

PERCUTANEOUS APPROACH TO RESIDUAL PULMONARY BIFURCATION STENOSIS IN CONOTRUNCAL DISEASES

B. Castaldi , A. Di Candia, D. Sirico, E. Reffo, E. Cuppini, F. Prati, A. Guariento, M. Padalino, V. Vida, G. Di Salvo

Department for Women’s and Children's Health, University Hospital of Padova, Pediatric and Congenital Cardiology Unit, Padova, Italy

BACKGROUND:

The residual stenosis of the pulmonary arteries (PAs) after right outflow (RVOT) surgery represents an issue difficult to manage due to the peculiar anatomical, physio-pathological and surgical variability of the different cases. The therapeutic approach must be individualized.

AIM:

The aim of this study was to analyze retrospectively the outcome of the percutaneous transcatheter treatment in pediatric patients with post-surgical stenosis of pulmonary artery bifurcation.

RESULTS:

We enrolled 39 patients with a median age of 6.0 years. Standard high-pressure balloon dilation was attempted in 26 patients, effective in five of them. Pulmonary branch stenting was performed in 10 patients, effective in six. A kissing balloon approach was chosen in 17 patients (6 after angioplasty or stenting failure), this technique was effective in 16 cases. Finally, a bifurcation stenting was performed in 10 patients (second step in 9 cases), effective in all the cases. None of the patients approached by kissing balloon needed a bifurcation stenting.

Group	n. pts treated (EP)	RVOT pressure gradient		P value	RV/LV pressure ratio		P value
		pre	post		pre	post	
SB	33	44.4±15	29±14.7	0.002	0.77±0.26	0.53±0.18	0.001
	(5)	38.6±3.0	12.7±9.5	0.013*	0.7 ±0.17	0.4±0.12	0.014
SS	10	46.0±12.3	23.2±14.8	0.002	0.81±0.25	0.52±0.16	0.004
	(6)	41.2±13.2	13.1±4.6	0.012*	0.76±0.19	0.44±0.11	0.007
KB	17	49.1±11.9	21.8±11.0	<0.001	0.80±0.33	0.45±0.09	0.005
	(16)	44.8±8. 0	17.0±3.3	>0.001*	0.69±0.07	0.40±0.09	0.01
JS	10	58.1±9.5	12.0±8.2	<0.001*	0.93±0.19	0.41±0.10	<0.001
	(10)	-	-	-	-	-	-

Procedural outcomes. The gradients are expressed in mmHg. EP: effective or partially effective procedures.

EP= effective; PE= partially effective; SB= single balloon; SS= standard stenting; KB= kissing balloon; JS: jailing stenting

Subgroup according to disease	N. of pts	E or PE procedure/n° pts treated				p value (SB+SS vs KB)	p value (SB+SS vs KB+JS)
		SB	SS	KB	JS		
d-TGA	9	0/8	0/0	5/6	1/1	0.003	0.001
ToF	23	3/17	5/8	7/7	9/9	0.002	<0.001
TA	8	2/8	1/2	3/4	-	0.24	0.24
Subgroup according to RV-PA gradient							
RV-PA≤40 mmHg	6	4/4	1/1	-	0/0	-	-
RV-PA>40 mmHh	34	1/29	5/9	15/17	10/10	<0.001*	<0.001

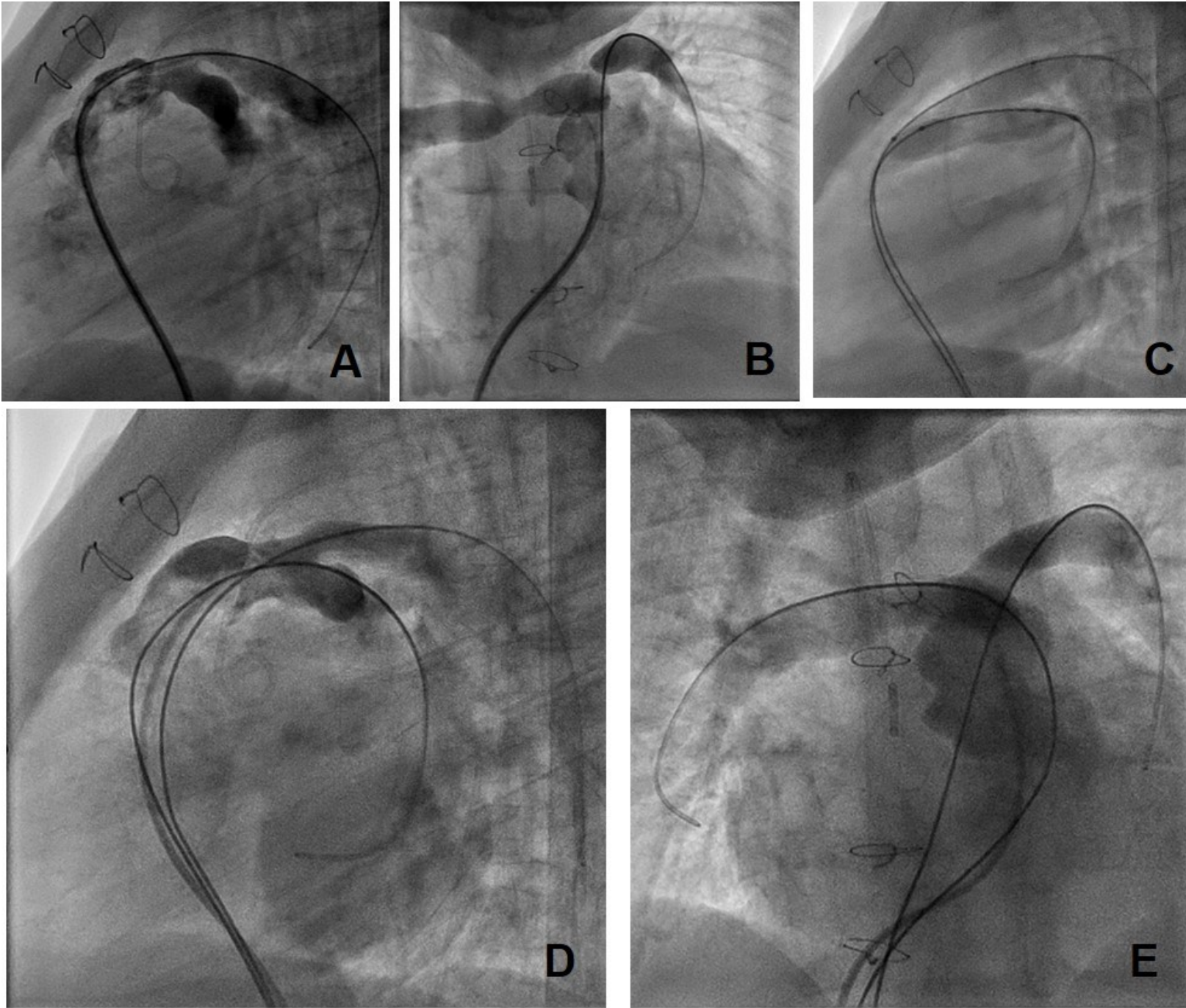
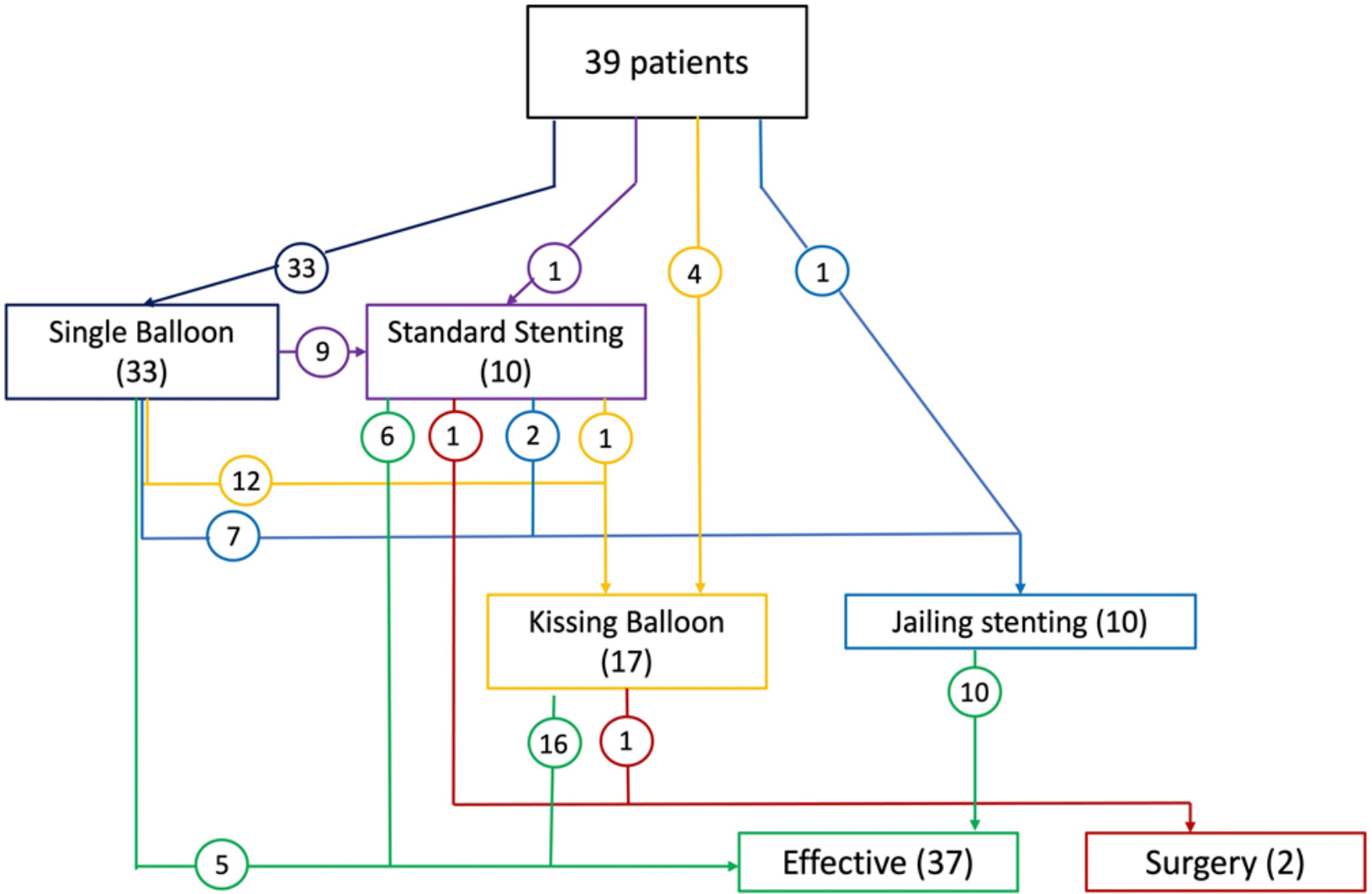
Subgroup analysis based on the underlying pathology and on the baseline gradient.

CONCLUSION:

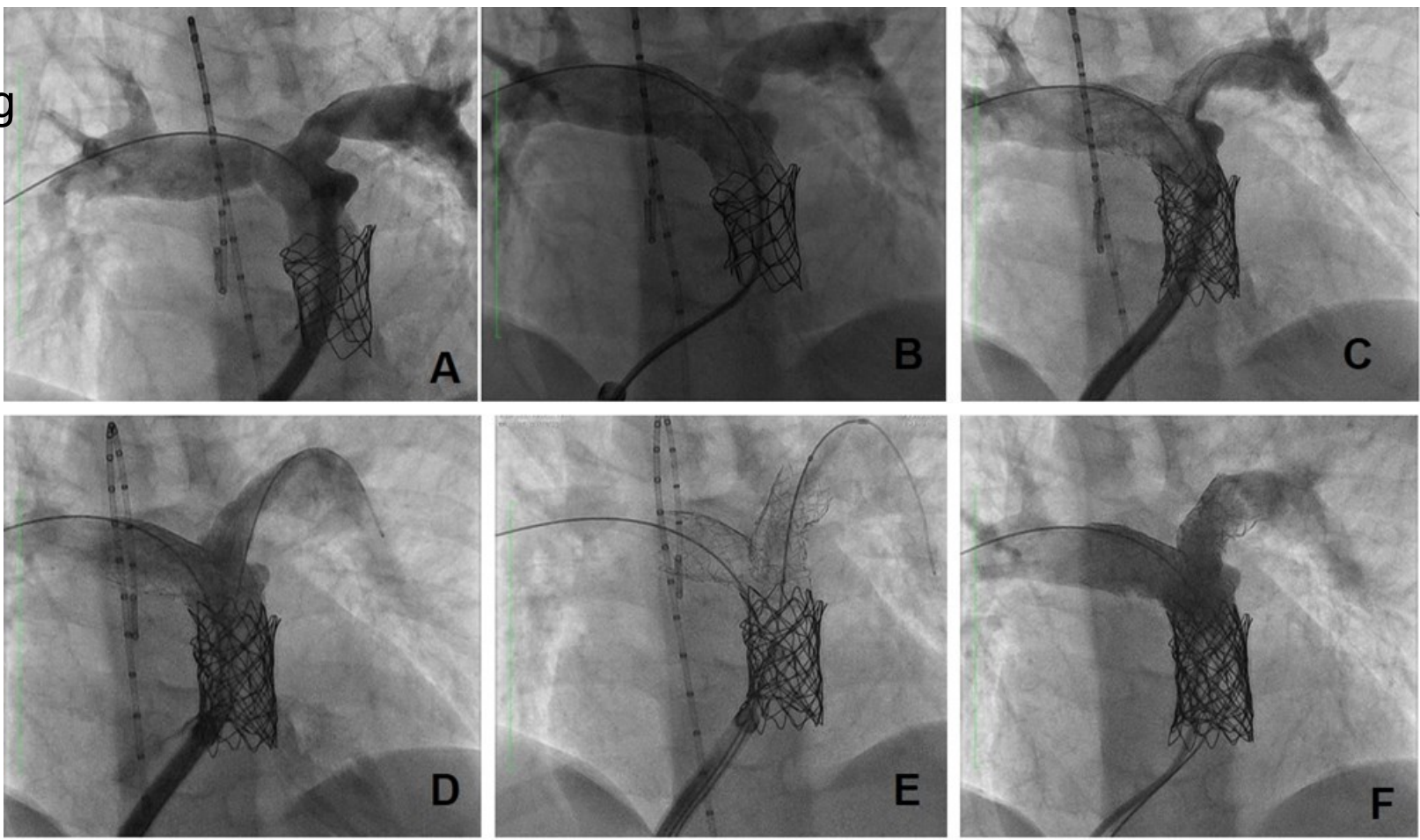
Despite a detailed multimodality imaging to study of the RVOT anatomy, the treatment of distal pulmonary trunk and pulmonary artery bifurcation in patients surgically treated for conotruncal CHDs may be difficult.

In patients with RVOTO involving this anatomical site, standard balloon angioplasty and selective pulmonary branch stenting may be ineffective. In this setting, a kissing balloon approach may be more appropriate and more effective.

When the percutaneous pulmonary valve implantation is indicated, stenting of the bifurcation starting from the left or the right pulmonary branch may be chosen to break down the RVOT gradient and to create an effective anchoring before the valve placement.



Three y.o. baby, residual multiple stenosis after surgical correction of truncus arteriosus. A) Severe stenosis of the origin of left pulmonary artery and distal main pulmonary artery; B) stenosis of distal right pulmonary artery. After selective balloon dilatation of right, left, and main pulmonary artery stenosis (see supplementary video 1) whole gradient dropped from 75 mmHg to 45 mmHg. Finally, a kissing balloon approach was used (C), with a good result (D, E). Final RVOT gradient was 20 mmHg, RV/Ao dropped to 75% after standard balloon approach to fall to 50% after kissing balloon.



Tetralogy of Fallot with multiple stenosis. a CP stent was previously implanted in the conduit, however, it showed several fractures. First, a 57 mm XL Andra Stent was implanted in right pulmonary artery (A), the overlap between CP and Andra stent was weak (B), so a CP stent was implanted to stabilize the system (C). The left pulmonary artery was approached by opening the Andra stent struts up to 14 mm by using an Atlas Gold balloon (D). The residual stenosis was approached by implanting a 30 mm Andra Stent (TAP technique) (E). Finally, a 22 mm Melody valve was implanted. Whole gradient dropped from 50 mmHg to 0 mmHg.

	mean±SD
Age (yrs)	8.7±7.8
Weight (kg)	31.0±26.3
Height (cm)	119.1±36.6
BSA (m²)	1.00±0.53
LV pressure (mmHg)	90.0±15.8
RV pressure (mmHg)	67.3 ±14.6
RV/Ao ratio	0.75±0.24
Total RVOT gradient (mmHg)	46.9±11.8

Patients' characteristics.

LV: left ventricle, RV: right ventricle, Ao: aorta, RVOT: right ventricular outflow tract, PA: pulmonary artery, SD: standard deviation