S. Hascoët

Cardiologie pédiatrique et congénitale

Hôpital Marie Lannelongue

Stent dans les cardiopathies congénitales

Biarritz, Appac, 9 juin 2016

Archives of Cardiovascular Disease (2015) **108**, 650—660

CLINICAL RESEARCH

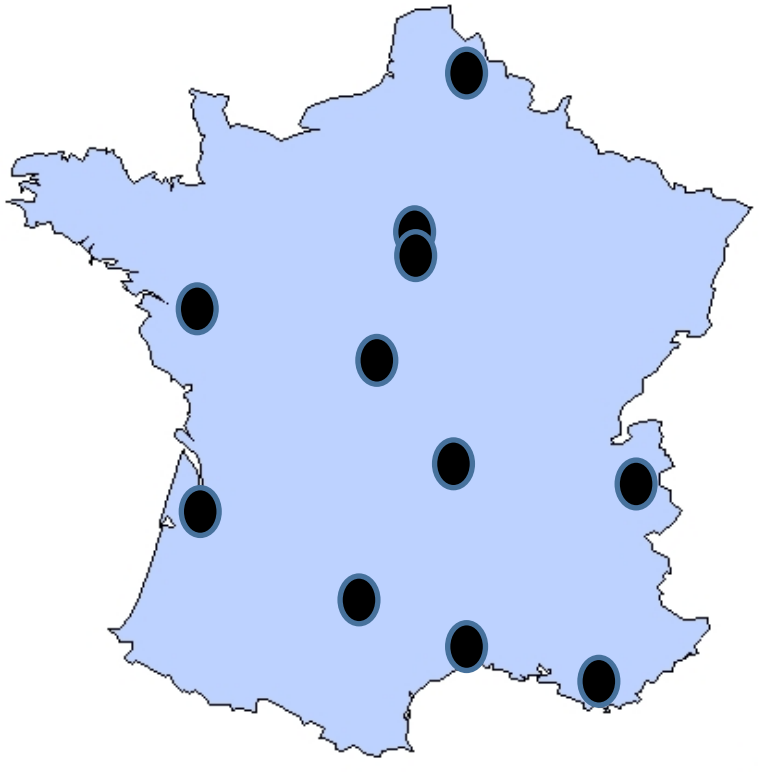
Stenting in paediatric and adult congenital heart diseases: A French multicentre study in the current era

Utilisation du stent dans le cathétérisme des cardiopathies congénitales de l'enfant et de l'adulte : une étude française multicentrique de la pratique actuelle

Sebastien Hascoët[a,b,c,d,e,*], Zakaria Jalal[a,f], Alban Baruteau[a,f,g], Lucia Mauri[a,h], Aurélie Chalard[a,i], Ivan Bouzguenda[a,j], Jean-François Piéchaud[a,j], Jean-Benoit Thambo[a,f], Bruno Lefort[a,k], Patrice Guérin[a,l], Lauriane Le Gloan[a,l], Philippe Acar[a,b], Ali Houeijeh[a,m], François Godart[a,m], Alain Fraisse[a,h,n]

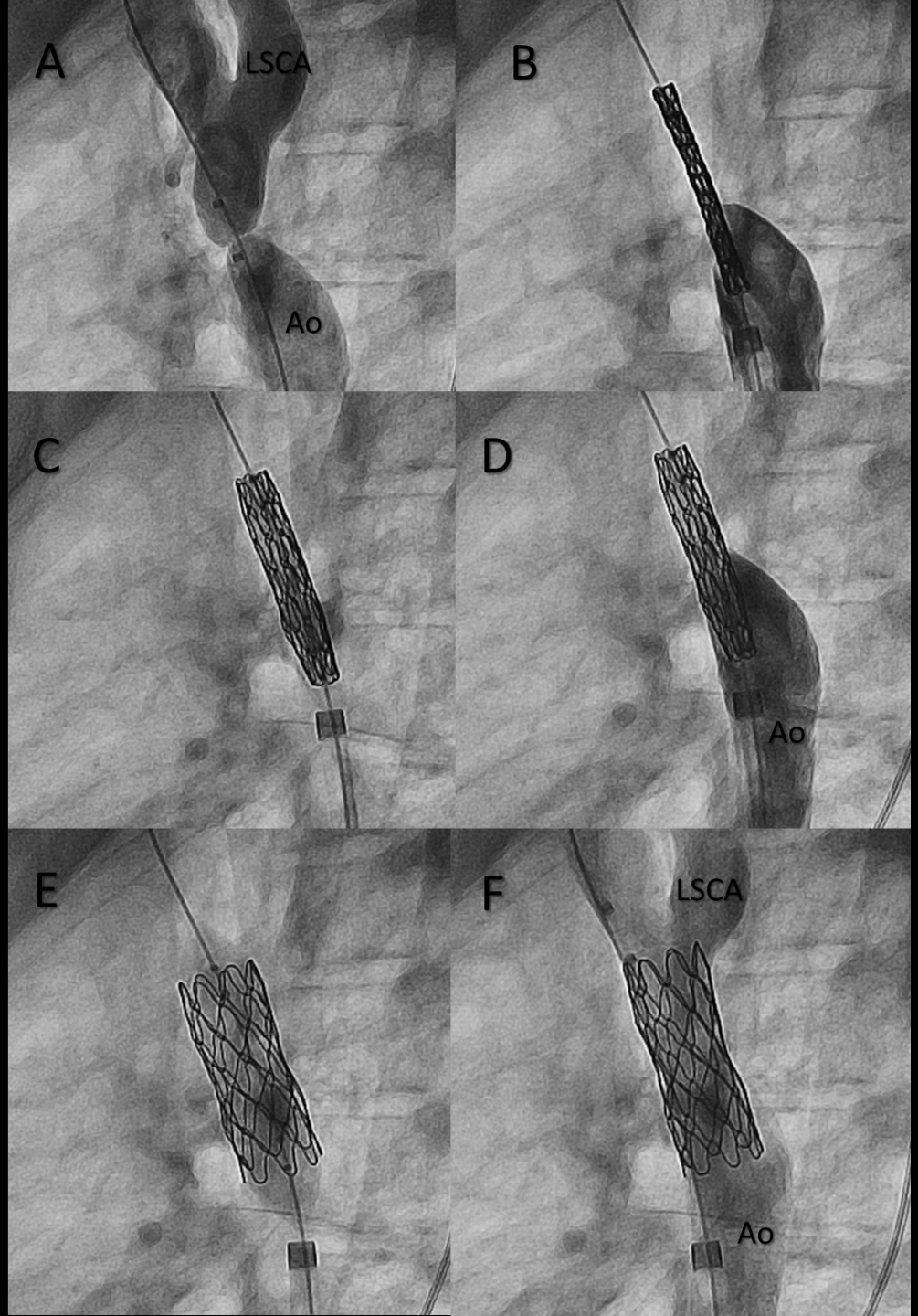
Methods

- French multi-center retrospective study
- over 1 year.
- 11 centers
- **151 patients / 207 stents**
- 106 CHD patients <18 y.o (70.2%)
- <1 ans (9.2%)
- Median age 13,7 y.o. (min 5 d.o. max 70,1 y.o.)



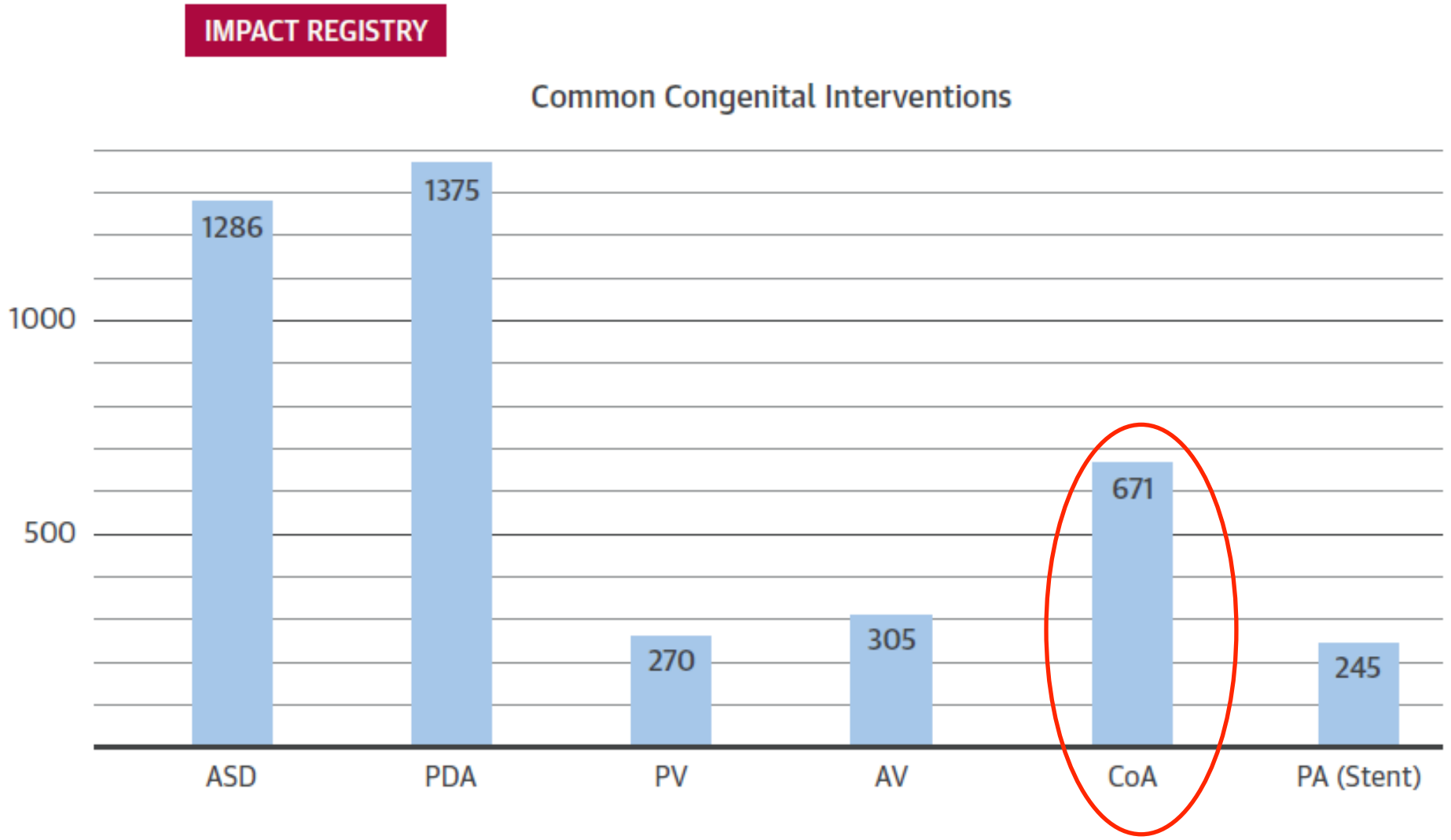
Indications

Procedure type (n = 158)	
Stenting coarctation (*n* = 28); recoarctation (*n* = 15)	43 (27.2)
PA stenosis (*n* = 46); thrombosis (*n* = 1)	47 (29.7)
PPVI	32 (20.2)
RV-to-PA conduit stenting	10 (6.3)
DA stenting	14 (8.9)
BT shunt stenosis (*n* = 1); thrombosis (*n* = 2)	3 (1.9)
Coronary lesions	3 (1.9)
Mustard baffle stenosis; vena cava stenosis	2 (1.3)
Potts shunt occlusion	1 (0.6)
Cavopulmonary conduit stenosis (*n* = 1); fenestration occlusion (*n* = 2)	3 (1.9)
TTVI	1 (0.6)


A
LSCA
Ao
B
C
D
Ao
E
F
LSCA
Ao

Impact, 81 centers, 4152 procedures

Moore JACC 2014



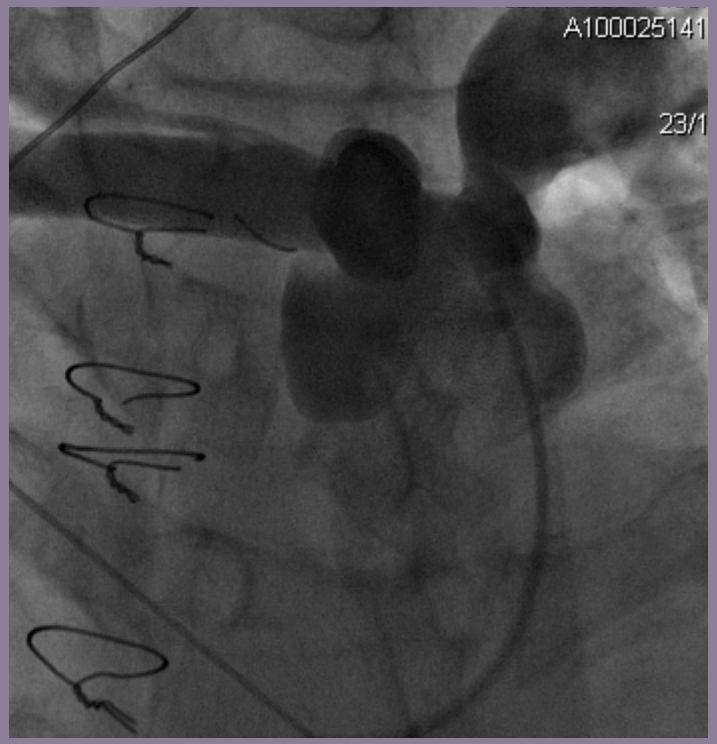
Coarctation.

- Coa : Stent > balloon
  - Primary Stenting ++
  - Stent > Surgery ?
  - Covered stents
    - high risk patient /rescue

Limits : aortic aneurysm / vascular access / Stroke (eV3?)

Moore JACC 2014, Sohrabi JACCCI 2014, Godart ACVD 2011, Forbes JACC 2011, Chessa EHJ 2005 Ringel Cath CI 2013, Hu Ann Vasc Surg 2014, Padua cochrane database 2012

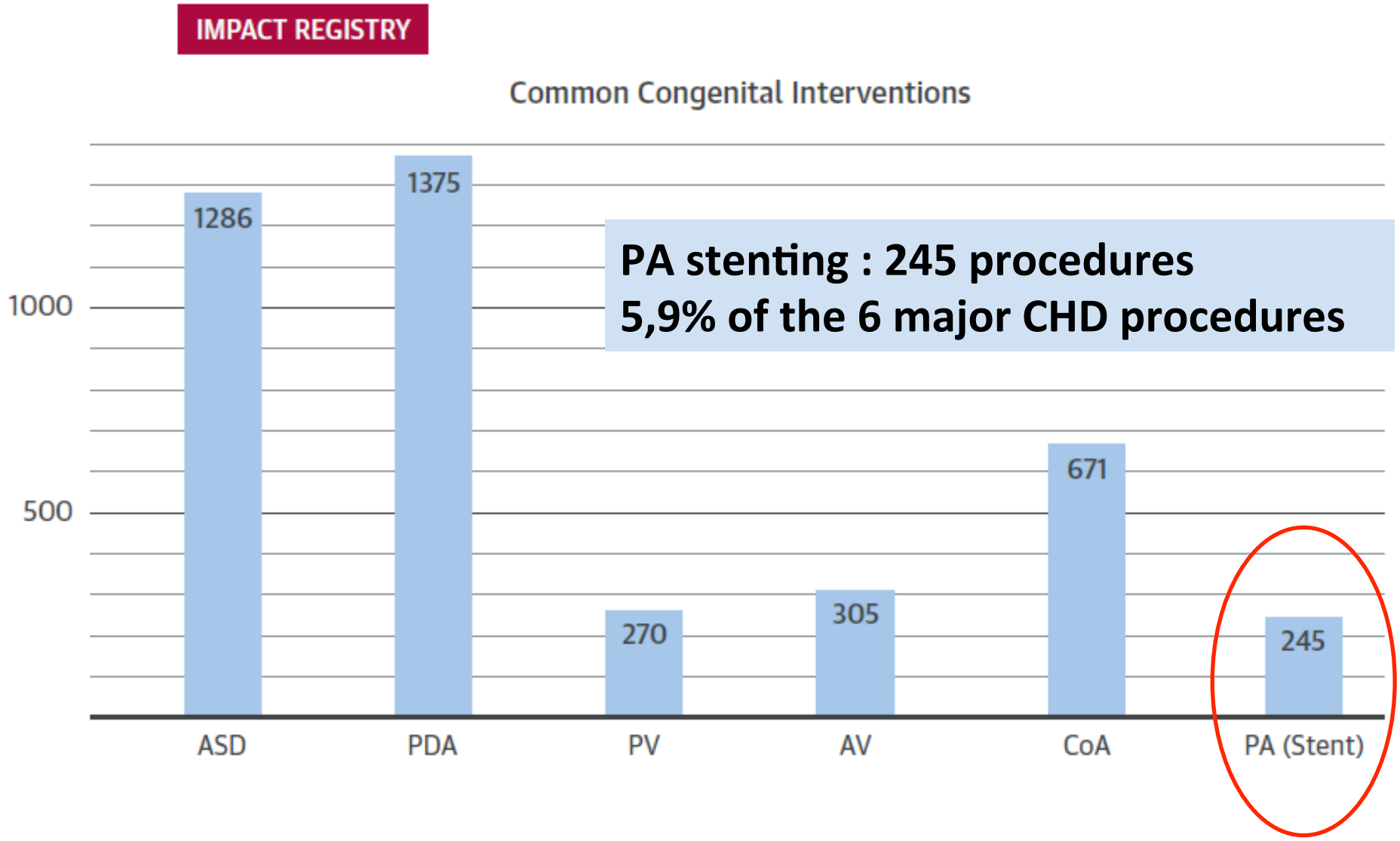
Branches angioplasty

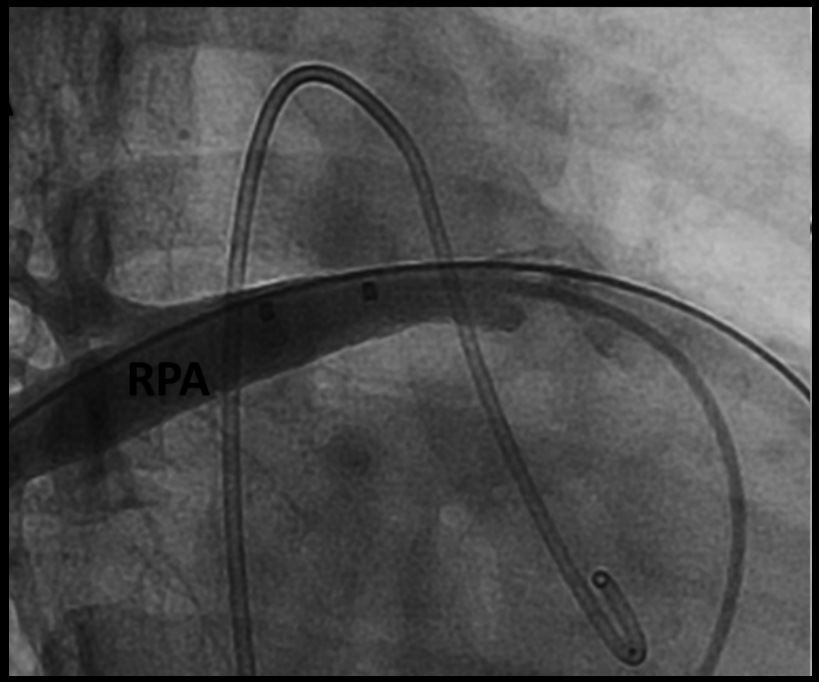


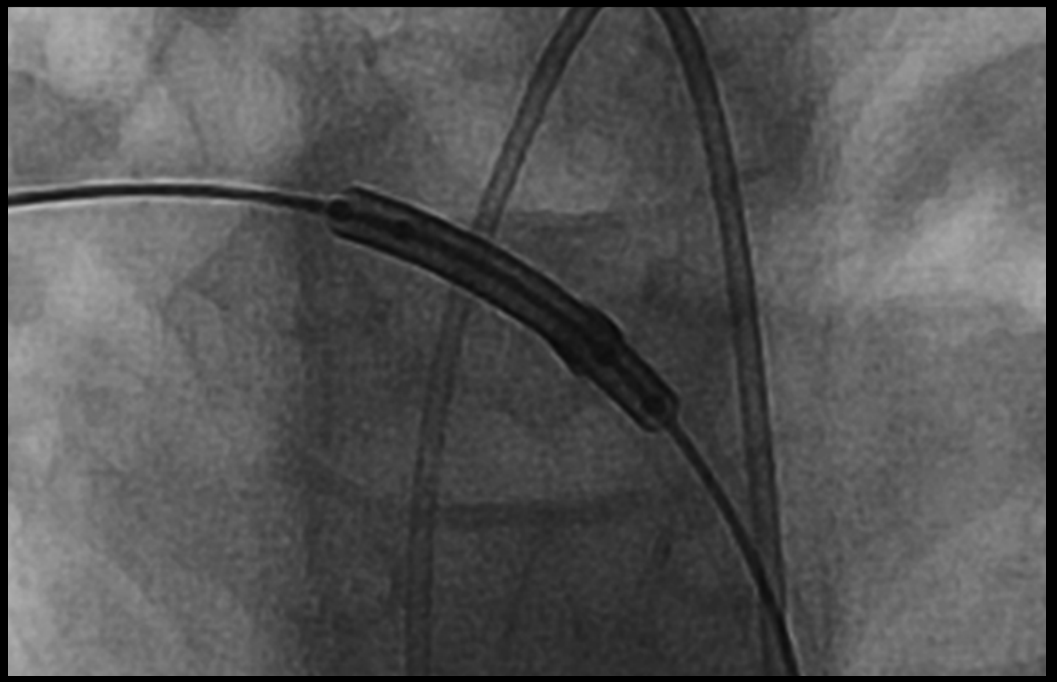
20 y.o., tube n°4 Homograft 23
sRVP 83 mmHg

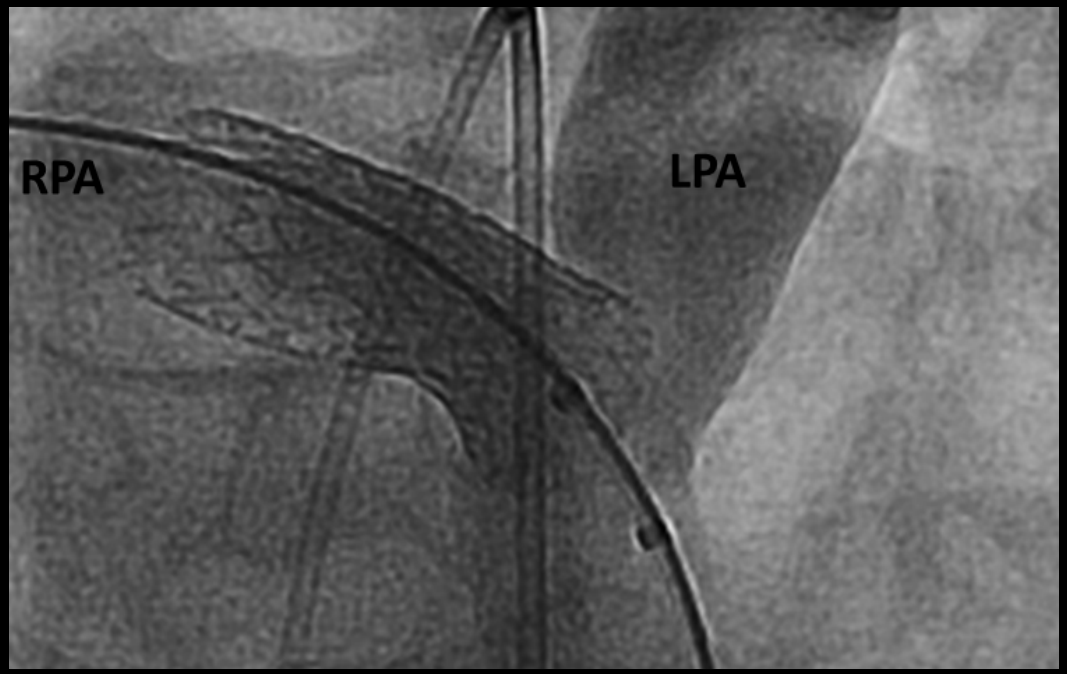
Impact, 81 centers, 4152 procedures

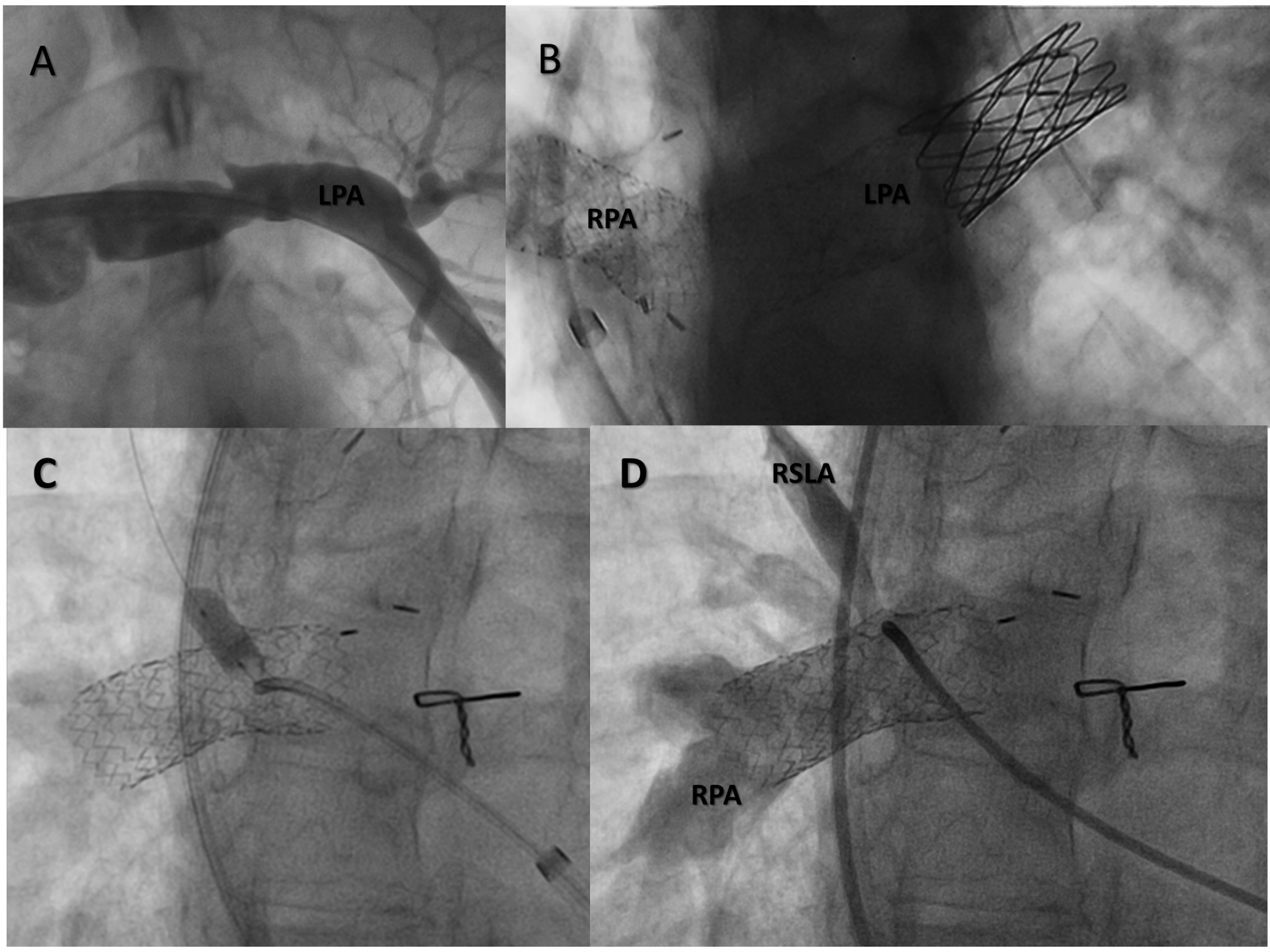
Moore JACC 2014

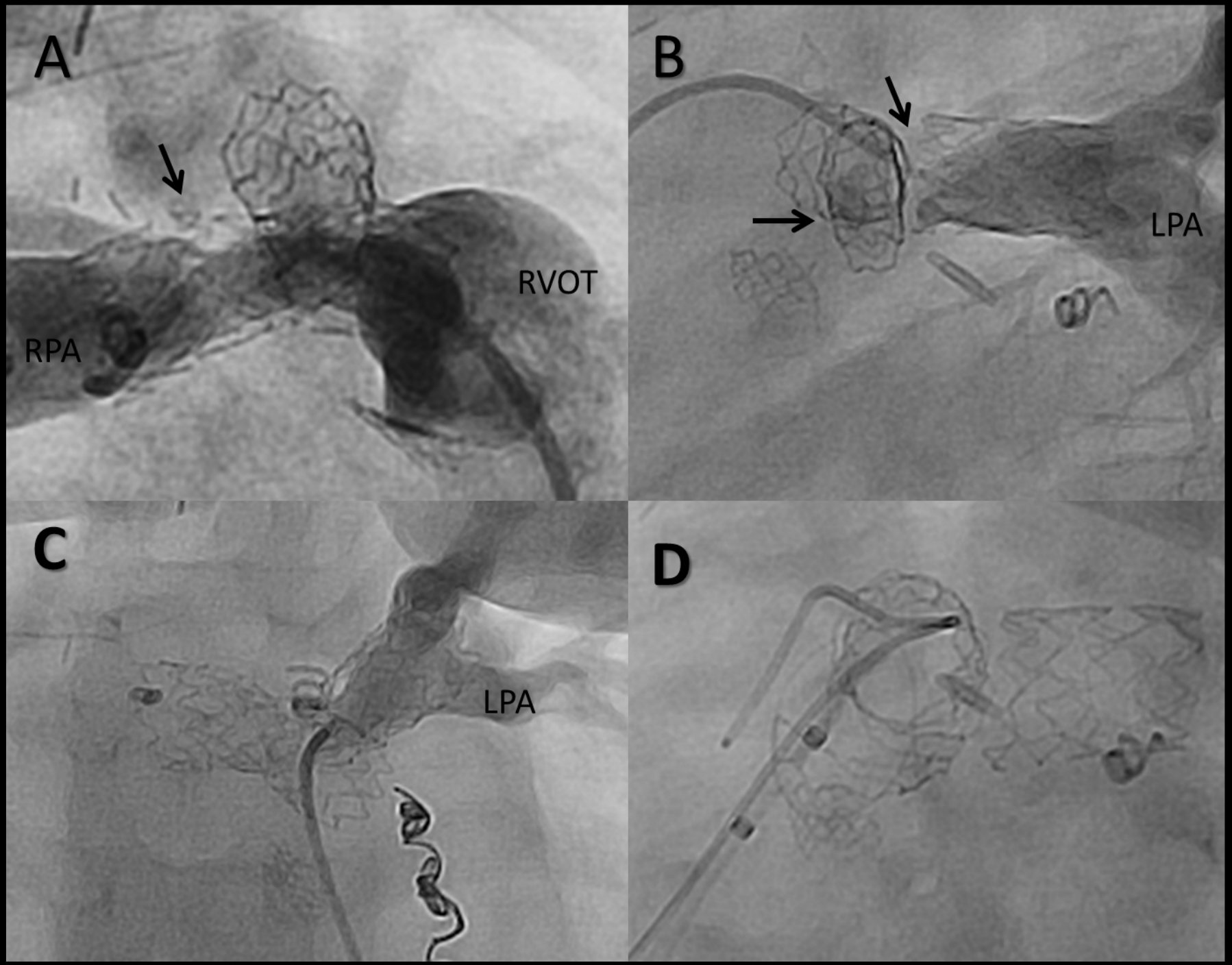



RPA



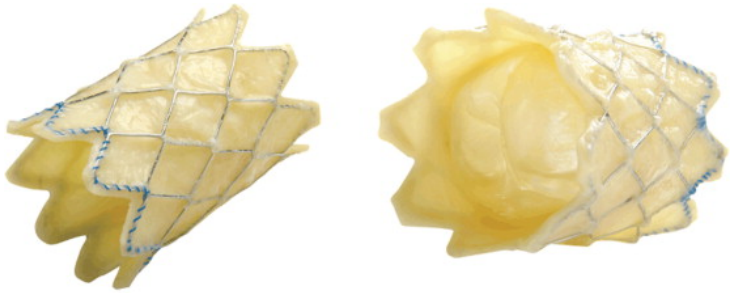

RPA
LPA


A
LPA
B
RPA
LPA
C
D
RSLA
RPA


A
RVOT
RPA
B
LPA
C
LPA
D

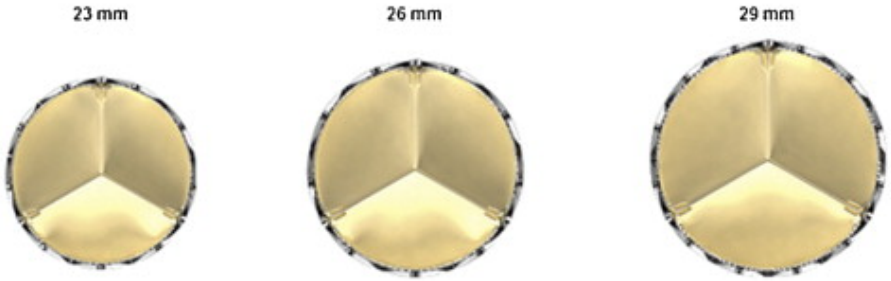
Percutaneous Valvulation

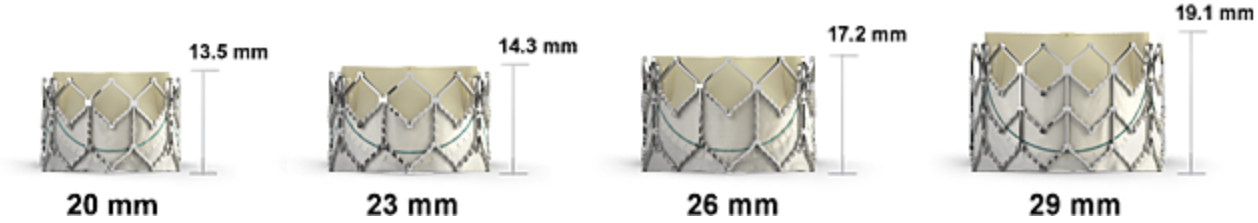
16 mm tube
Or « dilatable » tube up to 16 mm



Systeme 22F

18 mm tube
Or « dilatable » tube up to 18 mm

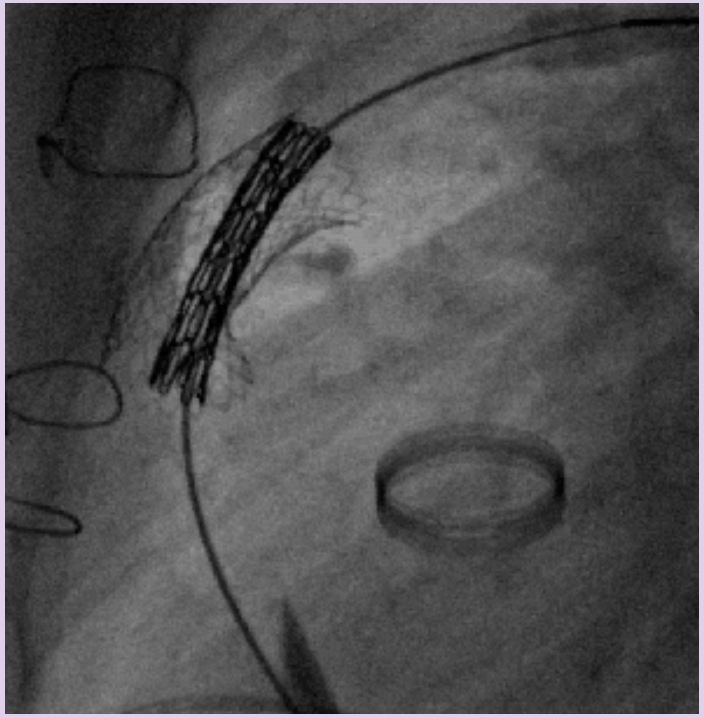


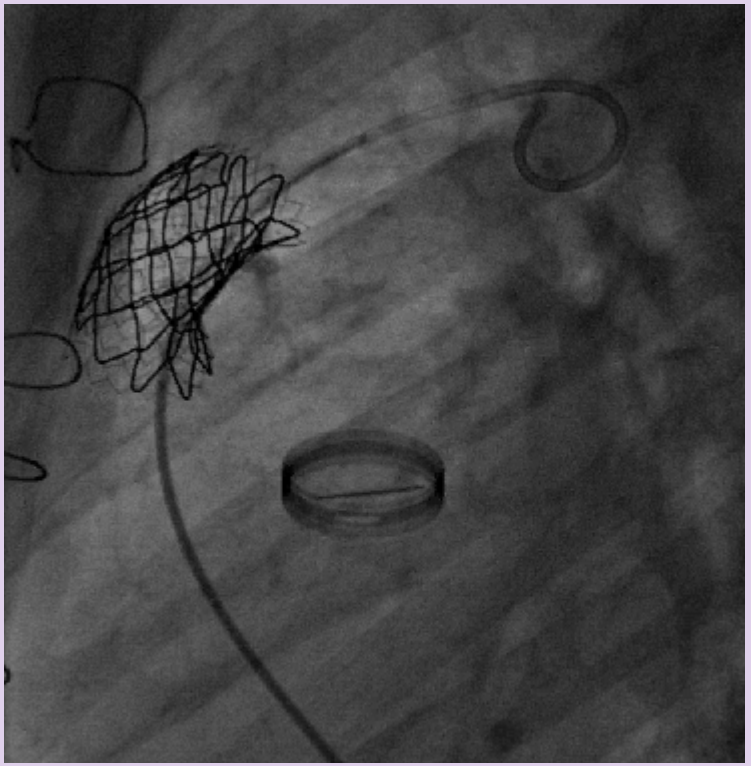


System 19 à 24F

Transcatheter pulmonary valvulation: Current indications and available devices, Hascoet S. and al., ACVD 2014
Edwards valve : results from a french registry, Mottin and al., in submission

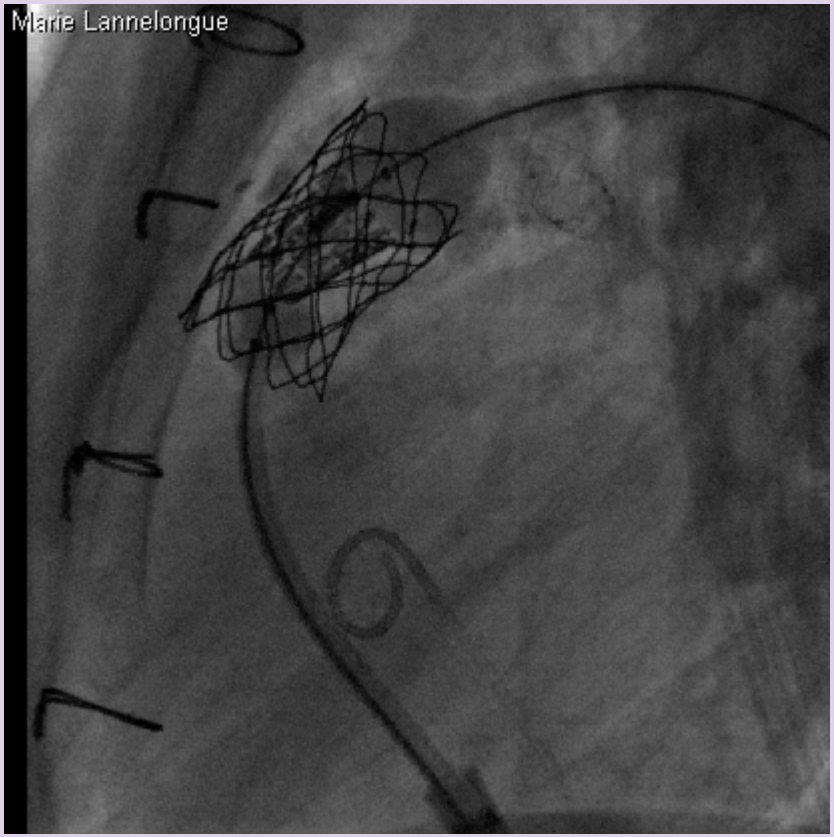
Percutaneous Valvulation

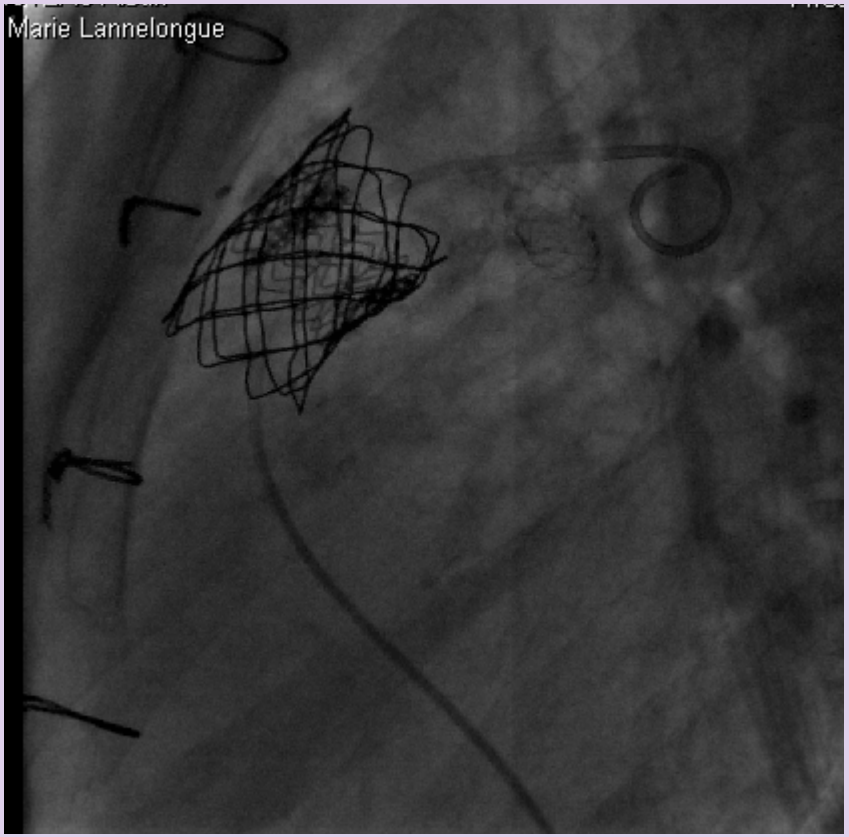




CCML n=32

Percutaneous Valvulation





CCML 2016 , Implantation more challenging

Norwood hybrid procedure

ductus arteriosus stenting
following bilateral
pulmonary arteries banding

« ideal » stent for CHD

Hascoet, ACVD 2014

1	Radiopacity	High radio-opacity facilitates stent positioning before implantation
2	Low profile	A stent with a low profile decreases the delivery sheath size
3	Good crimpability	Premounted stents or easy hand crimping with stability of the stent onto the delivery balloon are expected
4	High flexibility	High flexibility allows delivery in tortuous vessels like pulmonary arteries, gives compliance to the target area and ease of manoeuvrability during deployment
5	Good conformability	A stent with good conformability will fit well with the vessel geometry and curves, and will protect from vessel distortion
6	No foreshortening	A predictable expansion diameter with a low degree of stent foreshortening is expected during stent expansion for precision of positioning and to better match the length of lesion to be treated
7	High radial strength	Stents must have a high radial strength to resist external radial forces of the vessel wall, prevent vessel recoil and keep tight and scarred lesions open
8	High scaffolding	High scaffolding of the vessel is necessary to prevent parietal tissue protrusion and risk of restenosis
9	Retrievability	Stent retrievability and repositioning decrease the risk of malpositioning and embolization
10	Wide struts	Wide struts are expected to maintain blood flow to jailed vessel branches
11	Soft edges	Rounded and soft edges will prevent vascular tears and balloon rupture during delivery
12	Potential to grow	An ideal stent implanted in small children would follow the natural growth of the vessel; on the other hand, a stent must be redilatable until the expected adult diameter is reached
13	Solidity	The framework must be solid enough to resist fracture; loss of integrity decreases the radial strength and increases the risk of restenosis
14	Imaging compatibility	The stent should be compatible with all imaging modalities without artefacts
15	Biocompatibility	Biocompatibility must be high, with resistance to thrombus formation, corrosion and unwanted inflammatory or allergic reactions, and avoidance of neointimal proliferation

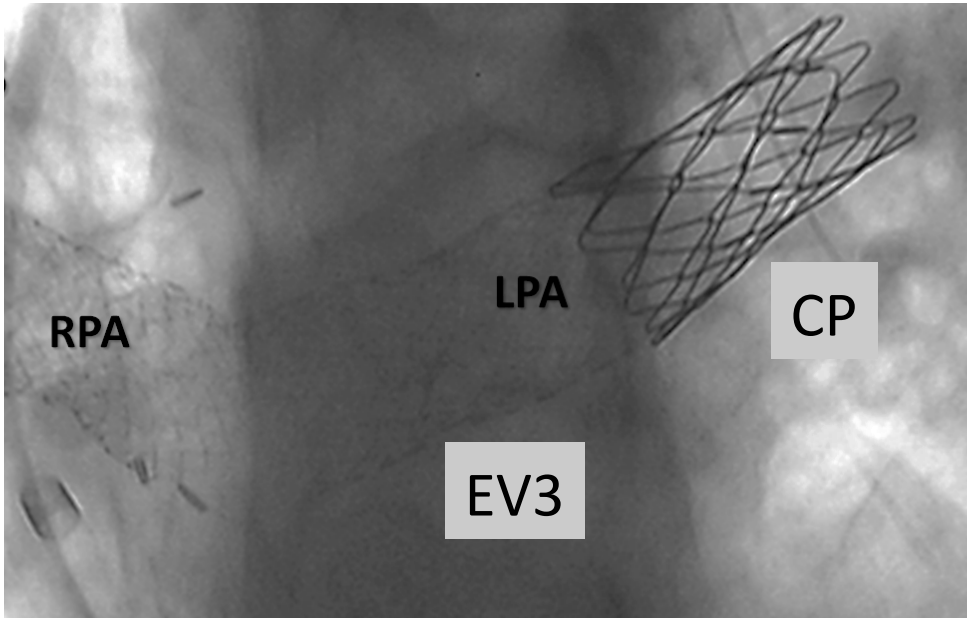
« ideal » stent for CHD

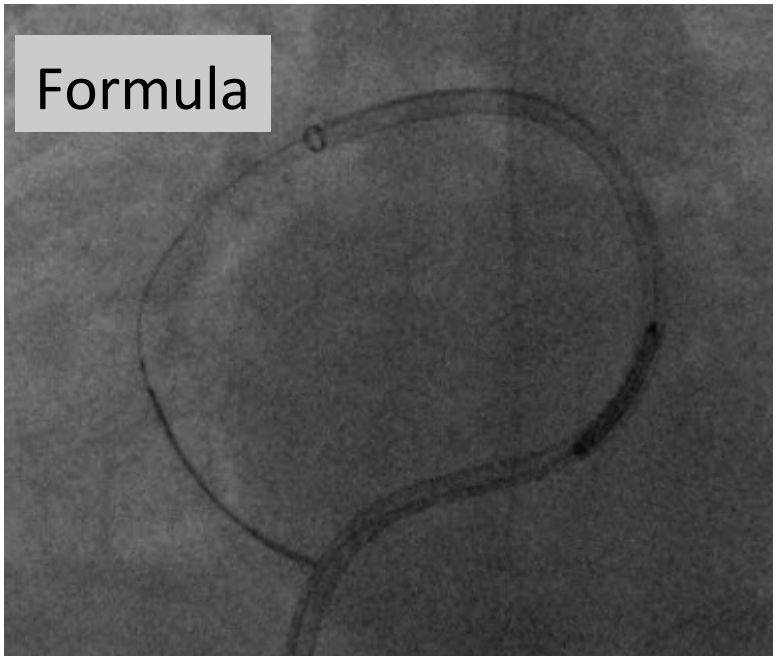
Hascoet, ACVD 2014

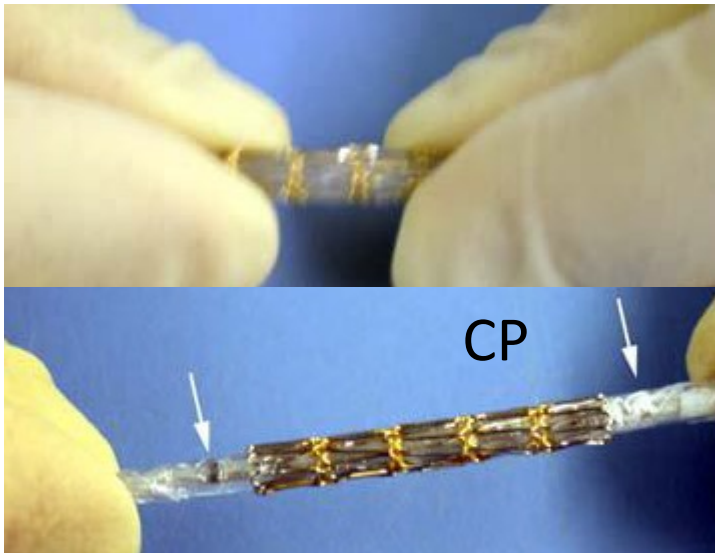
« One stent do not fill all the required properties »

Multiple stent available => « Know your devices»

1) Radio-opacity 2) High Radial strength 3) Low profile 4) Flexibility

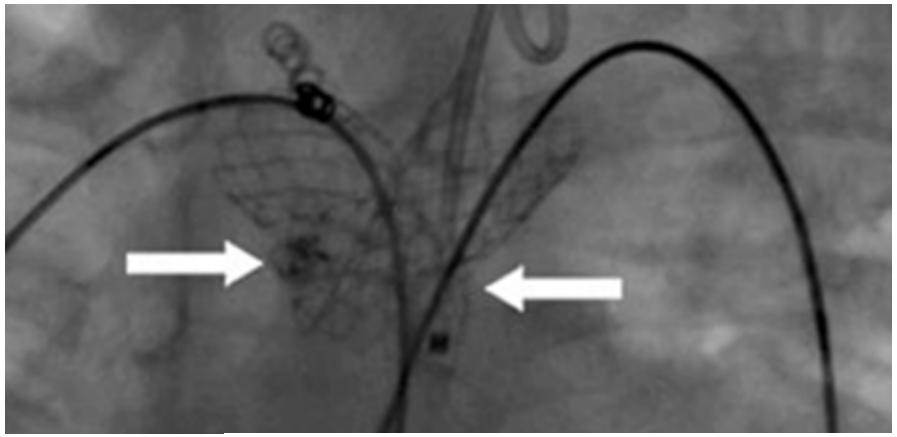






5) High scaffolding

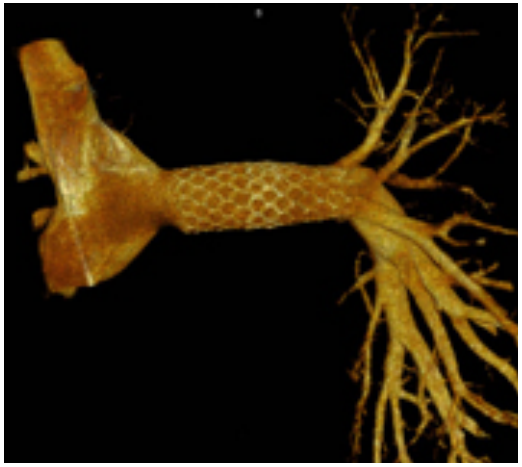
6) Retrievability

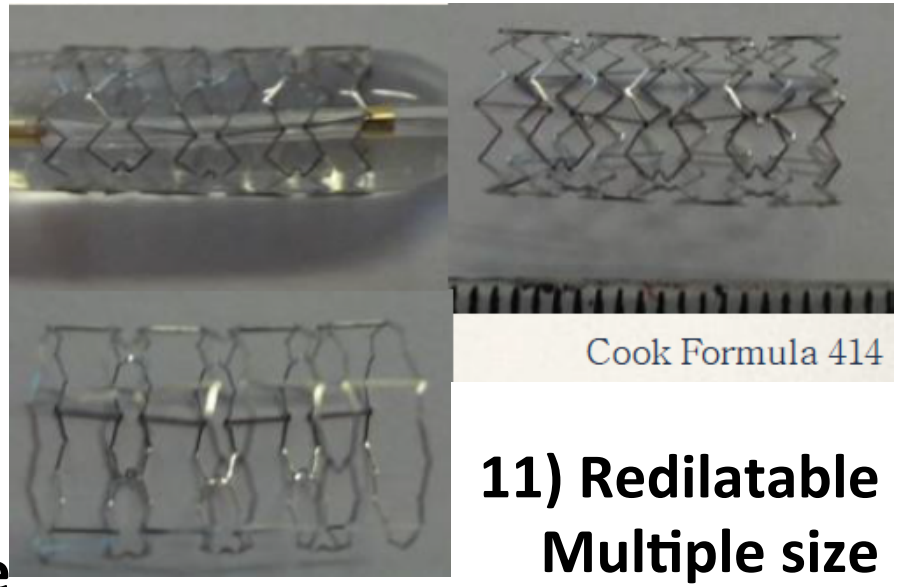


7) Good Crimpability / premounted stent

8) Good Comformability

9) Imaging compatibility





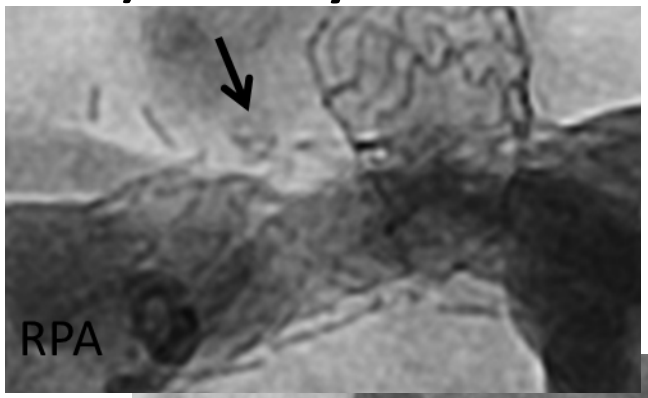
10) Solidity : resistance to fracture

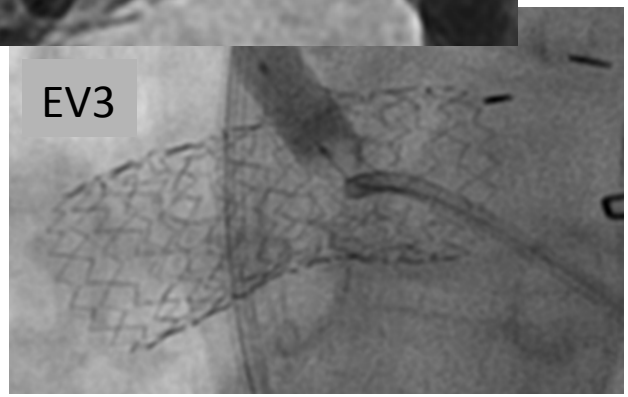
11) Redilatable
Multiple size

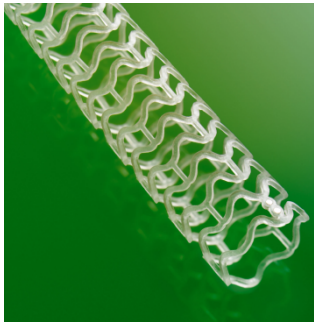
12) No foreshortening

13) Soft Edges

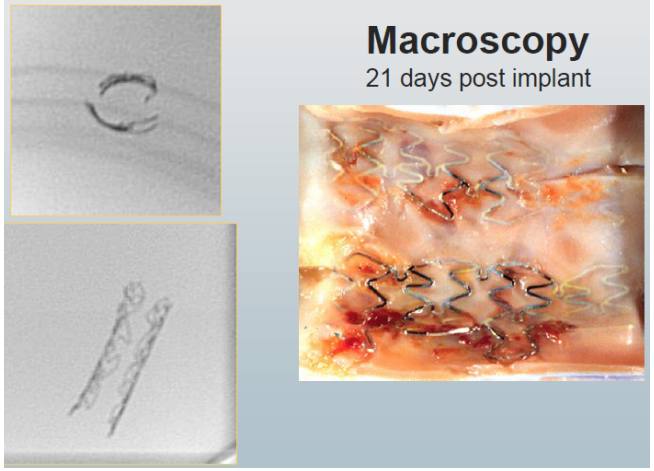
14) Potential to grow / disappear





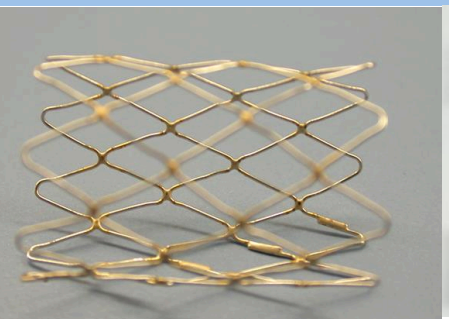


Absorb

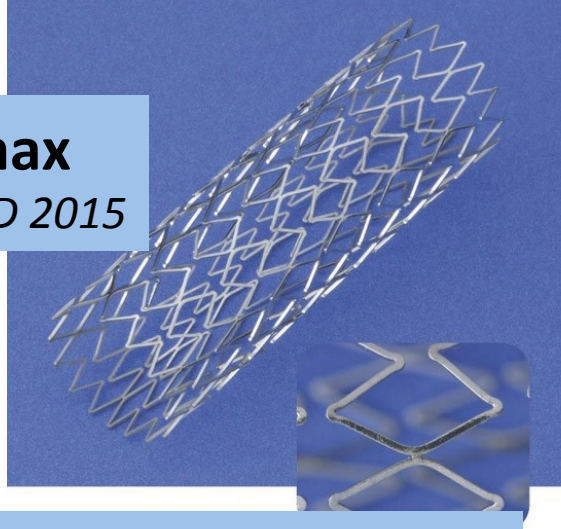


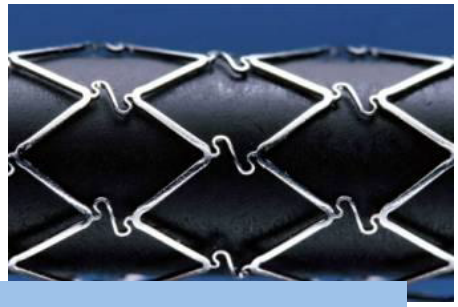
15) Wide strut / open cell

1 Cheatham Platinium *Ewert Heart 2005*

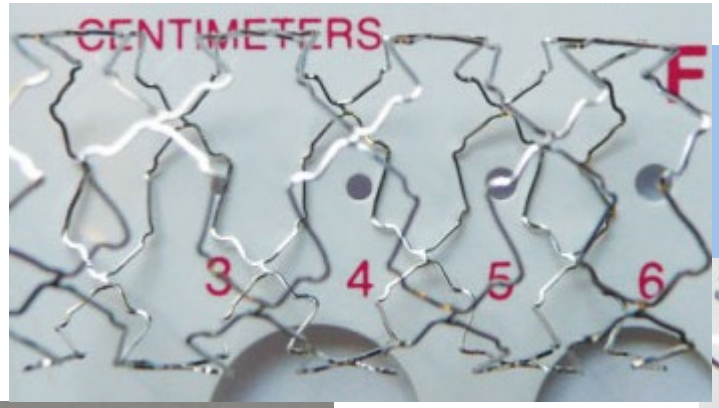


2 Ev3 Ldmax
Hascoet ACVD 2015

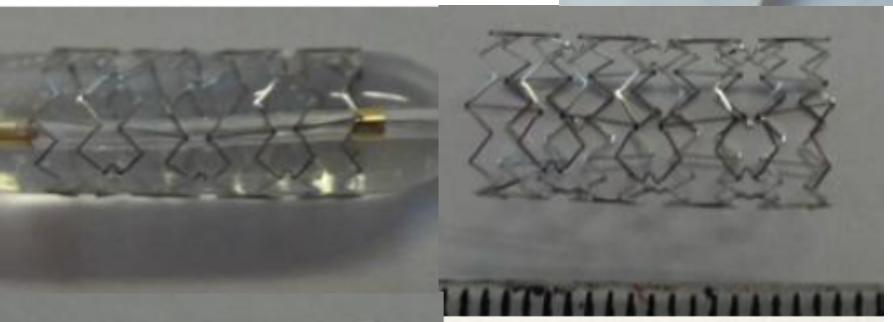


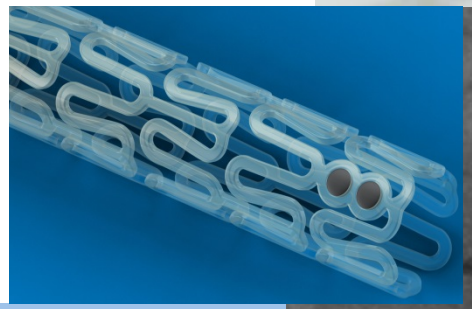


3 Genesis
Forbes Cath CI2003



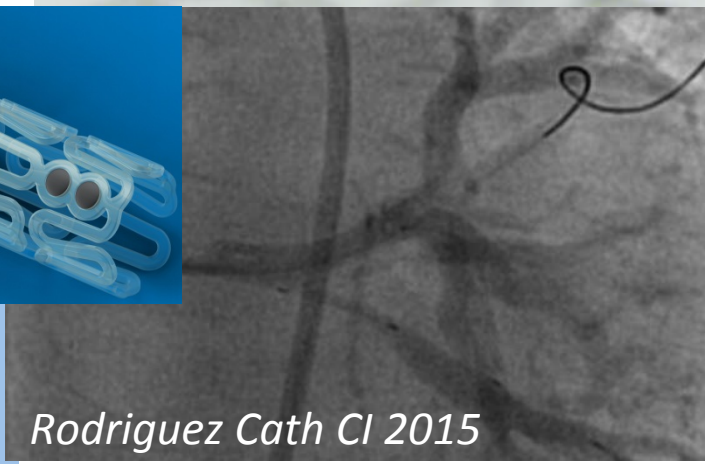
4 Valeo
Kudumala Cath CI 2014
Ovaert Eurointervention 2015





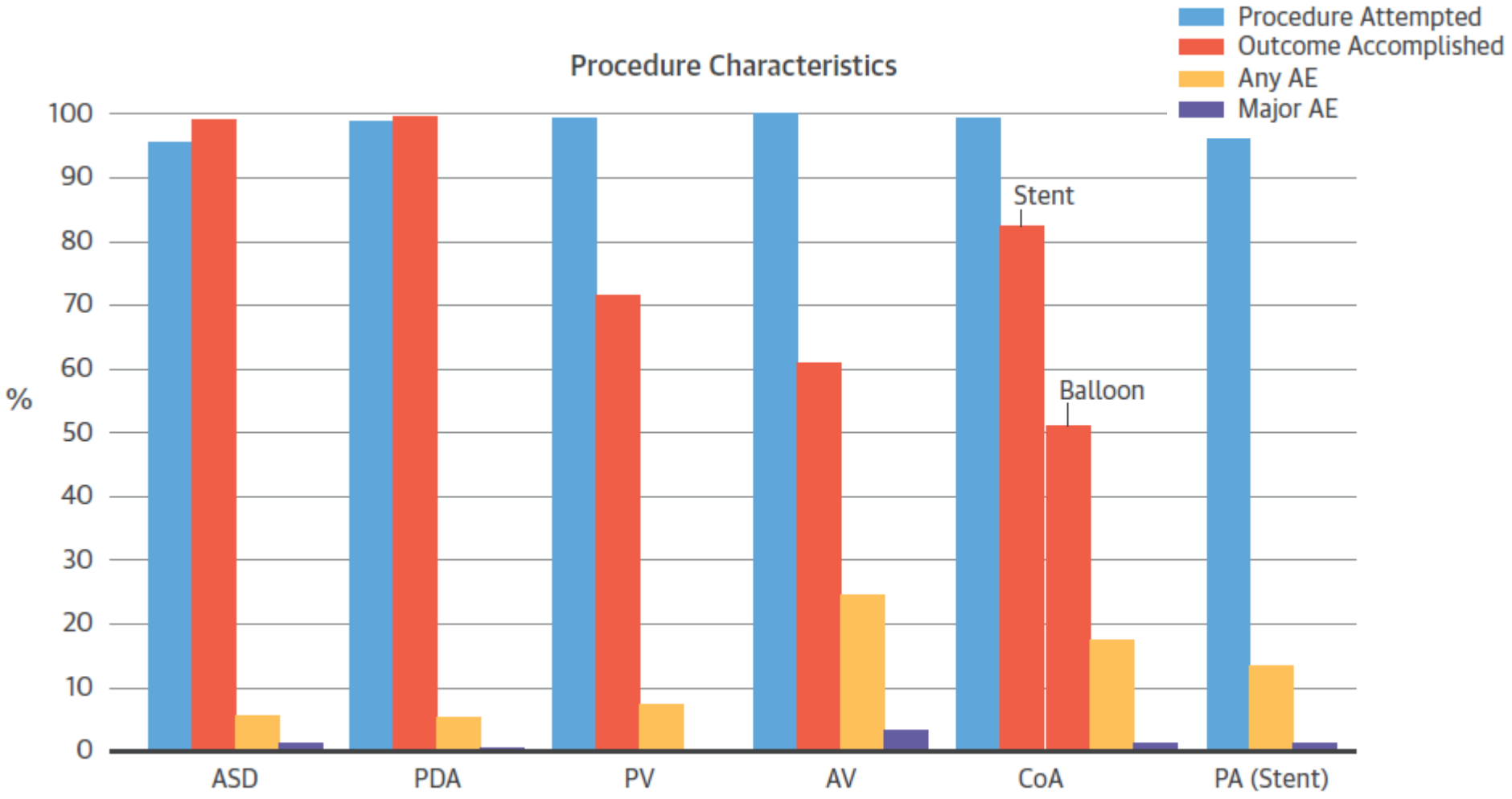
5 Formula
Stumper Heart 2013

6 Absorb
et stents coronaires



Rodriguez Cath CI 2015

Impact, 81 centers, 4152 procedures
Moore JACC 2014



Moore, J.W. et al. J Am Coll Cardiol. 2014; 64(23):2439–51.

Success Rate / complications

- Procedure Sucess rate : 96.8% (CI 92.8-99.0)

High-severity adverse events	19	12.0
Adverse event details		
Stroke	2	1.3
Haemothorax	2	1.3
Intra-lobar pulmonary haemorrhage	1	0.6
Reperfusion pulmonary oedema	2	1.3
PA dissection	1	0.6
Ventricular arrhythmia	1	0.6
Bacteraemia	1	0.6
Groin haematoma (managed medically)	2	1.3
Groin haematoma (managed surgically)	2	1.3
Retroperitoneal haemorrhage	1	0.6
Femoral arteriovenous fistula	1	1.3
Transient stent thrombosis	1	0.6
Haemodynamic instability (DA stenting)	2	1.3
Stent migration	3	1.9
Stent malposition (surgical extraction)	2	1.3
Death	2	1.3

6) Risk Markers

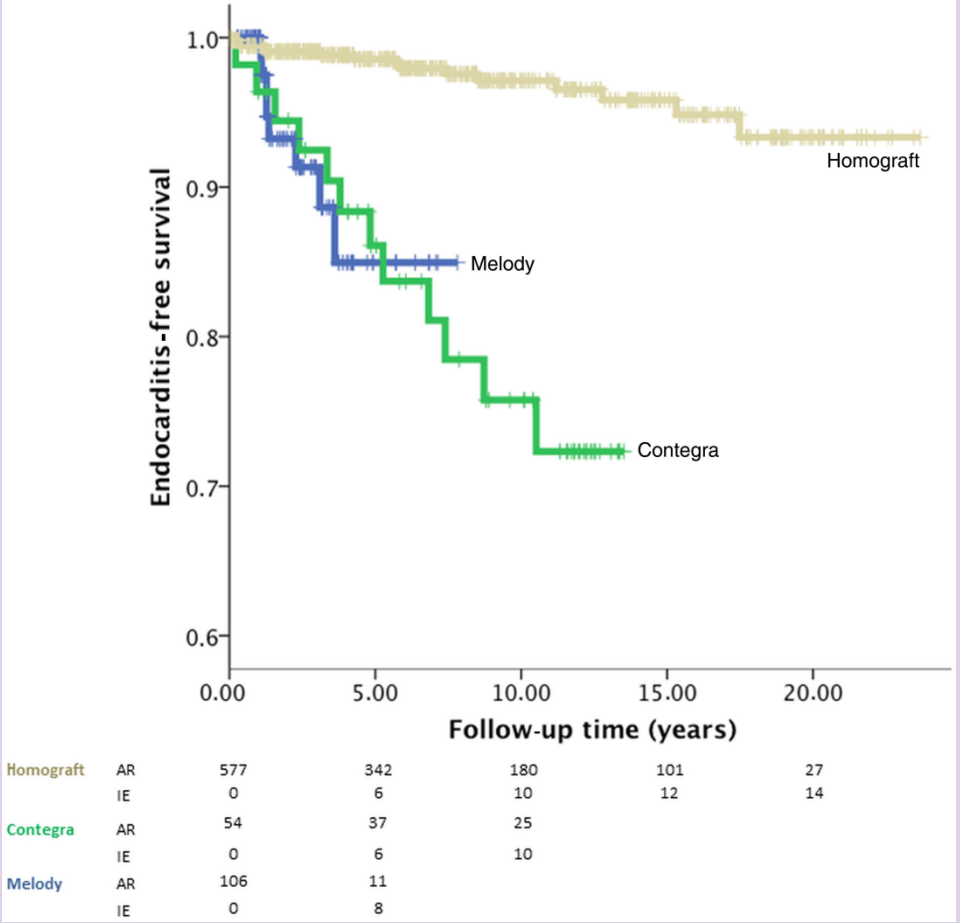
- Stent related adverse events :

Center, operator, age, weight, genetic syndrome, type of stent NS

DA stenting OR 12.4 (CI 2-77.5)

PPVI OR 5.9 (CI 1.1-32.3)

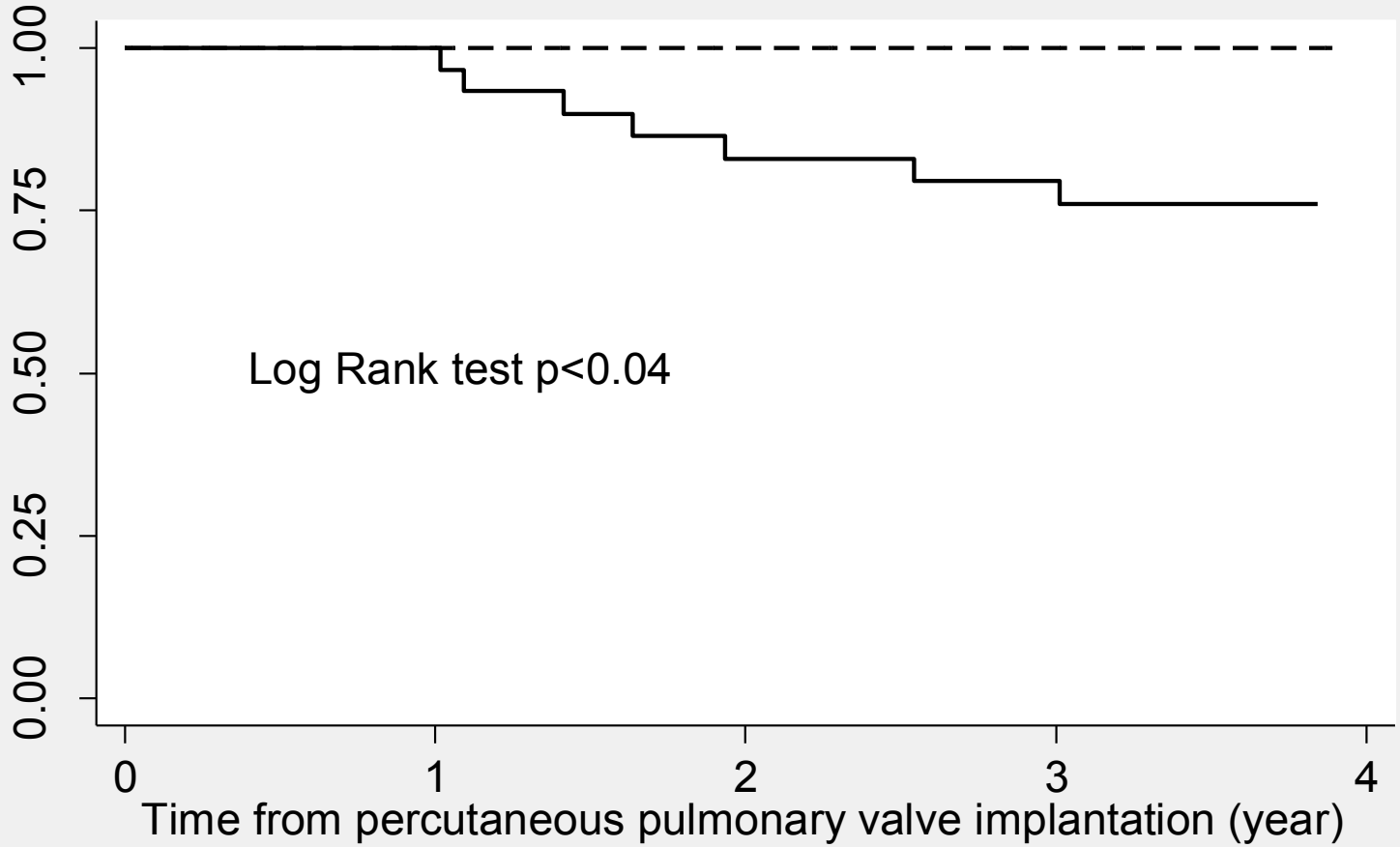
Melody® and endocarditis



Necker 5.8 % sur 86 patients
CCML 8/32 25%

Van Dijck, Heart 2015

Kaplan Meier survival estimates free from endocarditis



Number at risk					
typevalve = Melody	32	30	24	23	20
typevalve = Sapien	47	24	14	10	1

Melody Sapien

Marie Lannelongue 2016, in submission

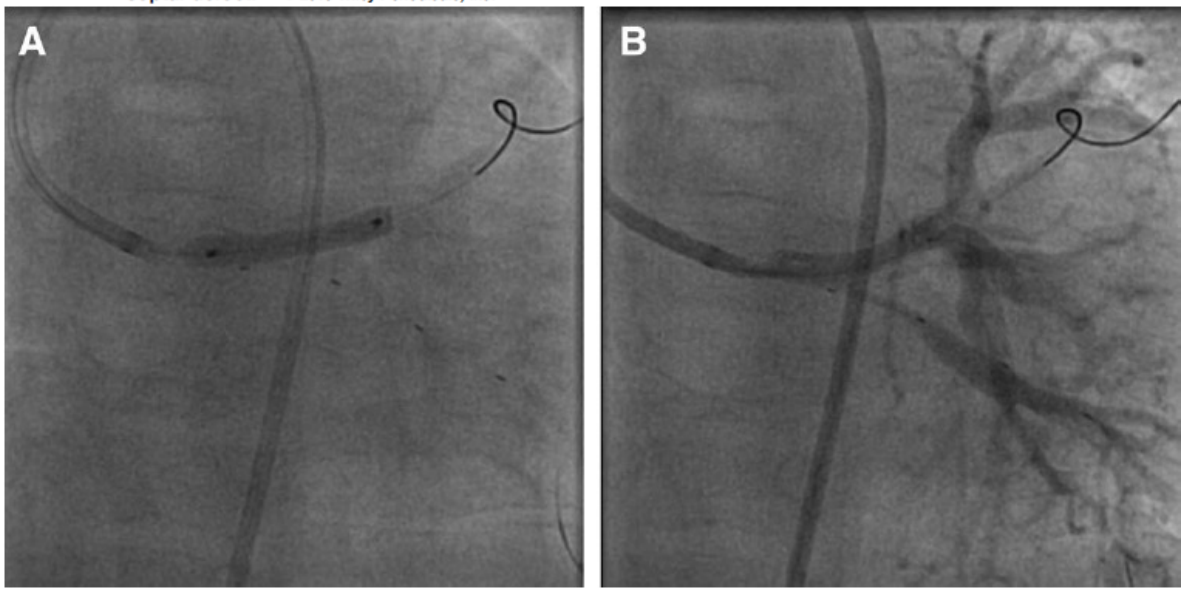
The future

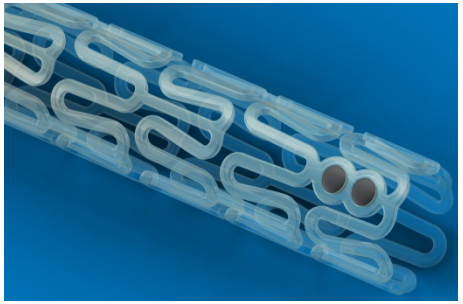
Catheterization and Cardiovascular Interventions 86:E76–E80 (2015)

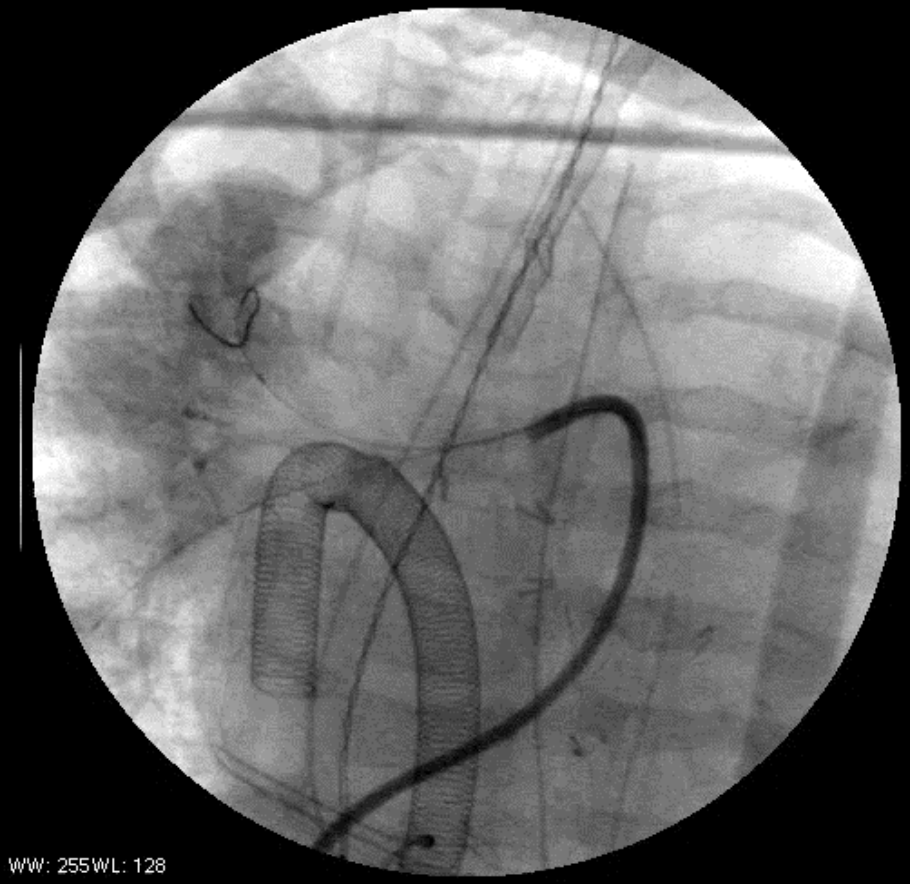
Implantation of an Absorb Bioresorbable Vascular Scaffold in the Stenotic Aortopulmonary Collateral Artery of a Young Child With Alagille Syndrome

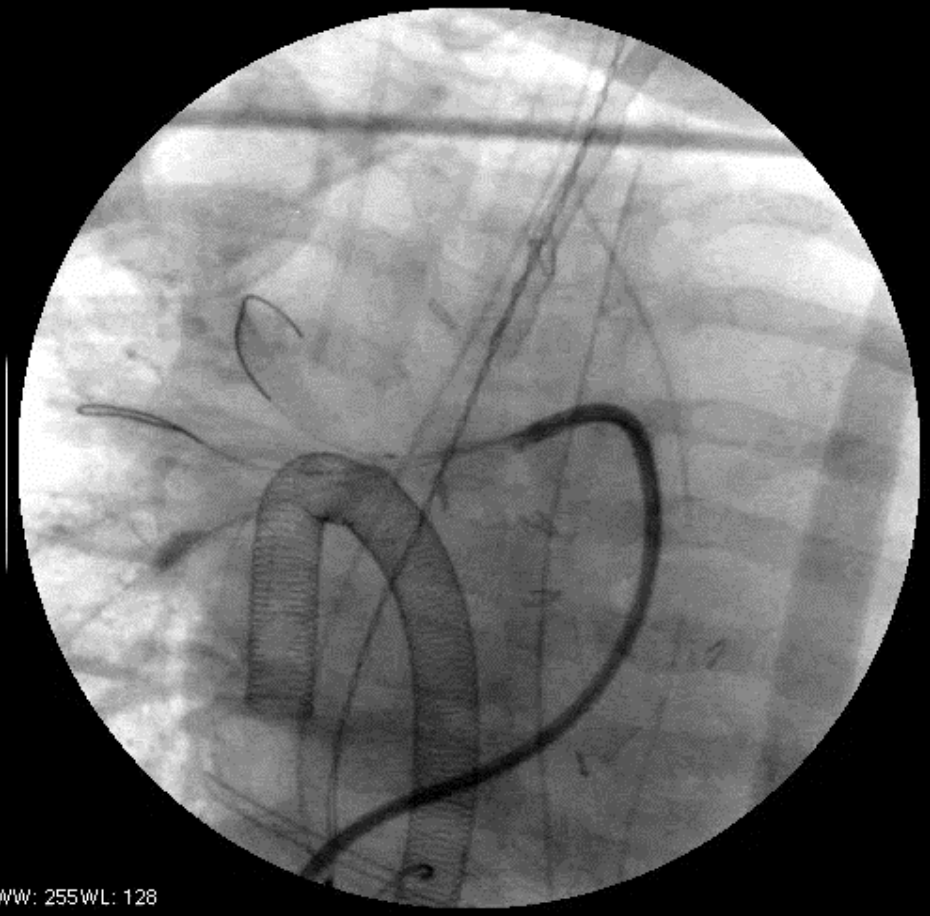
Jose Castro Rodriguez,* MD, Hugues Dessy,* MD, and Hélèr

Stent implantation in children can be problematic due to the possibility o pacity and difficulties during later surgery. For these reasons, bioresc may be a good alternative to conventional stents. We report our experi plantation of an Absorb bioresorbable stent in the stenotic major aortop lateral artery (MAPCA) of a 1-year-old girl born with pulmonary atresia with ventricular septal defect.



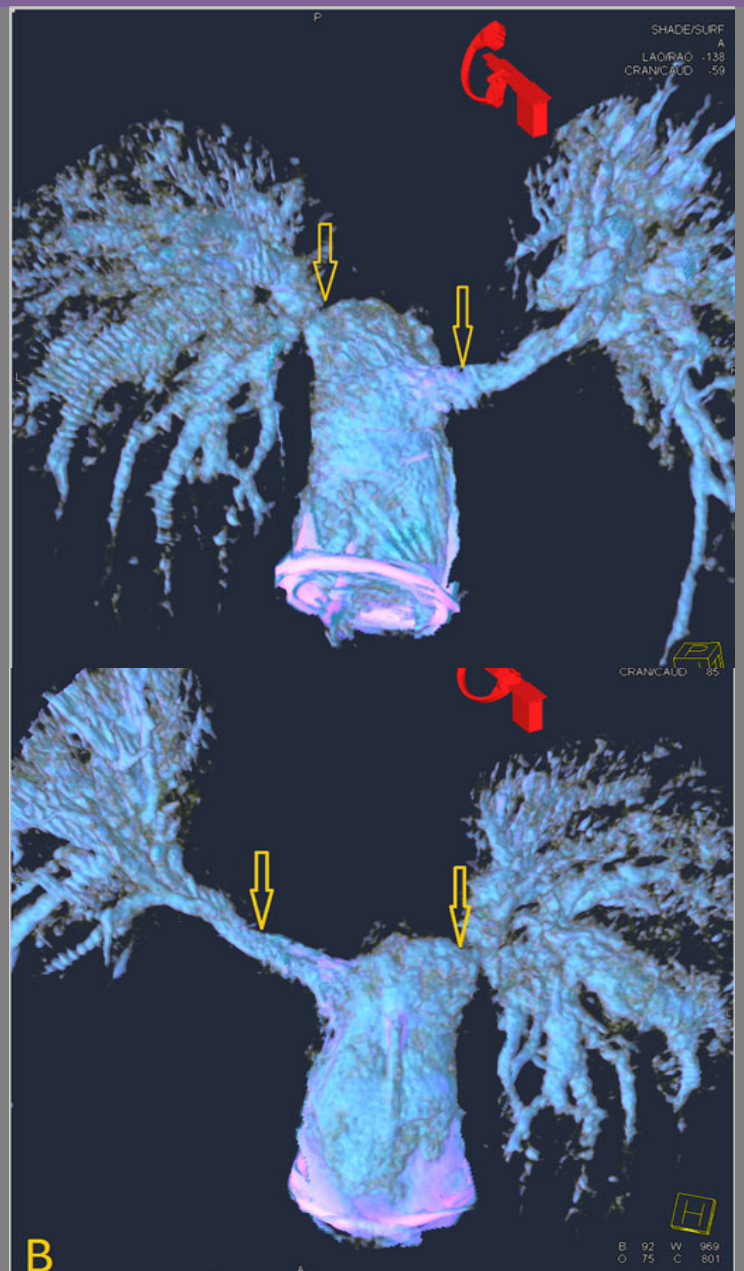


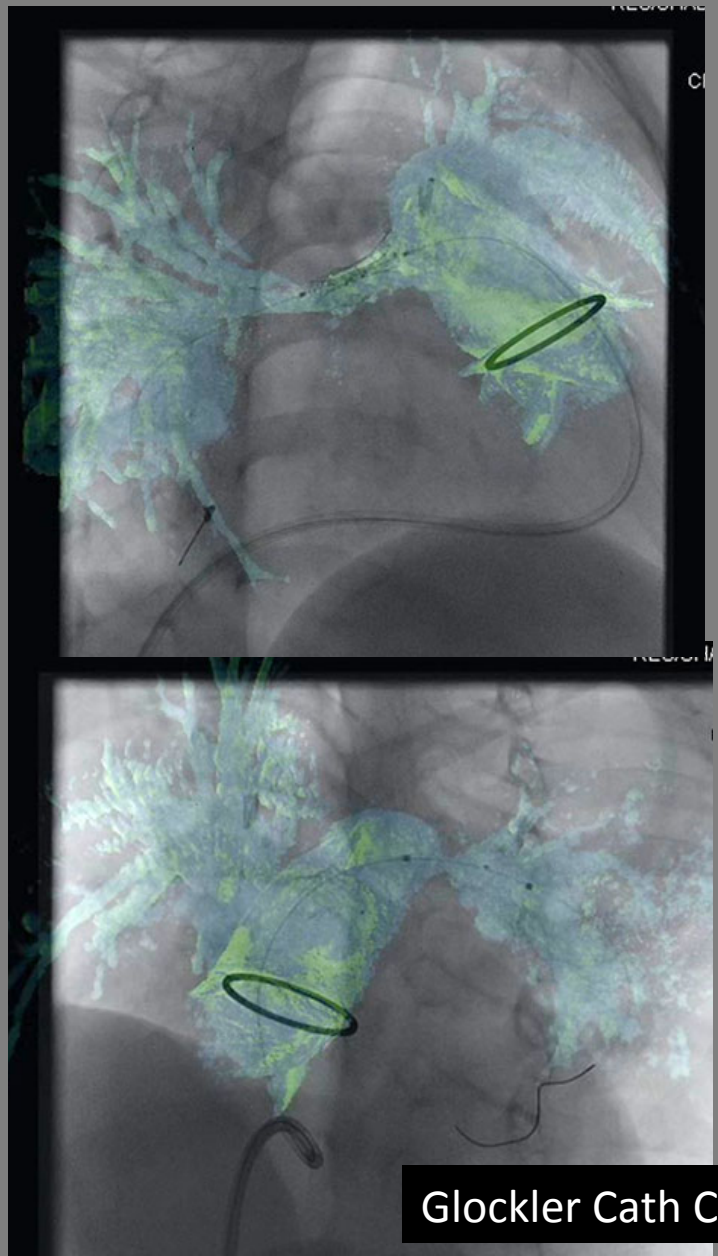




Courtesy Patrice Guerin

Fusion





Glockler Cath CI 2013

S. Hascoët
Cardiologie pédiatrique et congénitale
Hôpital Marie Lannelongue

Thank you for your attention

Groupe de travail sur le cathétérisme Cardiaque pédiatrique et congénital