Aortic Balloon Valvuloplasty in the Course of Time

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How it All Began

ELSEVIER

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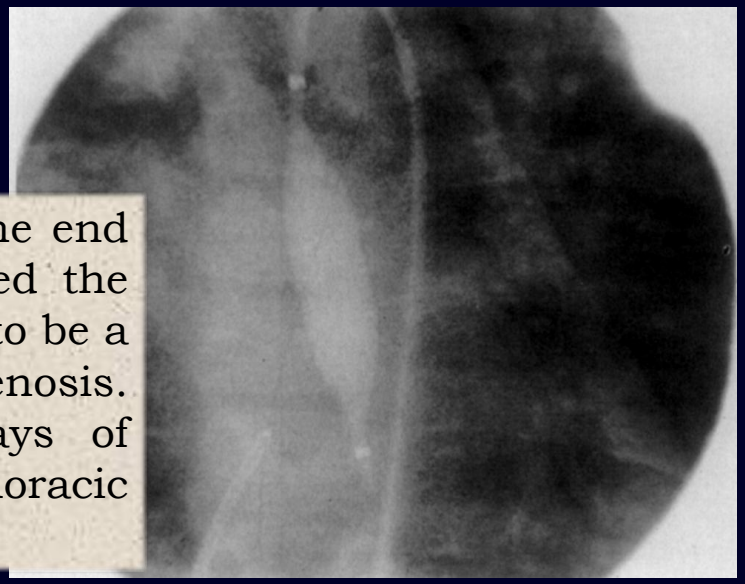
Brief communication

Aortic balloon valv

Zuhdi Lababidi M.D.

… No aortic insufficiency was demonstrated at the end of the procedure, and the patient was discharged the next morning. Balloon aortic valvuloplasty seems to be a good alternative treatment for congenital aortic stenosis. It is less risky, cheaper, requires only 2 days of hospitalization, and does not result in intrathoracic adhesions or cutaneous scars…



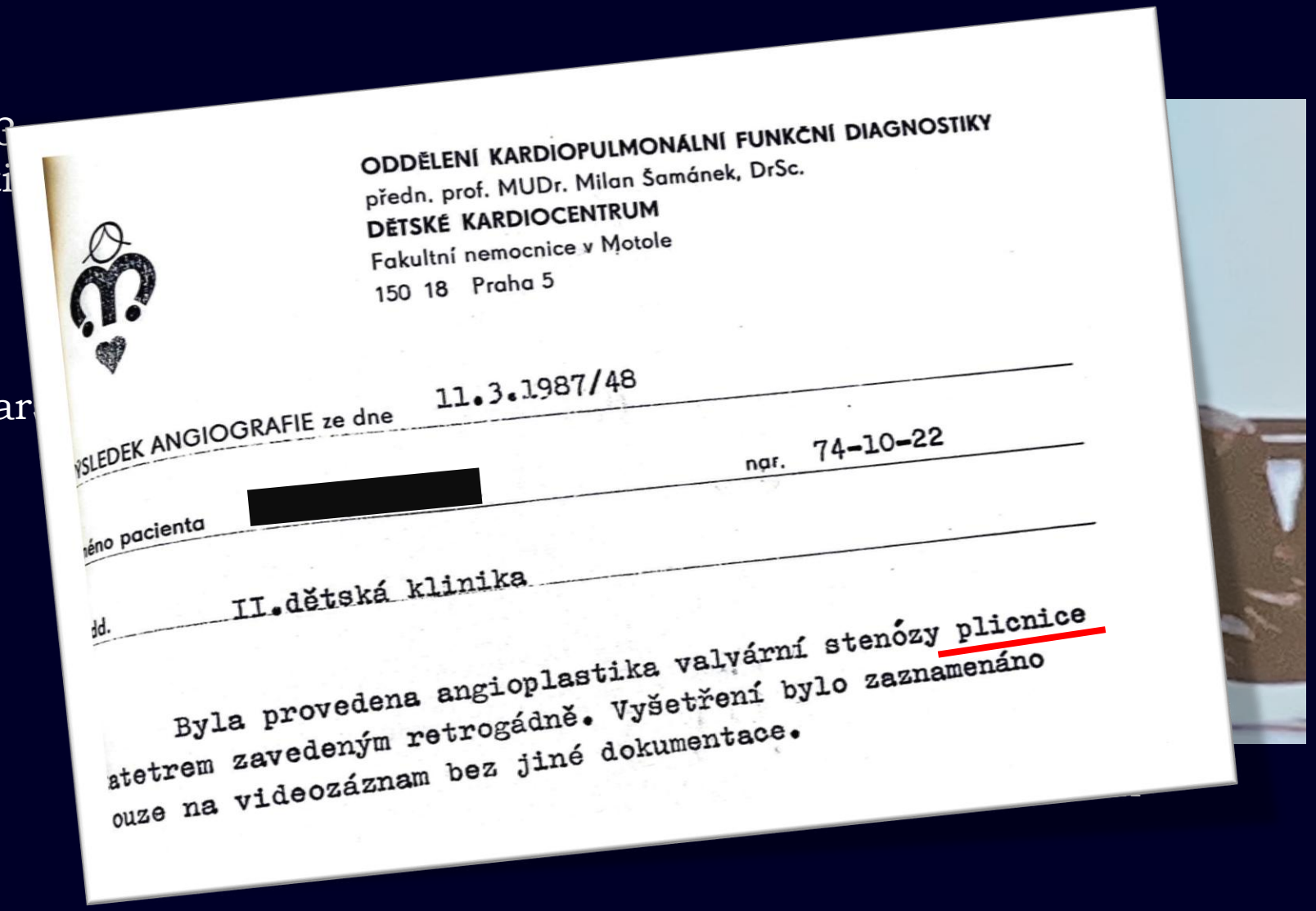
…On November 8, 1982, an 8-year-old boy, who was diagnosed clinically and echocardiographically as having severe valvular aortic stenosis, underwent cardiac catheterization which demonstrated a left ventricular pressure of 200/8 mm Hg and an aortic pressure of 115/84 mm Hg…

…The dilatation catheter was connected outside the body to another No. 9 French multipurpose catheter which had been previously placed percutaneously into the inferior vena cava, thus creating an arteriovenous communication. When the balloon was inflated and totally obstructed the aortic valve (Fig. l), the left ventricle pumped through the balloon catheter lumen to the venous catheter…

How it All Began in Prague

11.3.1987, 13
boy with aorti
stenosis…

…and few year



ODDĚLENÍ KARDIOPULMONÁLNÍ FUNKČNÍ DIAGNOSTIKY
předn. prof. MUDr. Milan Šamánek, DrSc.
DĚTSKÉ KARDIOCENTRUM
Fakultní nemocnice v Motole
150 18 Praha 5

ÝSLEDEK ANGIOGRAFIE ze dne 11.3.1987/48

[redacted] nar. 74-10-22

dd. II.dětská klinika

Byla provedena angioplastika valvární stenózy plicnice
atetrem zavedeným retrogádně. Vyšetření bylo zaznamenáno
ouze na videozáznam bez jiné dokumentace.

Methods

- Long-term results of BVPL used exclusively for initial management of congenital aortic stenosis in children (1987 – 2011)
- Single nation-wide paediatric centre
- Retrospective follow-up study
- Institutional clinical database
- Cross-mapping with the national registries by the end of 2020
- Primary end-point: death
- Secondary end-points: any valve reintervention, balloon re-valvuloplasty, any aortic valve surgery, aortic valve replacement

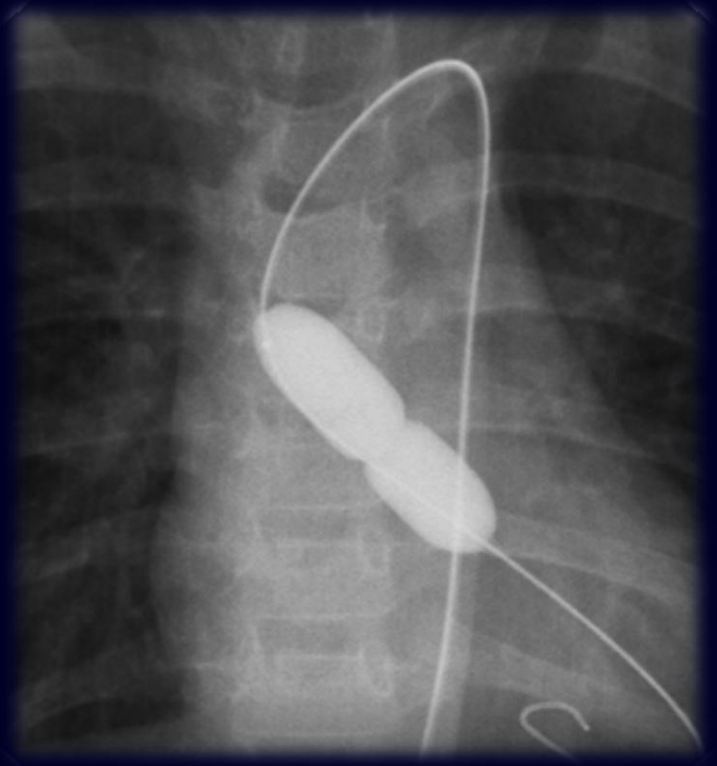
Methods

Indication for treatment

- Doppler gradient ≥70/40 mmHg – 355 patients (86.8%)
- Severe LV dysfunction – 43 patients (10.5%)
- PDA-dependent circulation – 11 (2.7%)

In older patients

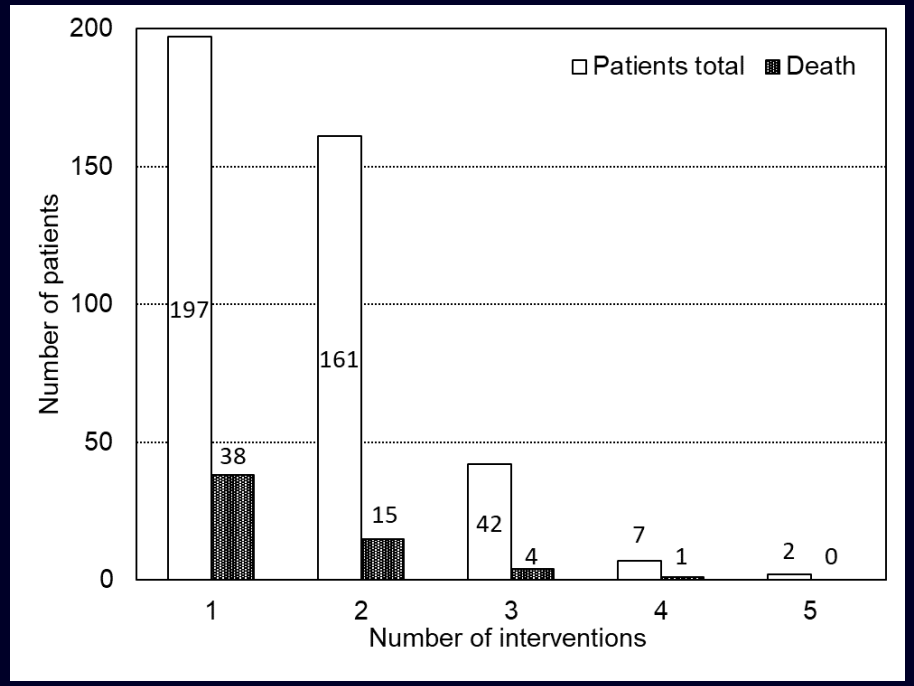
- 1999 adenosine-induced ventricular asystole
- 2004 rapid ventricular pacing

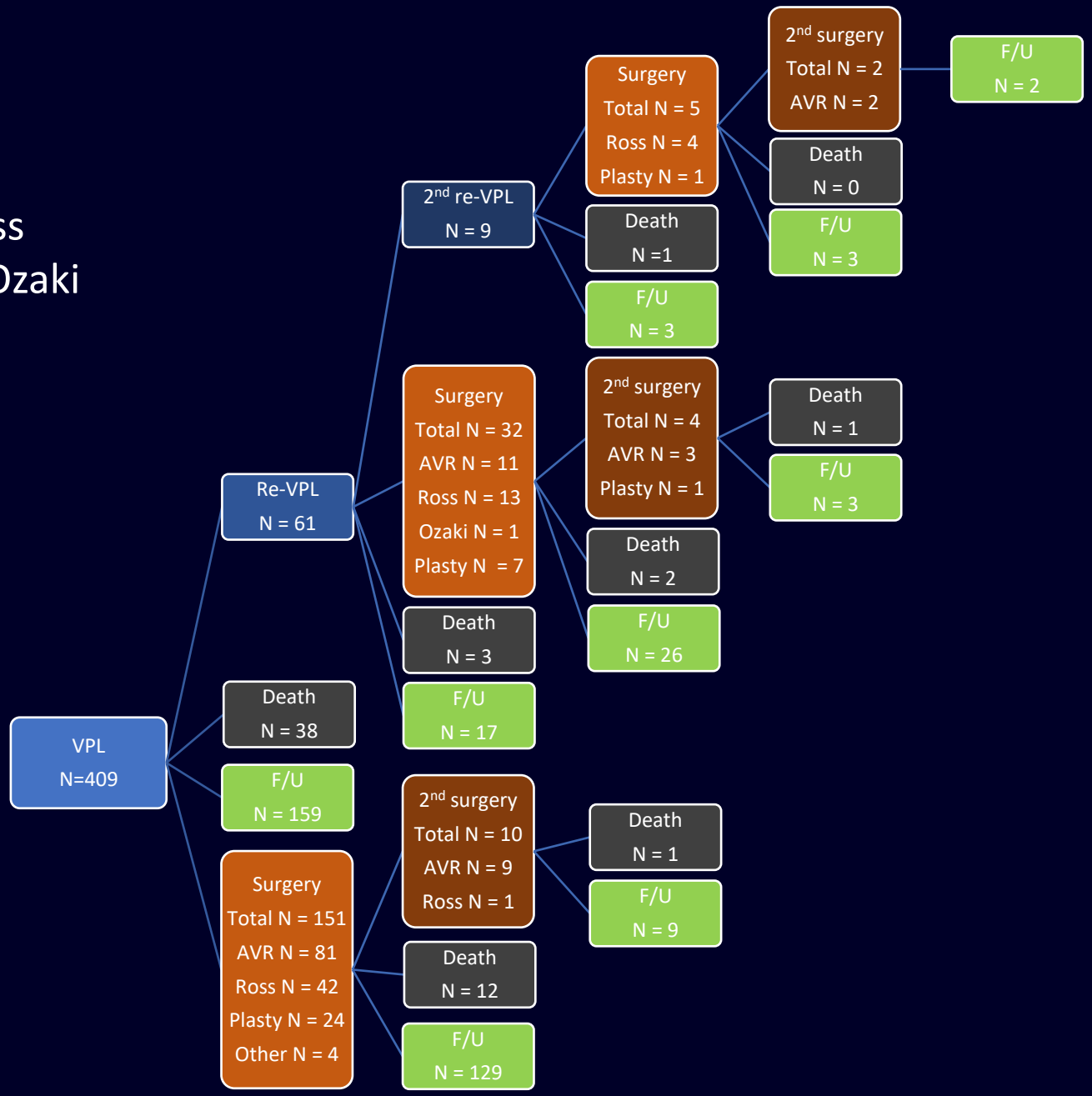


	Age at BVPL		Survival F/U			Hemodynamic F/U		
	median	IQR	N	median	IQR	N	median	IQR
Newborns	2 d.	1 – 4.25 d.	134	14.5 y.	9.6 – 21.8 y.	118	8.5 y.	2.1 – 13.6 y.
Older patients	4.3 y.	0.3 – 13.0 y.	275	19.4 y.	13.8 – 26.8 y.	260	8.5 y.	4.1 – 13.5 y.
Total	**117 d.**	**5 d. – 9.2 y.**	**409**	**18.5 y.**	**12.2 – 25.1 y.**	**378**	**8.5 y.**	**3.9 – 13.5 y.**

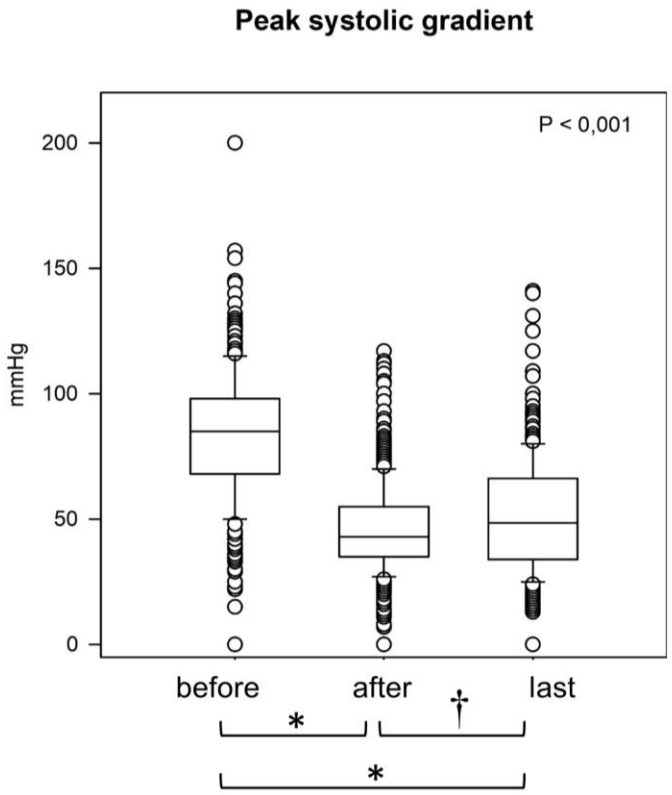
	Newborns (N=134)		Older patients (N=275)		P
Aortic annulus z-score	-1.5	(-1.9 to -1.1)	-1.3	(-1.8 to -0.6)	**<0.001**
Endocardial fibroelastosis	44	32.8 %	24	8.7 %	**<0.001**
Mitral stenosis	17	12.7 %	19	6.9 %	0.079

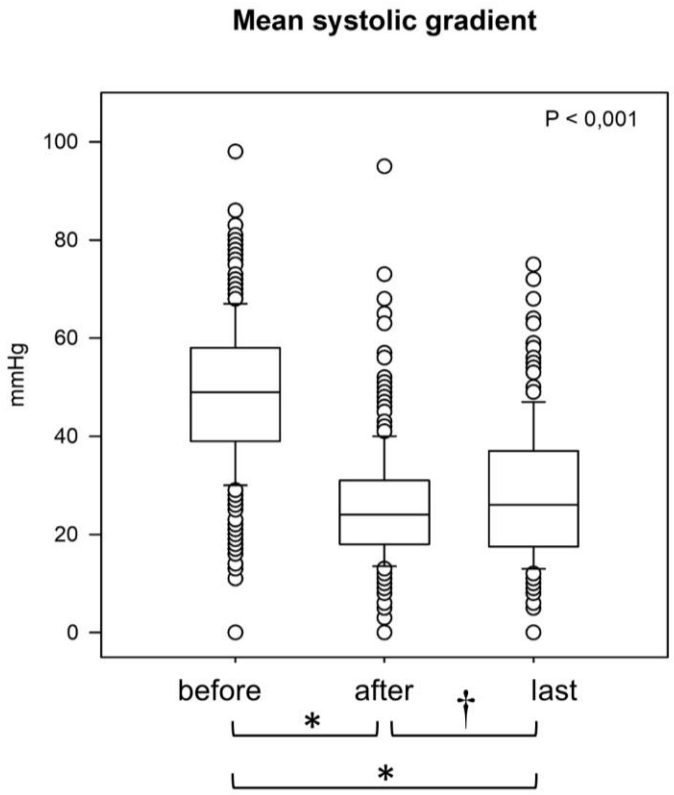
- Early death in 16 newborns and 5 older patients
- 37 patients died >30 days after BVPL
- 70 balloon re-BVPL
- 204 surgical procedures after primary BVPL
  - (106 mechanical valve replacements, 60 Ross operations, 33 plasties or valvulotomies, 1 Ozaki operation, and 4 other operations)

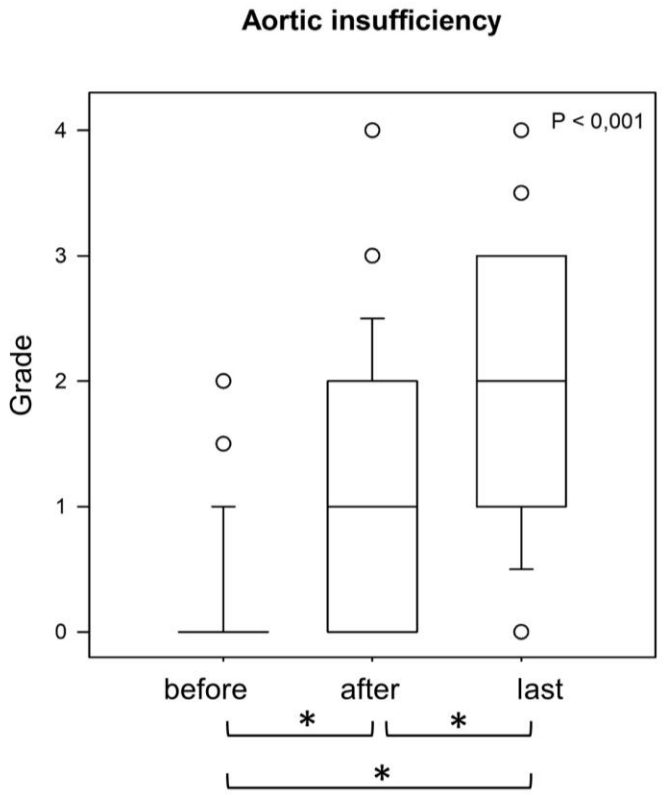




Results



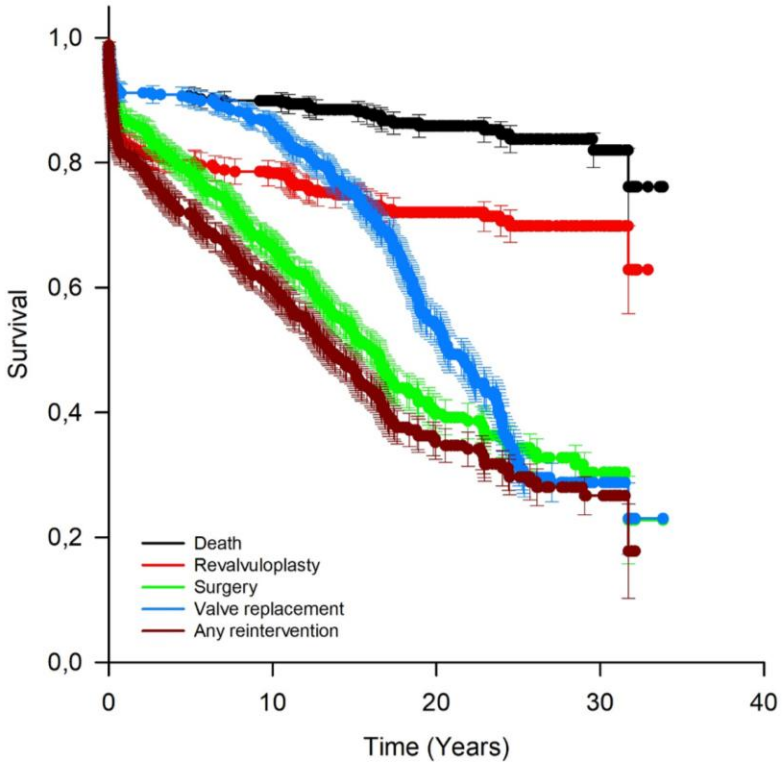


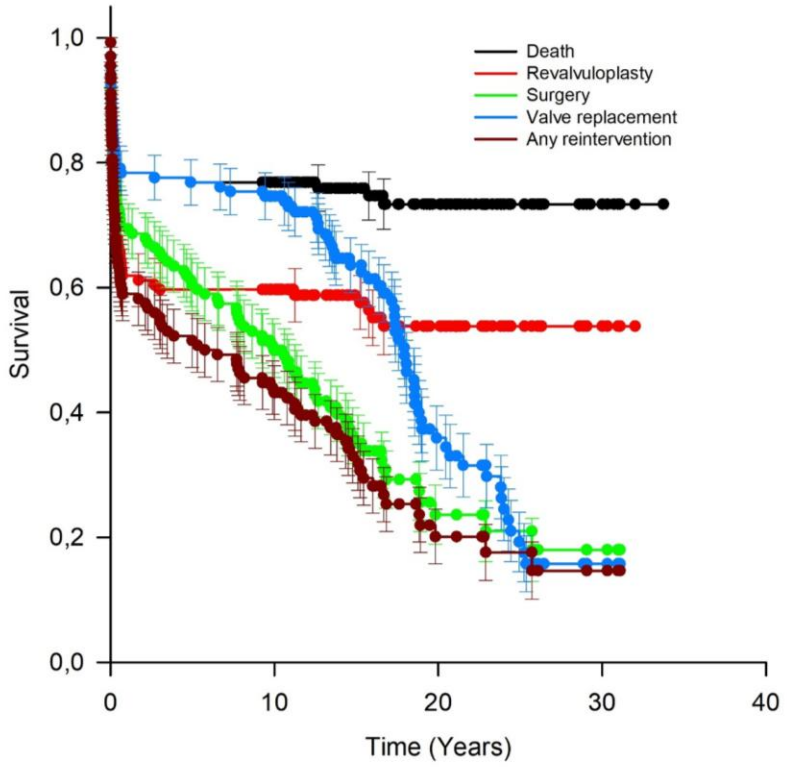


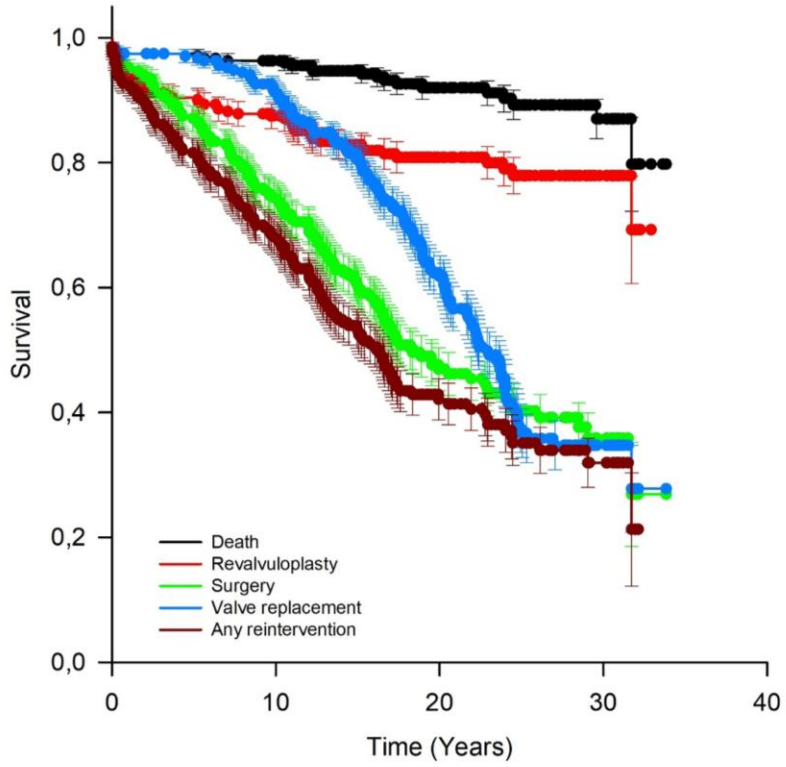
* p<0.001, † p<0.05

Short-term hemodynamic effect (≤30 days):

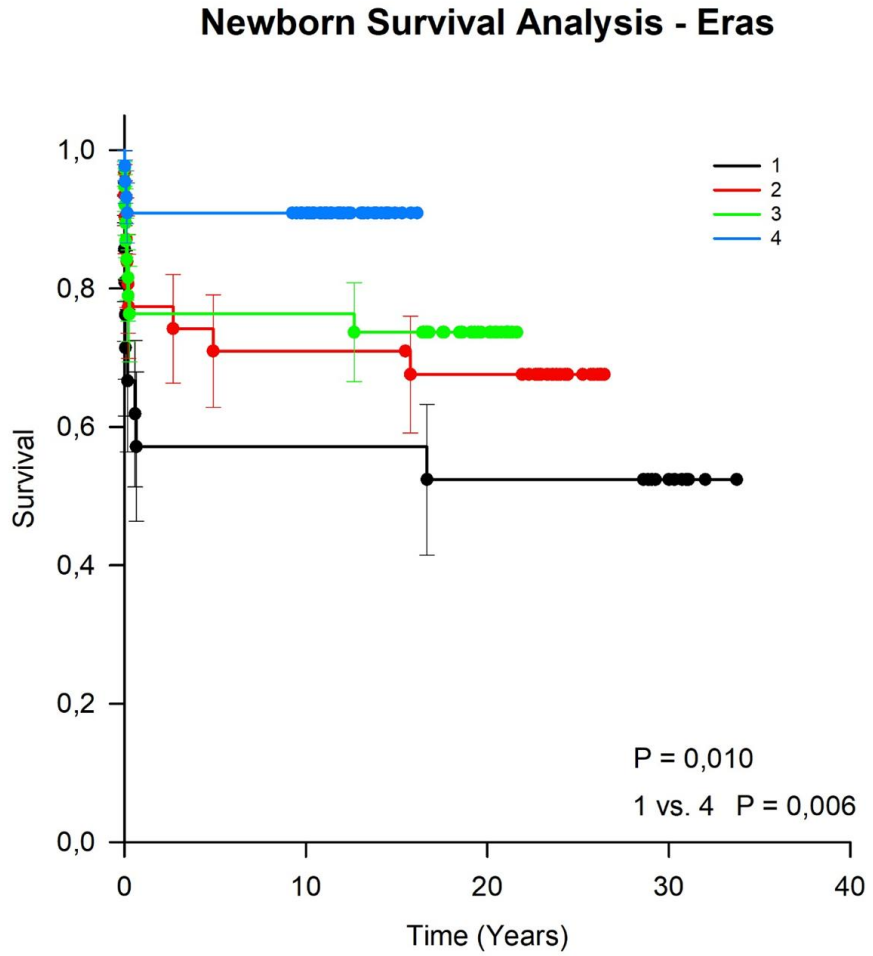
- Higher aortic annulus z-score predicted severe aortic regurgitation (p=0.014)
- Lower aortic annulus z-score predicted insufficient gradient reduction (p=0.029)
- Balloon-to-annulus diameter ratio did not predict aortic regurgitation nor residual stenosis
- Grade of initial aortic regurgitation did not have any influence on the balloon-to-annulus diameter
- Balloon-to-annulus diameter ratio median (IQR) ratio in the 1st to 4th era: 1.00 (0.93-1.04), 0.97 (0.94-1.00), 0.93 (0.87-1.00), and 0.95 (0.91-0.99)

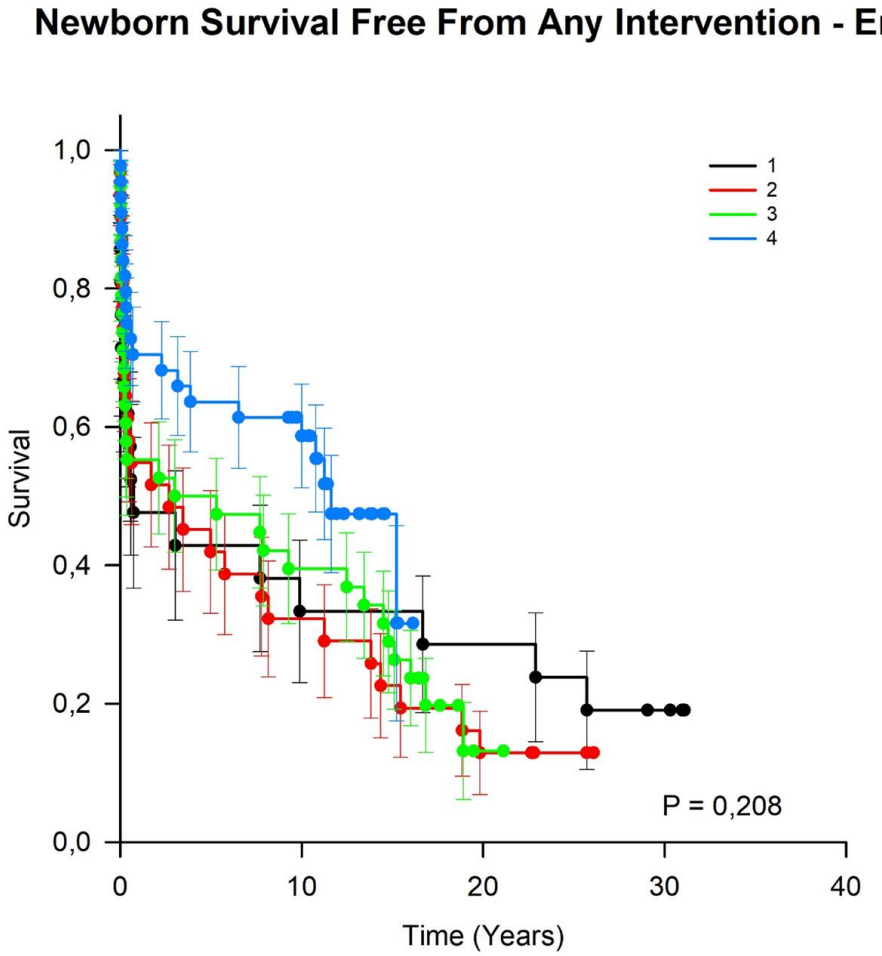






Death | Re-valvuloplasty | Aortic valve surgery | Aortic valve replacemenet | Any re-intervention

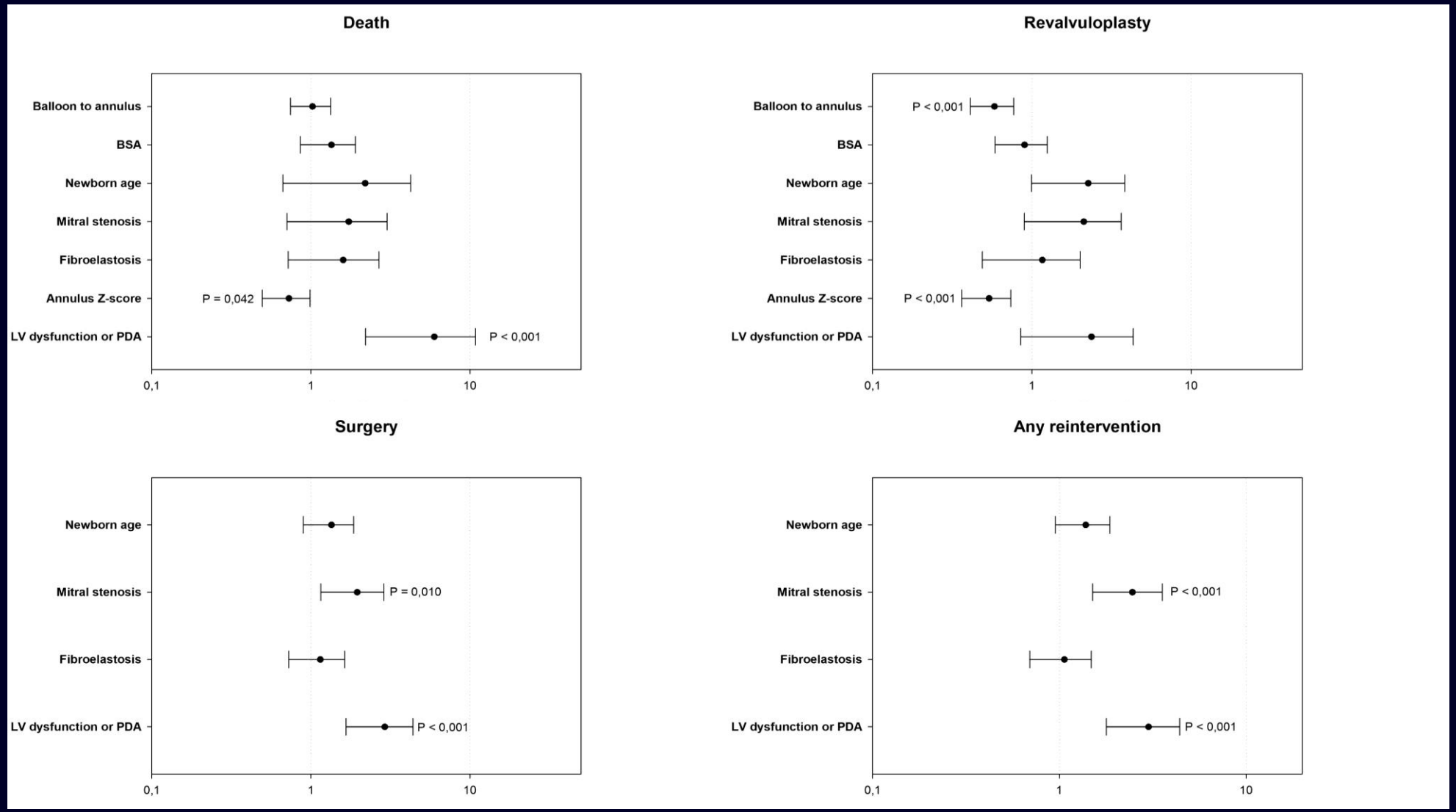




1987-1992 1992-1999 1999-2004 2004-2011

No difference in older patients

Multivariable Analysis of Outcome Risk Factors



Conclusions

- Percutaneous BVPL provides good palliation for patients with congenital AS
- Survival at 10, 20, and 30 years after the first BVPL is 89.9, 85.9, and 82.0 %
- Worse results in patients with hypoplastic annuli and LV and/or MV comorbidity
- Newborns have lower probability of survival than older patients
- Survival improved over the studied period in newborns (90 % at 10-15 years after the procedure in last era)
- Reintervention-free course did not improve over the time
- No differences in the incidence of procedure-related aortic insufficiency in relation to balloon-to-annulus ratio (this ratio did not exceed a median of 1.0)
- Larger aortic annulus is a risk factor for aortic regurgitation
- A lower balloon-to-annulus ratio is predictive of re-valvuloplasty

2011 – Change of Strategy (Oleg Reich's Data)

- 50 vs. 50 matched newborns (200
- 50 BVPL vs. 30 BVPL + 20 primary

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	BVPL (N=30)		Surgery (N=20)		
	N	%	N	%	P
LV failure	14	46,7	0	0,0	<0,001
MI 3-4	11	36,7	0	0,0	0,002
MS	1	3,3	0	0,0	1,000
FE	16	53,3	4	20,0	0,039
MI-MS-FE	17	56,7	4	20,0	<0,001

	BVPL (N=30)		Surgery (N=20)		
	mean/med	SD/IQR	mean/med	SD/IQR	P
BSA	0,205	0,188-0,216	0,202	0,190-0,214	0,664
AOan-Z	-1,471	0,561	-1,317	0,365	0,284
age days	2,500	1-6,25	9,000	7,0-16,0	<0,001