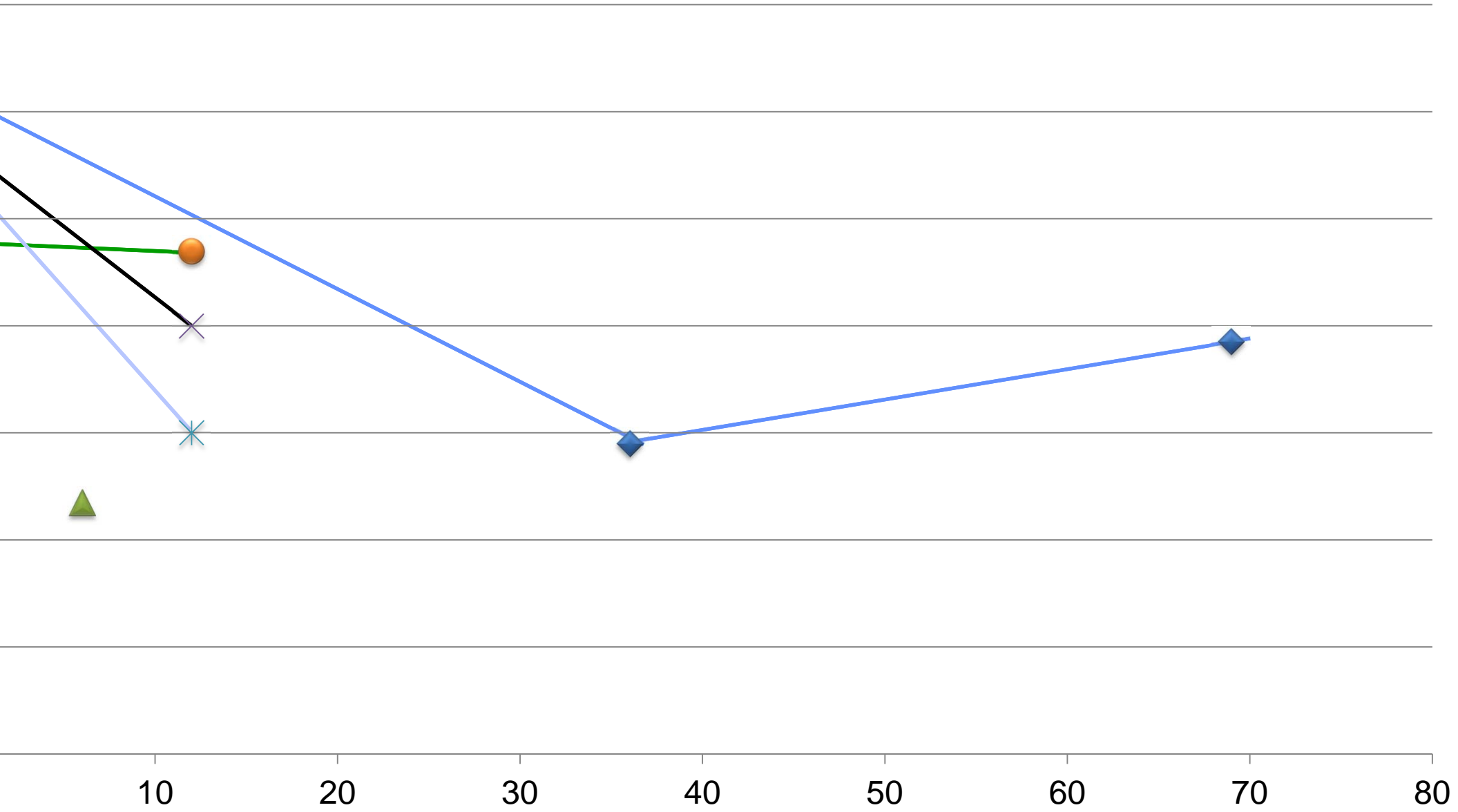




MAP (mmHg)



$\rho u^2 / M^2$



Surgical closure of ASD with fenestration in patients with ASD accompanied by borderline PH

- **Very low surgical risk even with concomitant procedures**
 - **Functional improvement in most cases**
 - **Decrease of PAP & PVR in most cases**
 - **Long-term patency of fenestration in all**
 - **No thrombo-embolic events during FU**
 - **No significant atrial arrhythmia**
- ⇒ if carefully selected**

Long-term FU is essential.

Surgical closure of ASD with fenestration for carefully selected cases

Transcatheter closure of ASD with fenestration

- **for carefully selected cases without any associated problems**
- **need FU for long-term patency and size change of the fenestration**

Treatment & repair for really irreversible cases

If carefully selected"

ASD closure with fenestration if

- **Not too high PVR < 15 (?) WU and**
- **1) or 2)**

1) Positive response to pulmonary vasodilator or test occlusion

- ✓ **PAP decrease $\geq 20\%$ or**
PAP decrease $\geq 10\%$ & $Q_p/Q_s \geq 1.5$

2) Baseline $Q_p/Q_s \geq 2.0$ without systemic desaturation

If not: "treat and follow the patients"

After Long-Term Sildenafil Therapy (III)

(Kim YH, et al. 2010)

1. Hemodynamic Data

Parameter	Initial Study		2 Years of Sildenafil Therapy		
	Baseline	O ₂ (10 L/min)	Baseline	O ₂ (10 L/min)	Balloon Occlusion
SBP (mm Hg)	1	2	10	8	8
DBP (mm Hg)	1	2	10	8	
MAP (mm Hg)	87/20, 55	85/20, 55	128/32, 75	110/34, 65	99/26, 56
SBP (mm Hg)	140/80, 100	140/83, 105	137/71, 98	131/75, 95	133/68, 95
HR (%)	69	74	76	68	79
HR (%)	75	80	86	89	
HR (%)	89	92	94	99	99
CI (L/min/m ²)	2.16	2.24	5.15	4.7	
CI (L/min/m ²)	2.49	2.72	2.98	1.75	2.83
CI ratio	0.87	0.82	1.73	2.68	
WU · m ²)	25.0	23.7	12.63	12.1	
WU · m ²)	39.8	37.8	29.53	49.7	30.73
VRI	0.63	0.63	0.43	0.24	