International Symposium on 3D Imaging for
Interventional Catheterization in CHD
Nationwide Children's Hospital
October 13 -15, 2016

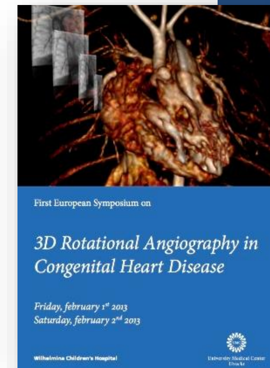
One Country-One Center: Changes in the Management of Single Ventricle Disease Stages I-III

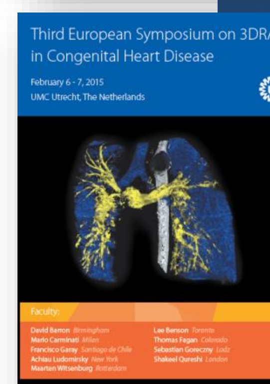
Sebastian Góreczny, Paweł Dryżek, Tomasz Moszura

Department of Cardiology
Polish Mother's Memorial Hospital
Research Institute

Polish Mother's Memorial Hospital

- 250-300 interventions per year
- 400-450 surgeries per year
- Up to 40 newborns with HLHS per year
- Norwood operation is the preferred first stage



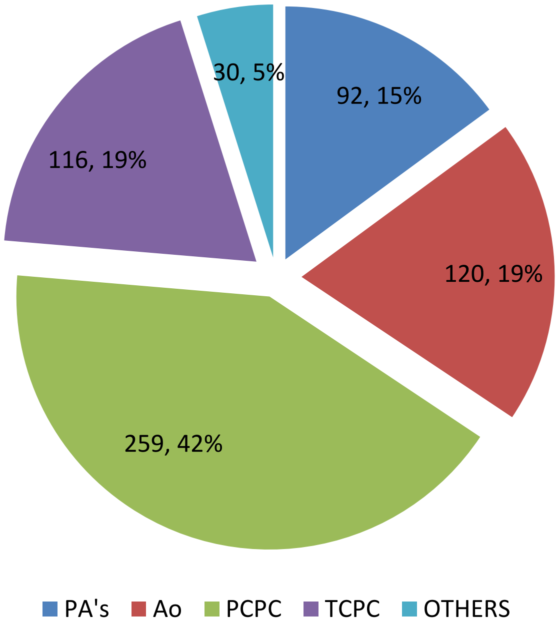


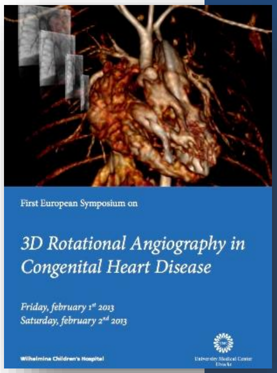
Polish Mother's Memorial Hospital

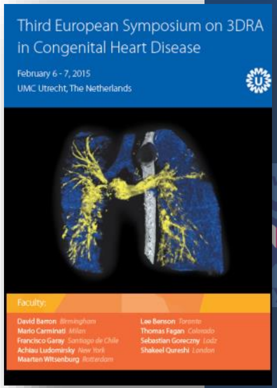
- 250-300 interventions per year
- 400-450 surgeries per year
- Up to 40 newborns with HLHS per year
- Norwood operation is the preferred first stage

3DRA experience:

- Introduced in 03/2010
- 479 catheterizations
- 617 3DRA runs
- 375 runs in PCPC/TCPC – 61 %



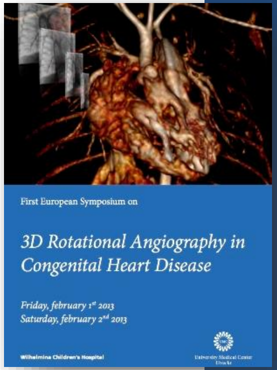


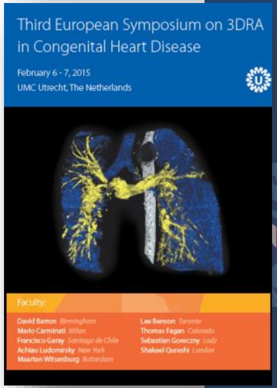


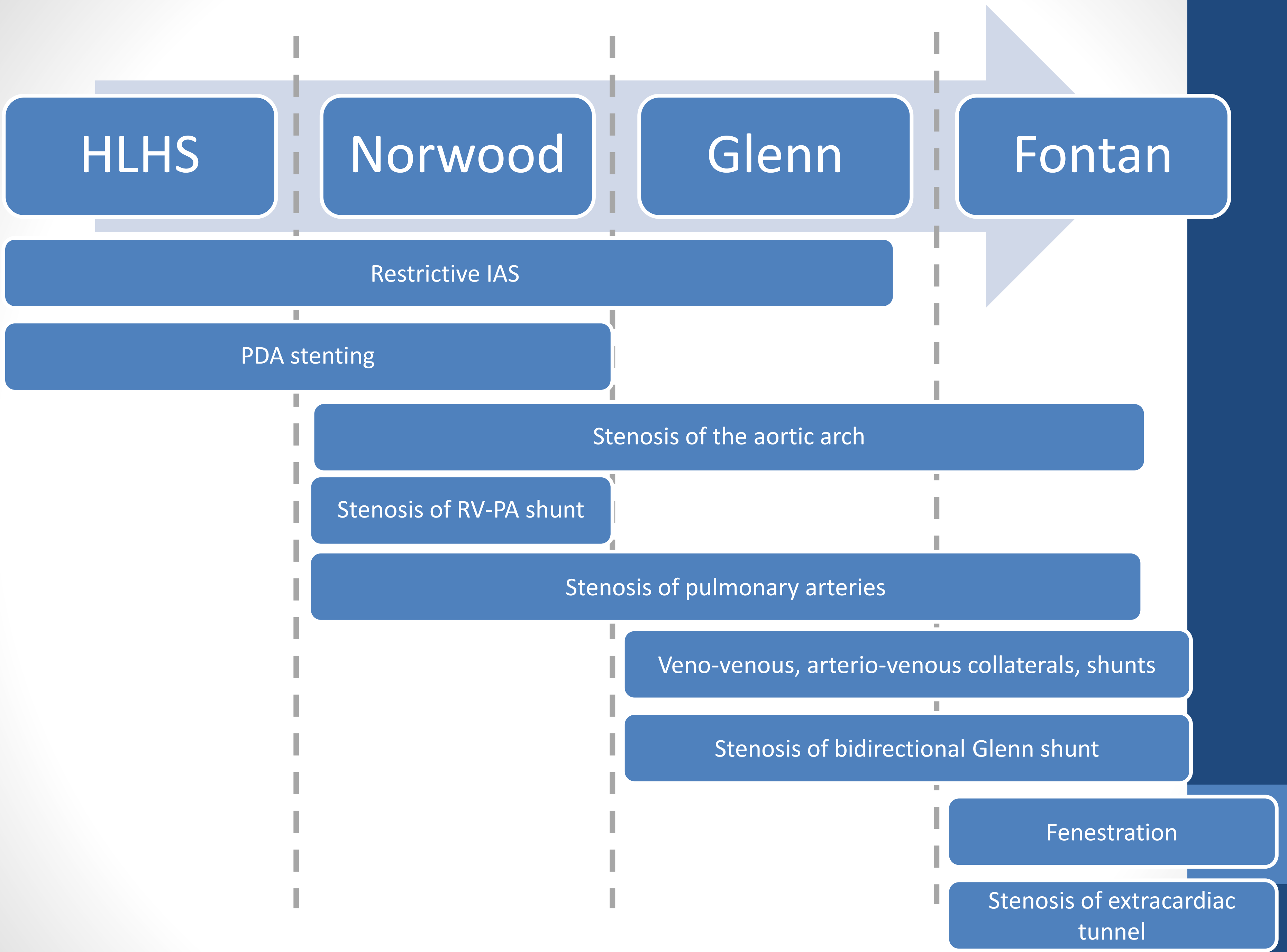
3DRA in Single Ventricle Patients

- Variable and challenging anatomy
- Residual lesions
- Need for numerous studies/interventions
- Small patients, radiation exposure early in life

- Slow blood flow
- Limited wash out of contrast
- Relatively big vessels
- Small systolic-diastolic variability in vessel dimensions



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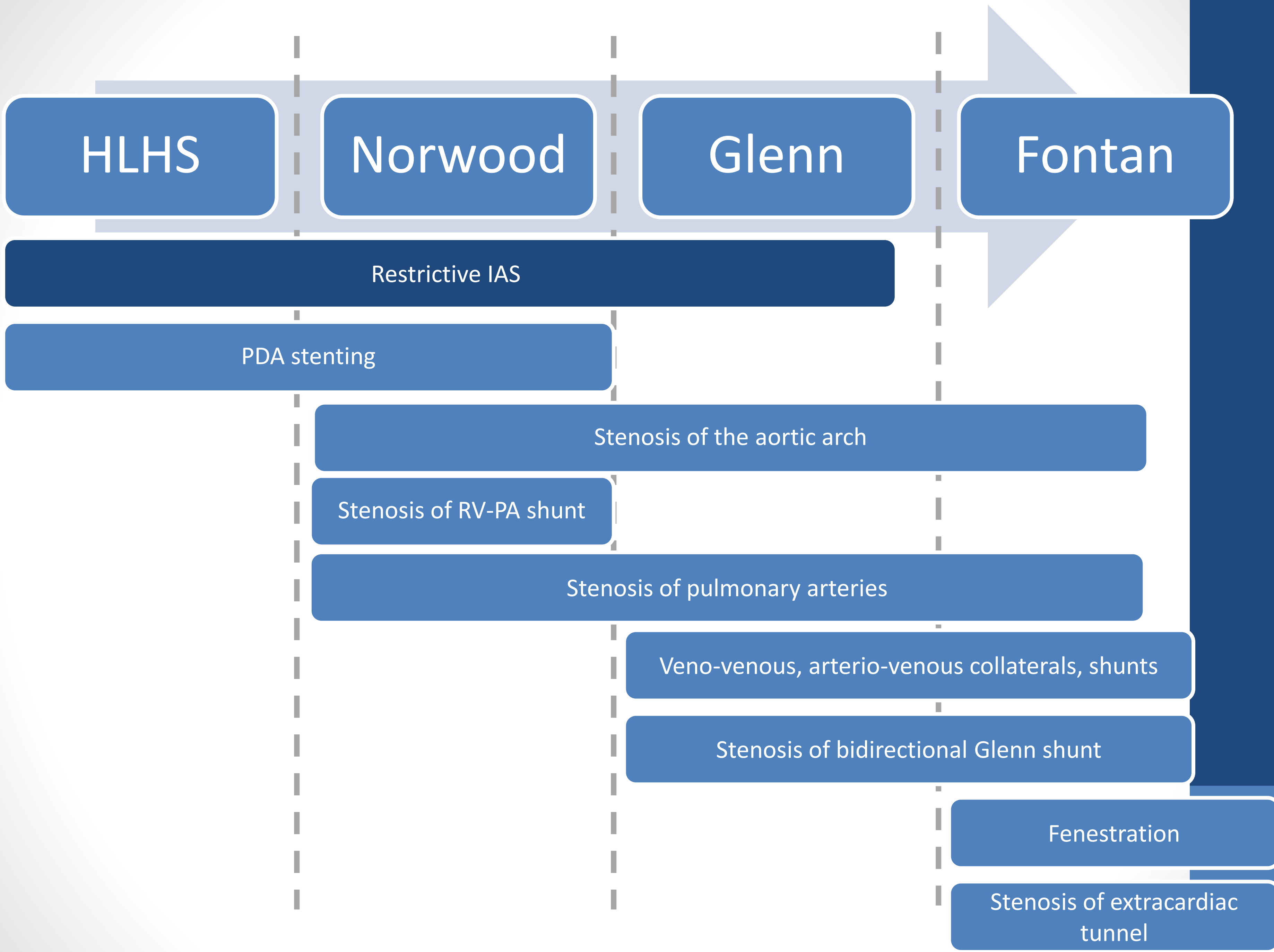
Norwood
Glenn
Fontan
Restrictive IAS
PDA stenting
Stenosis of the aortic arch
Stenosis of RV-PA shunt
Stenosis of pulmonary arteries
Veno-venous, arterio-venous collaterals, shunts
Stenosis of bidirectional Glenn shunt
Fenestration
Stenosis of extracardiac tunnel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Restrictive IAS


Original article

Kardiologia Polska
2011; 69, 11: 1137–1141
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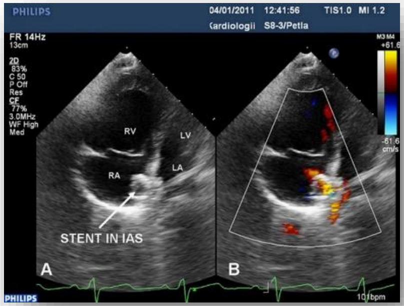
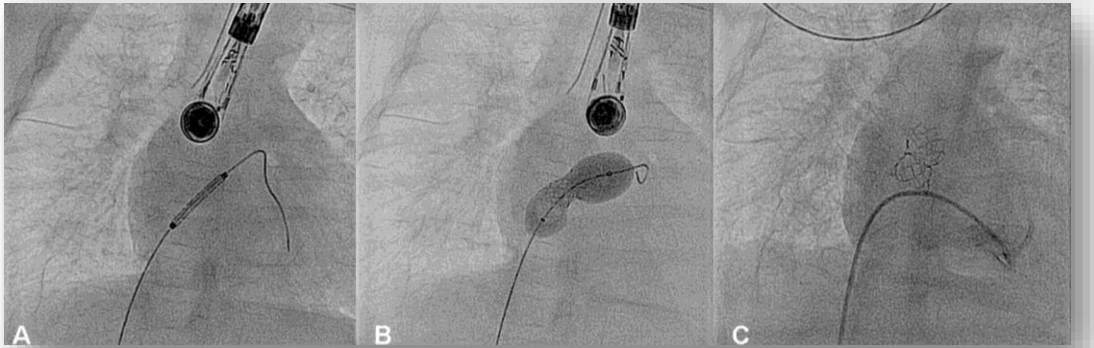
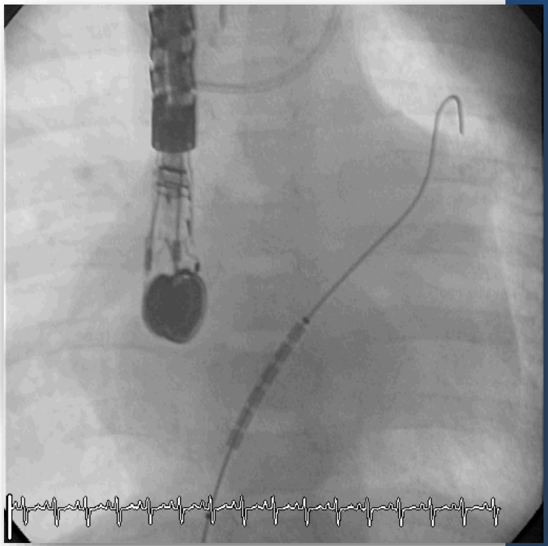
Stent implantation into the interatrial septum in patients with univentricular heart and a secondary restriction of interatrial communication

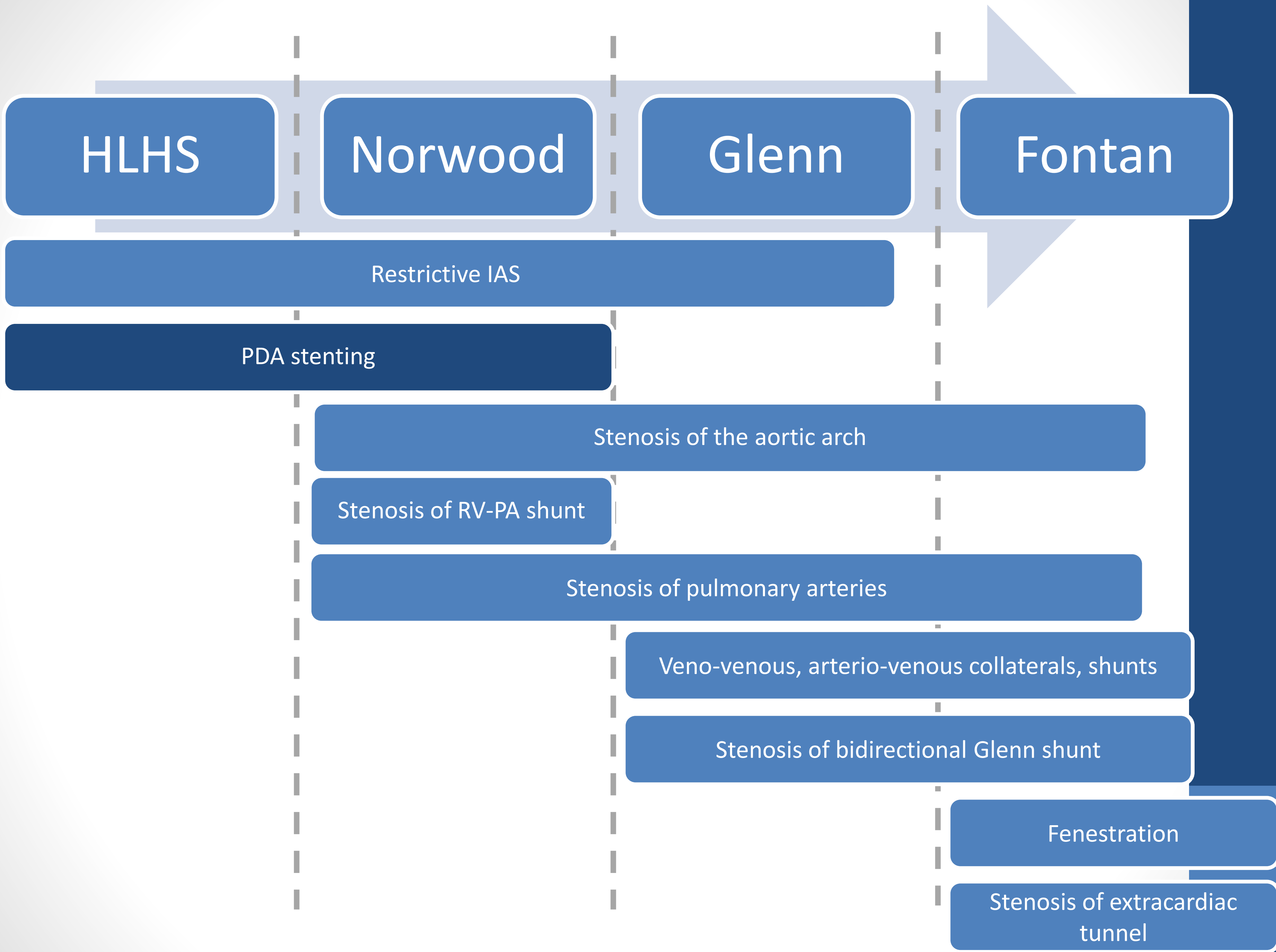
Tomasz Moszura[1, 2], Paweł Dryżek[1], Sebastian Góreczny[1], Waldemar Bobkowski[2], Anna Mazurek-Kula[1], Rafał Surmacz[2], Jadwiga A. Moll[1], Aldona Siwińska[2], Andrzej Sysa[1]







- Imaging for IAS stent implantation:
  - Echocardiography (TEE, TTE)
  - Angiography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HYBRID STAGE I – PDA STENTING

Third European Symposium on 3DRA
and Advanced Imaging in CHD

February 6 - 7, 2015
UMC Utrecht, The Netherlands

POLISH MOTHER'S MEMORIAL HOSPITAL
REASERCH INSTITUTE
ŁÓDŹ, POLAND

CASE # 2
FEBRUARY 6th, 2015

PREP
JADWIGA MOLL, S

OPER
TOMASZ MOSZURA, PAWEŁ

Third European Symposium on 3DRA
and Advanced Imaging in CHD

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Case # 2, DD

History:
15 day old male, 3.7 kg, postnatal diagnosis of critical AS at a local hospital
nCPAP -> mechanical ventilation, Prostin initiated
At the age of 3 days transferred to NICU in poor condition
Initialy required Adrenaline infusion, which was later replaced with Milrinone
Echo: AA + MS
On the 8th day of life presented with fever and increase in CRP (5 g/dl; N < 1 g/dl)

Polish Mother's Memorial Hospital

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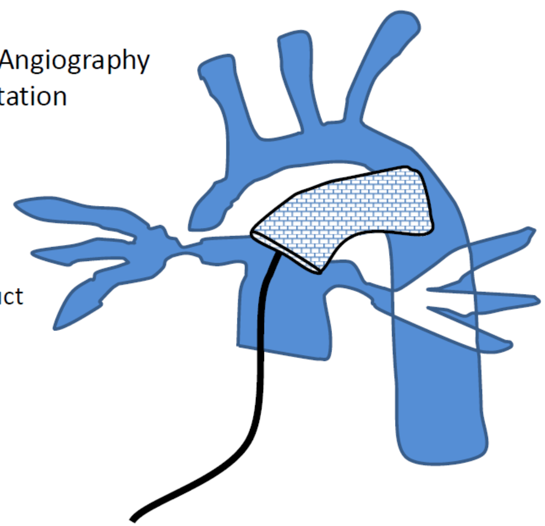
Case # 2, AT

Intended intervention:
- Three Dimentional Rotational Angiography
- 3D guided ductal stent implantation
- Consideration of septostomy

Rotational Angiography:
- Singlesite contrast injection
  - Short 6 Fr sheath in RFV
  - 4 Fr catheter in the arterial duct
- 12/4 ml of 70% diluted contrast

Breath hold
1 sec delay
4.1 sec run

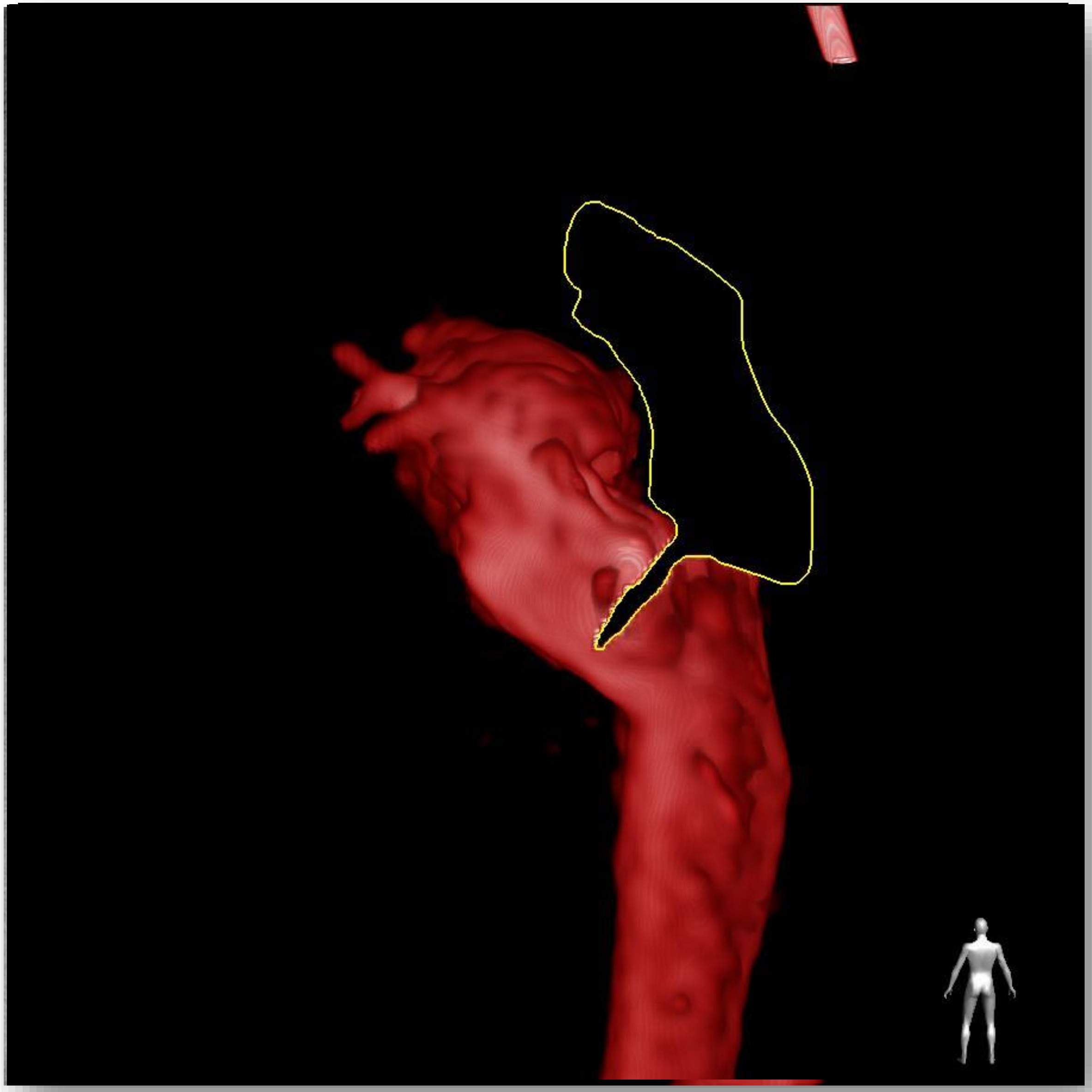


Case # 2

Polish Mother's Memorial Hospital

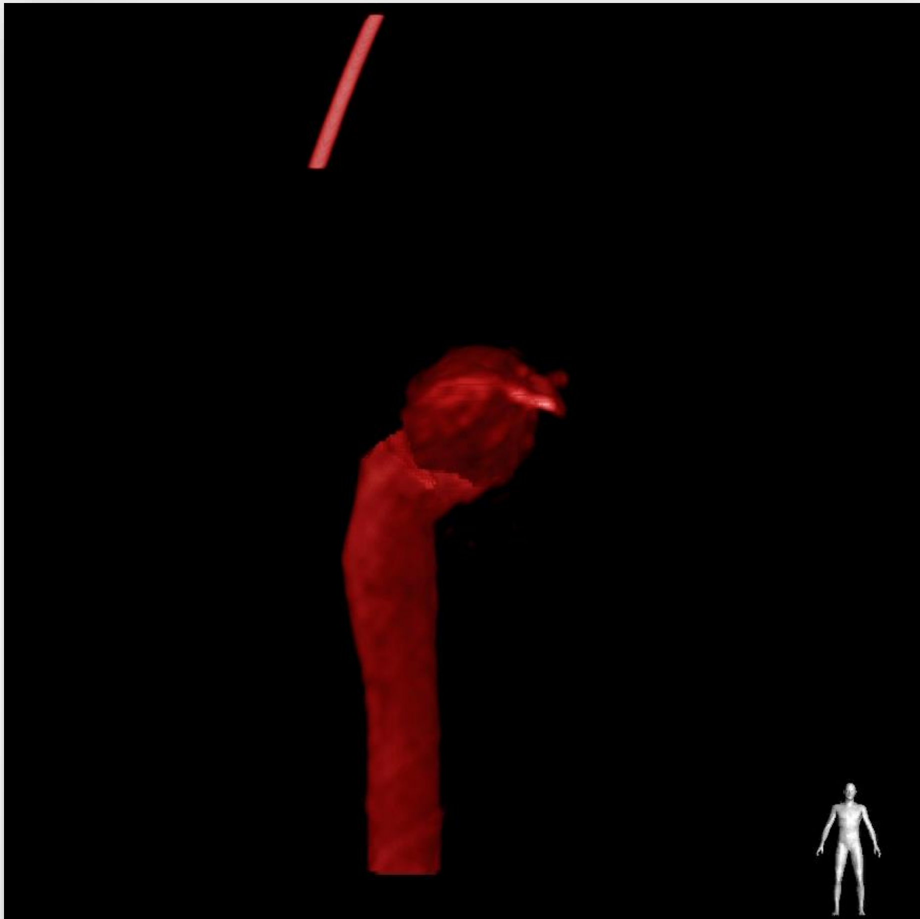
ROTATIONAL ANGIOGRAPHY

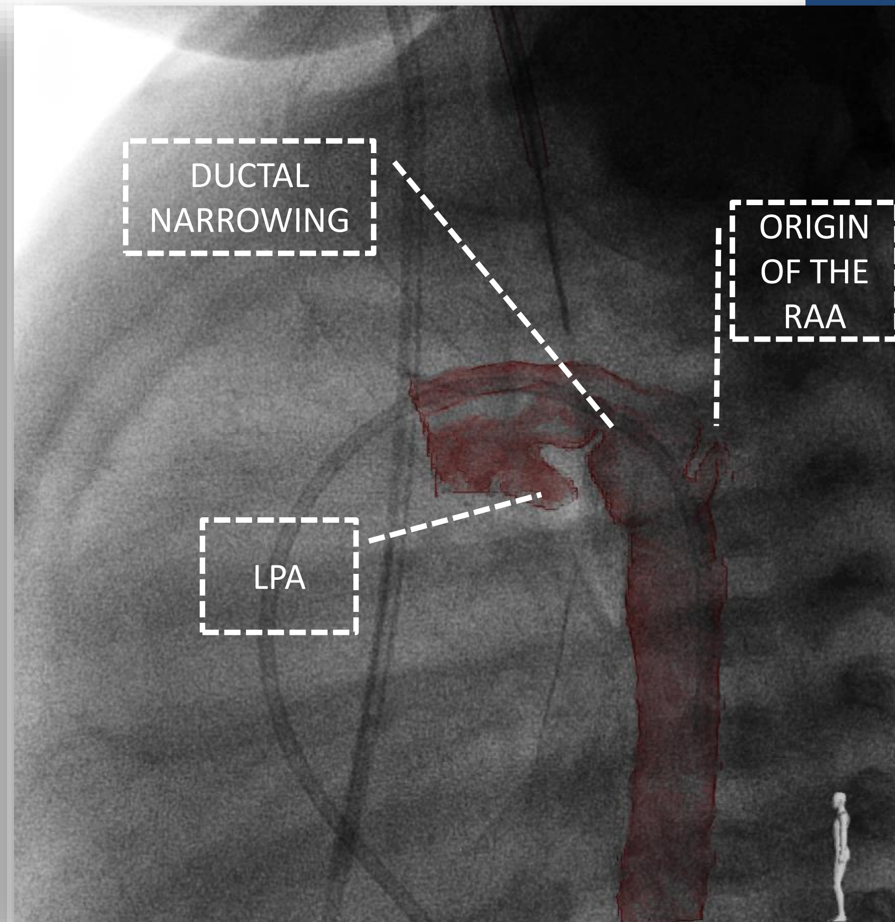
AW 3D RECONSTRUCTION



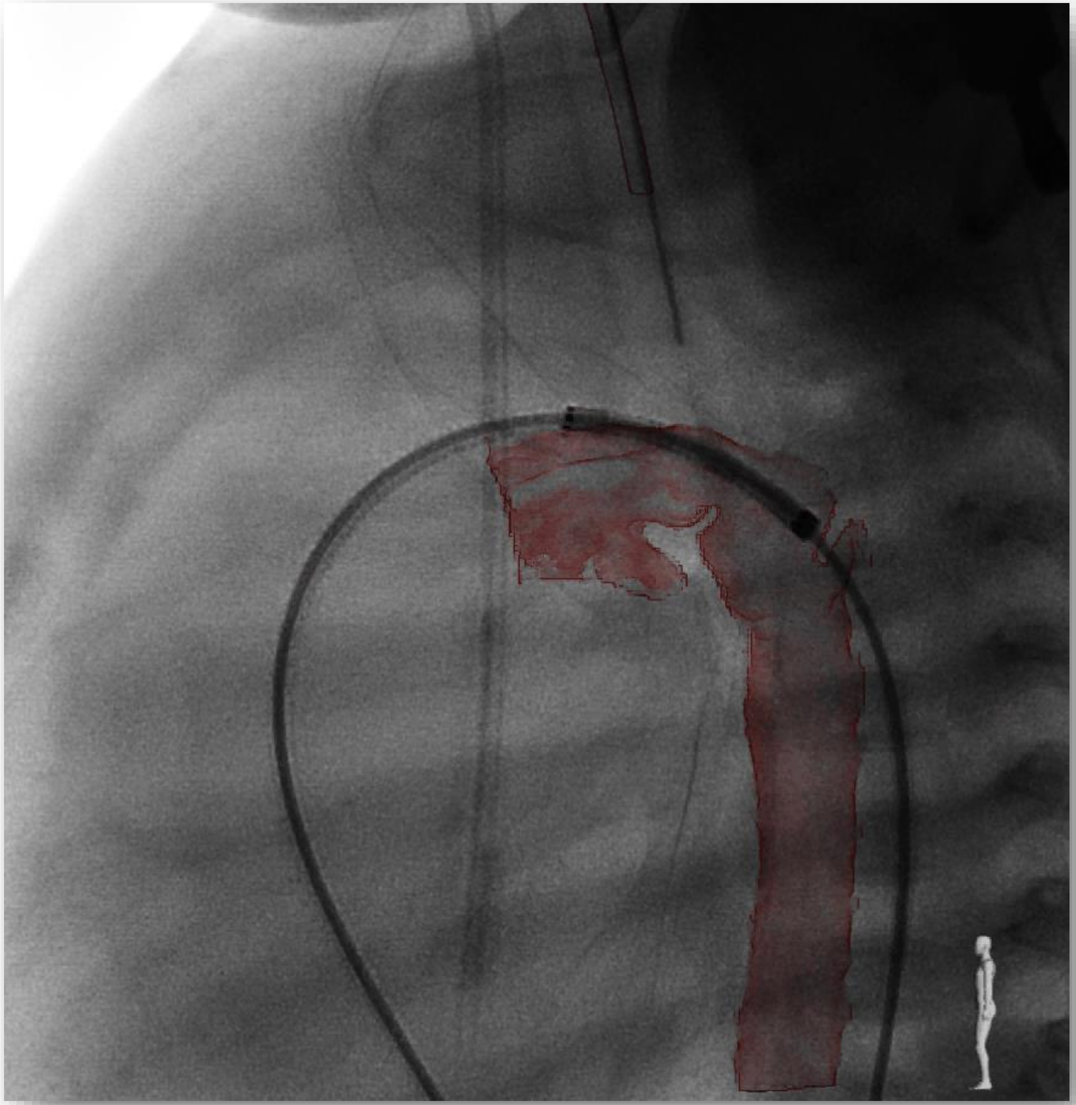
3D RECONSTRUCTION OVERLAY ON FLUOROSCOPY IMAGE

3D RECONSTRUCTION AFTER POST-PROCESSING

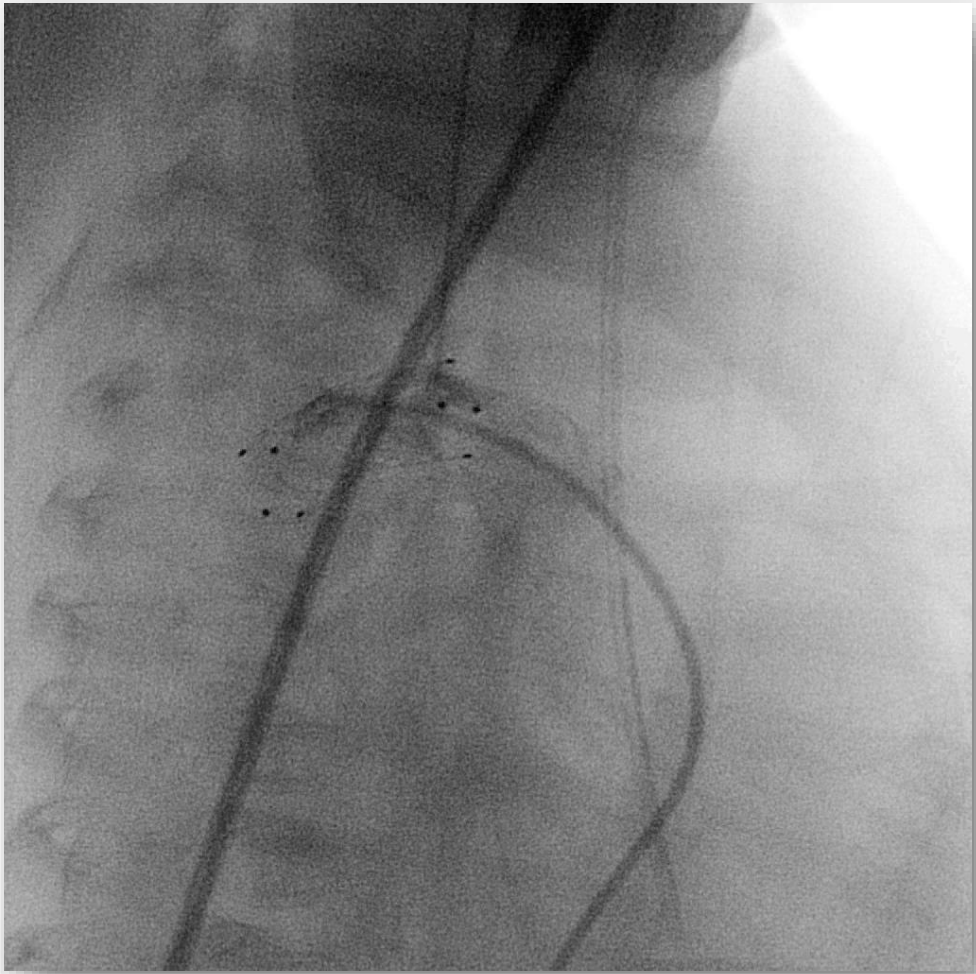


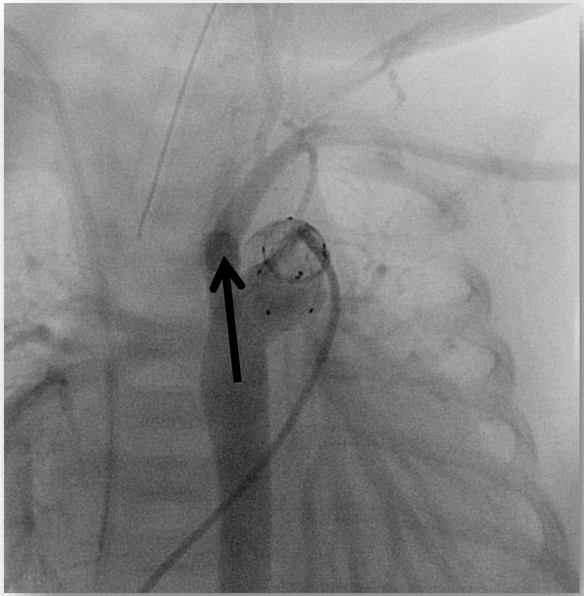


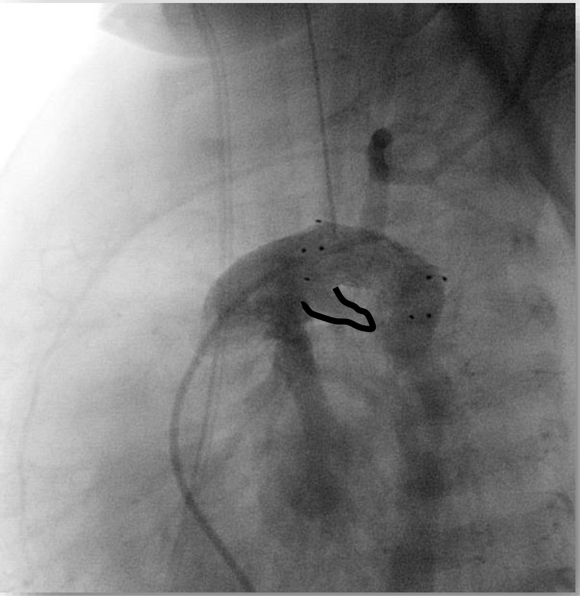
STENT DEPLOYMENT – 8 X 20 MM ZILVER FLEX



FINAL ROTATIONAL ANGIOGRAPHY

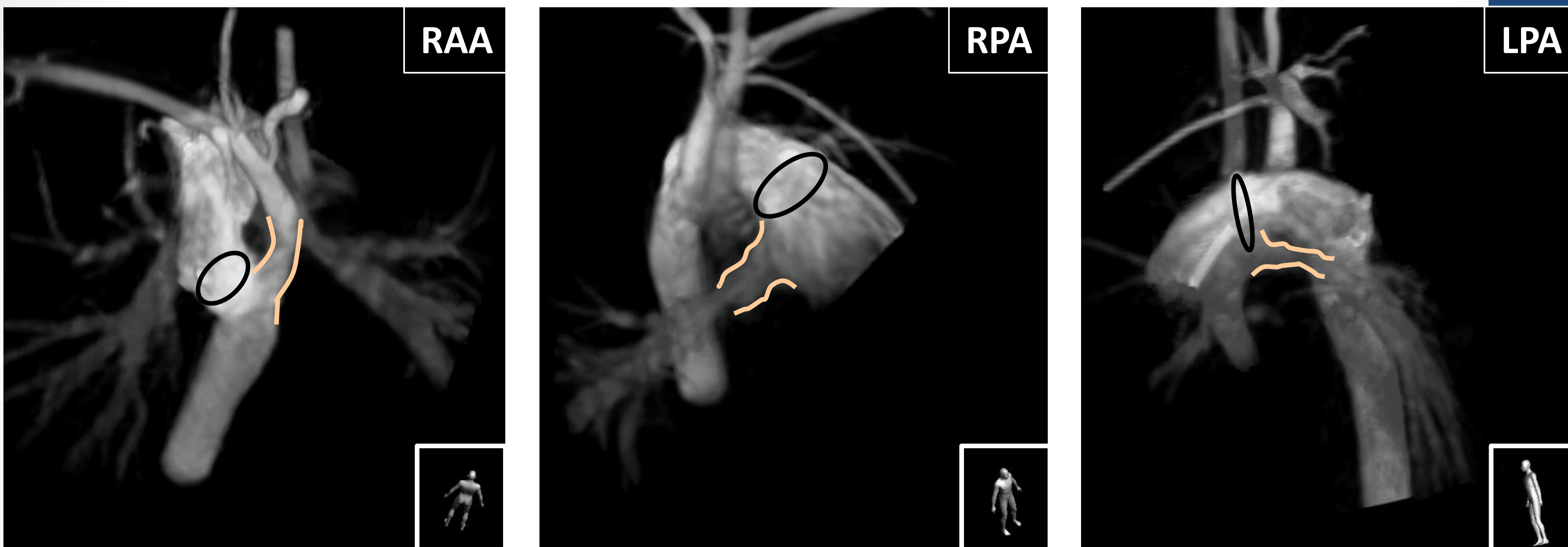






12/4 ml of undiluted, 0.5 sec delay
DAP - 158 mGycm2

FINAL 3D RECONSTRUCTION –STENT RELATIONSHIP TO NEARBY STRUCTURES



SUMMARY:

Total contrast – 24 ml
Fluoroscopy time – 6.2 min
RA radiation dose – 355 mGycm2
Total radiation dose – 2478 mGycm2
RA/Total radiation dose – 0.14
Skin in to skin out time – 35 min

EuroIntervention

Initial experience with live three-dimensional image overlay for ductal stenting in hypoplastic left heart syndrome.

--Manuscript Draft--

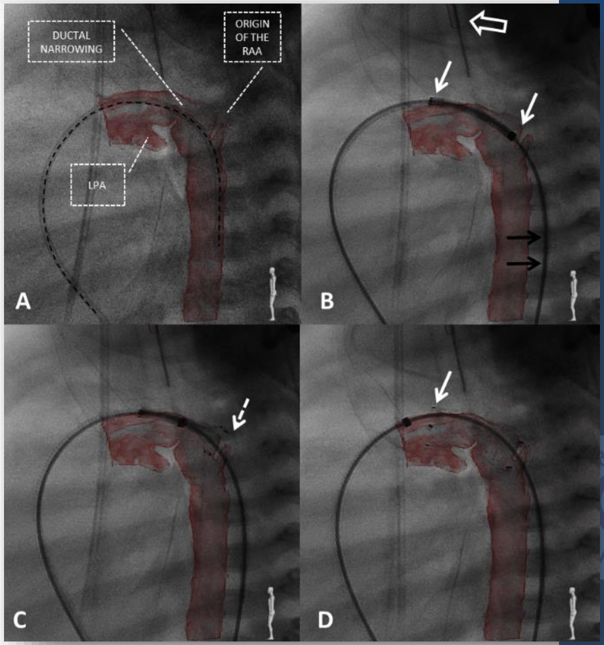
METHODS AND RESULTS:

- Retrospective review of ductal stenting in 18 newborns with HLHS, including 6 patients with 3DR overlay used to guide the intervention.
- Eleven RA runs were performed, pre and post stent implantation in 5 patients and before the intervention in a single patient.
- Three-dimensional reconstructions from all RA runs had image quality sufficient to allow stent placement without additional contrast injections.
- Comparison with 2D angiography guided ductal stenting showed similar contrast usage with the 2D angiography patients receiving higher radiation dose.

Table 2. Comparison between patients with 3DR overlay and 2D angiography guided ductal stenting.

	3D (n=6)	2D (n=12)	p
Age (days)	20.3 ± 6.1	39.7 ± 19	0.03
Weight (kg)	3.35 ± 0.4	3.4 ± 0.7	0.88
Fluoroscopy time (min)	9.8 ± 5.6	16.2 ± 9.1	0.13
DAP (µGym2)	289.1 ± 123.5	709 ± 482.9	0.02
Total contrast (ml)	21 ± 5.5	21.5 ± 8.6	0.88

DAP – Dose Area Product



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CONCLUSIONS:

- Three dimensional rotational angiography provides accurate visualization of the ductal morphology and nearby structures.

- Three-dimensional reconstruction overlay with clear landing points enables precise stent implantation with no additional contrast injections and lower radiation doses than conventional angiography in our patients.

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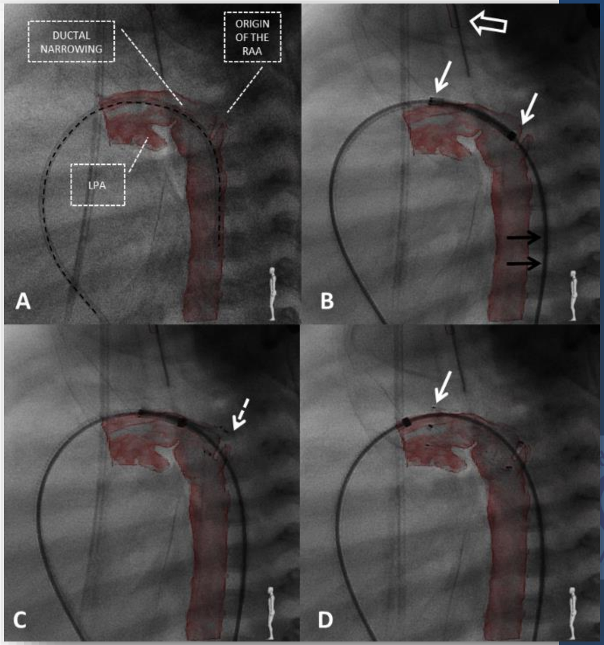
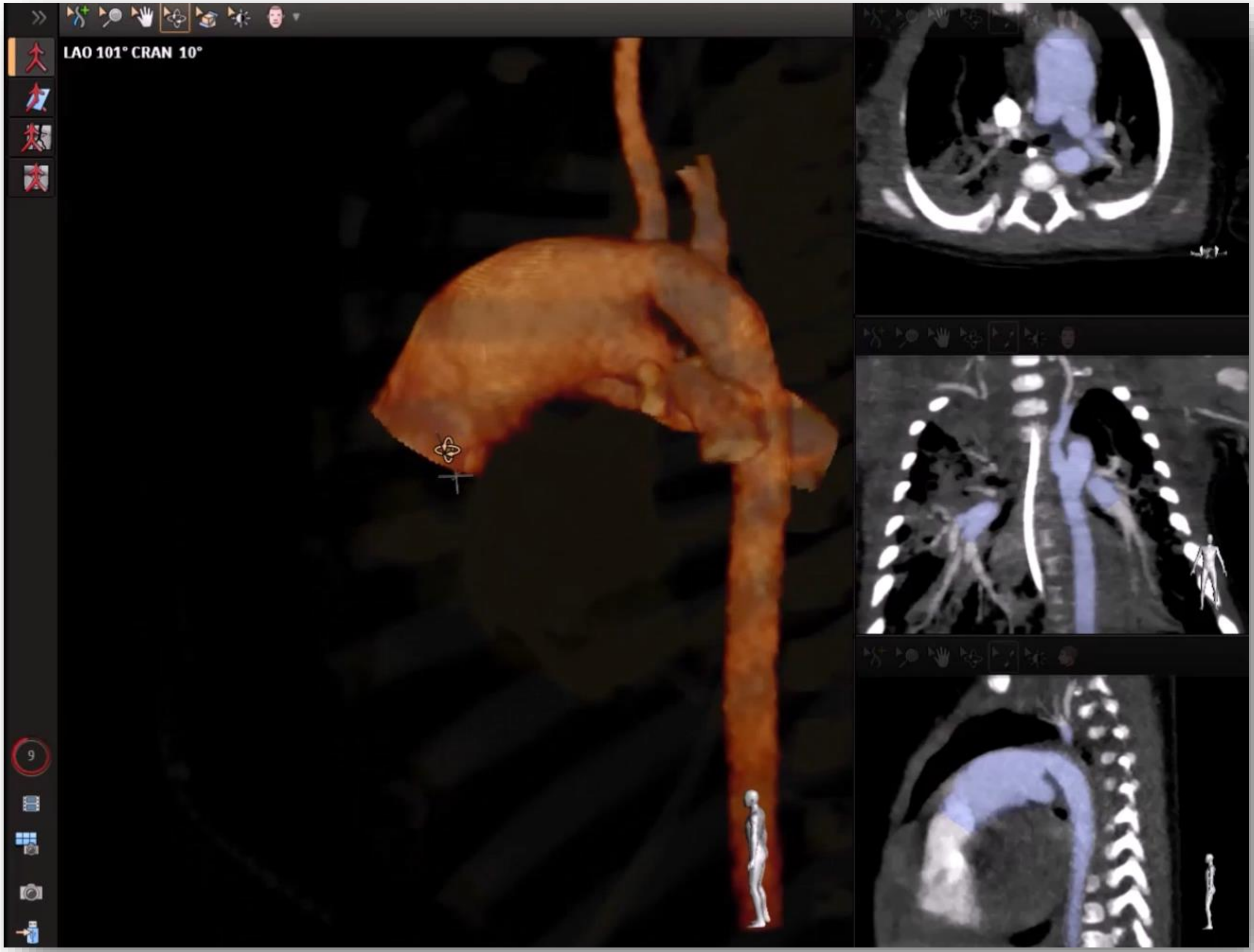
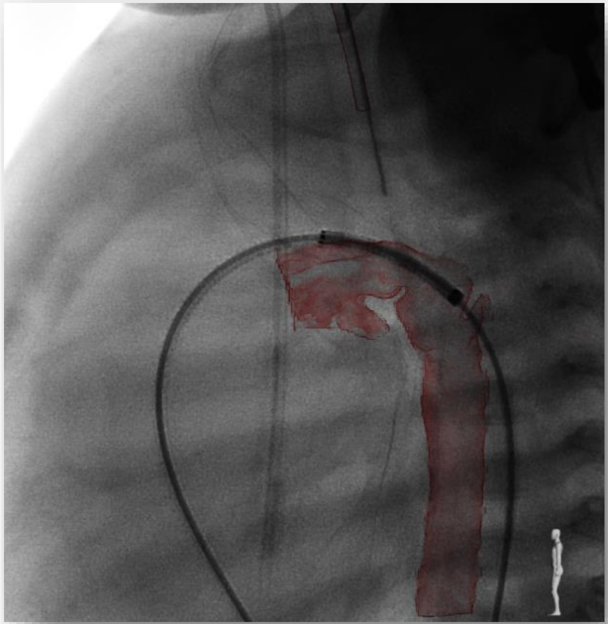


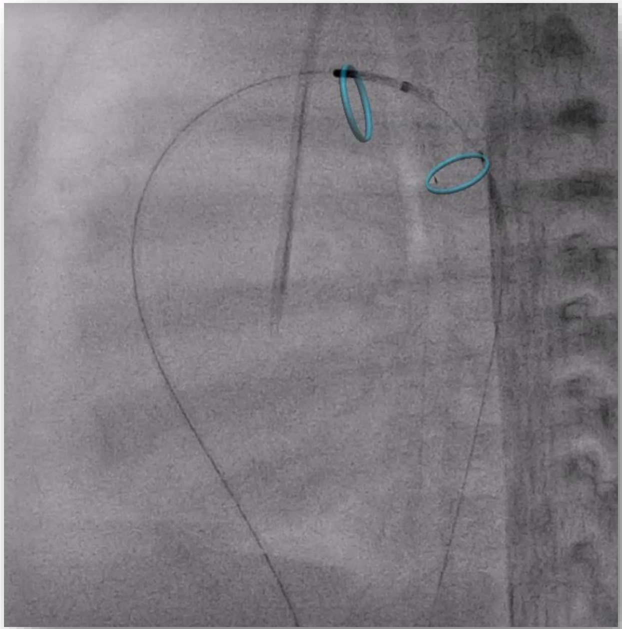
HYBRID STAGE I –
VESSELNAVIGATOR GUIDED PDA STENTING



- HLHS, s/p bPAB
- 3 kg, 0.22 m2
- CT – 5 ml, 65.6 mGy cm

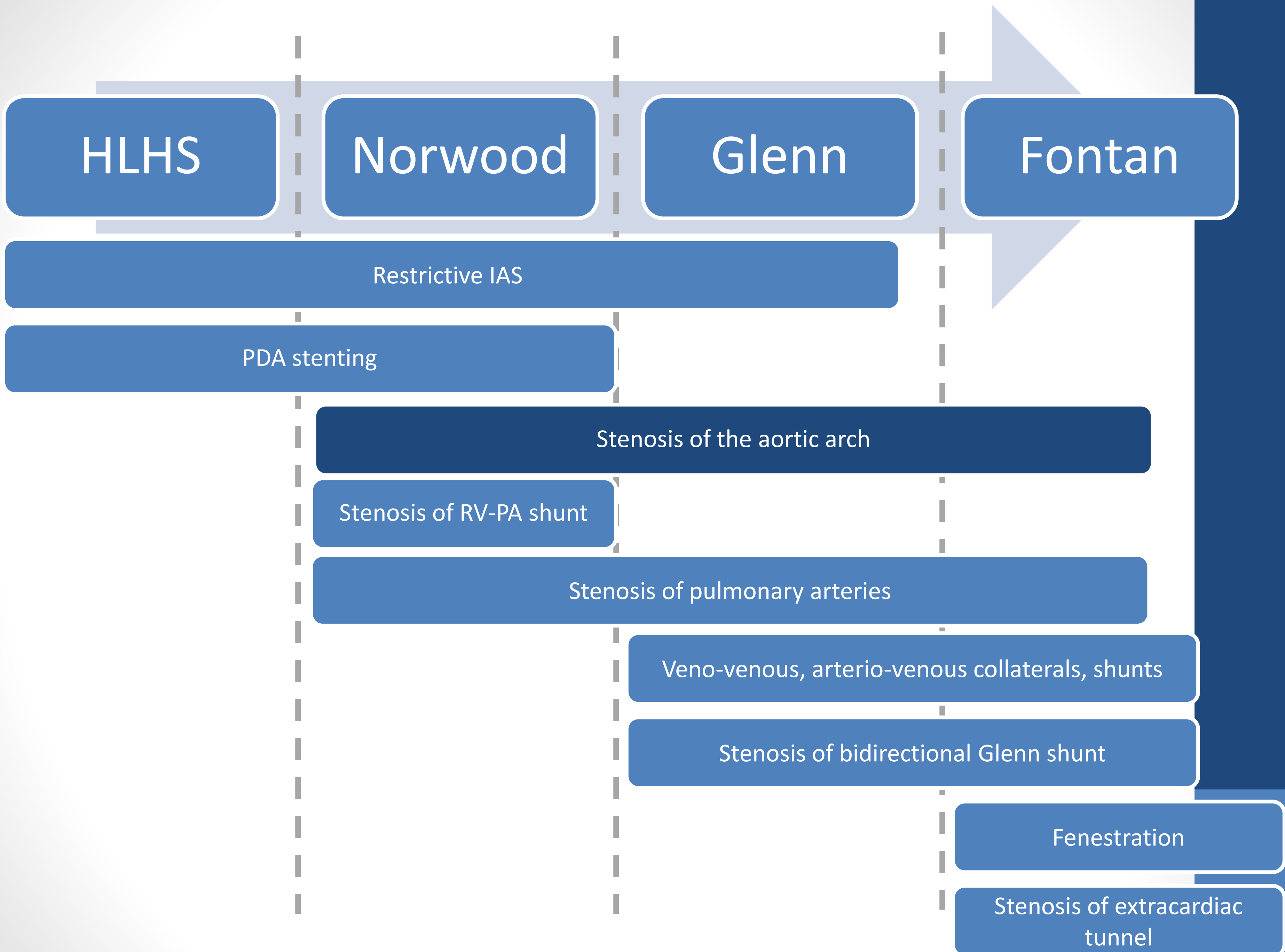
HYBRID STAGE I – PDA STENTING





- 3DRA Guidance
  - Total contrast – 24 ml
  - Fluoroscopy time – 6.2 min
  - RA radiation dose – 355 mGy cm2
  - Total radiation dose – 2478 mGy cm2
  - RA/Total radiation dose – 0.14
  - Skin in to skin out time – 35 min

- VesselNavigator Guidance
  - Total contrast – 5 ml
  - Fluoroscopy time – 4.3 min
  - N/A
  - Total radiation dose – 862 mGy cm2
  - N/A
  - Skin in to skin out time – 15 min
  - CT DLP – 65.6 mGy cm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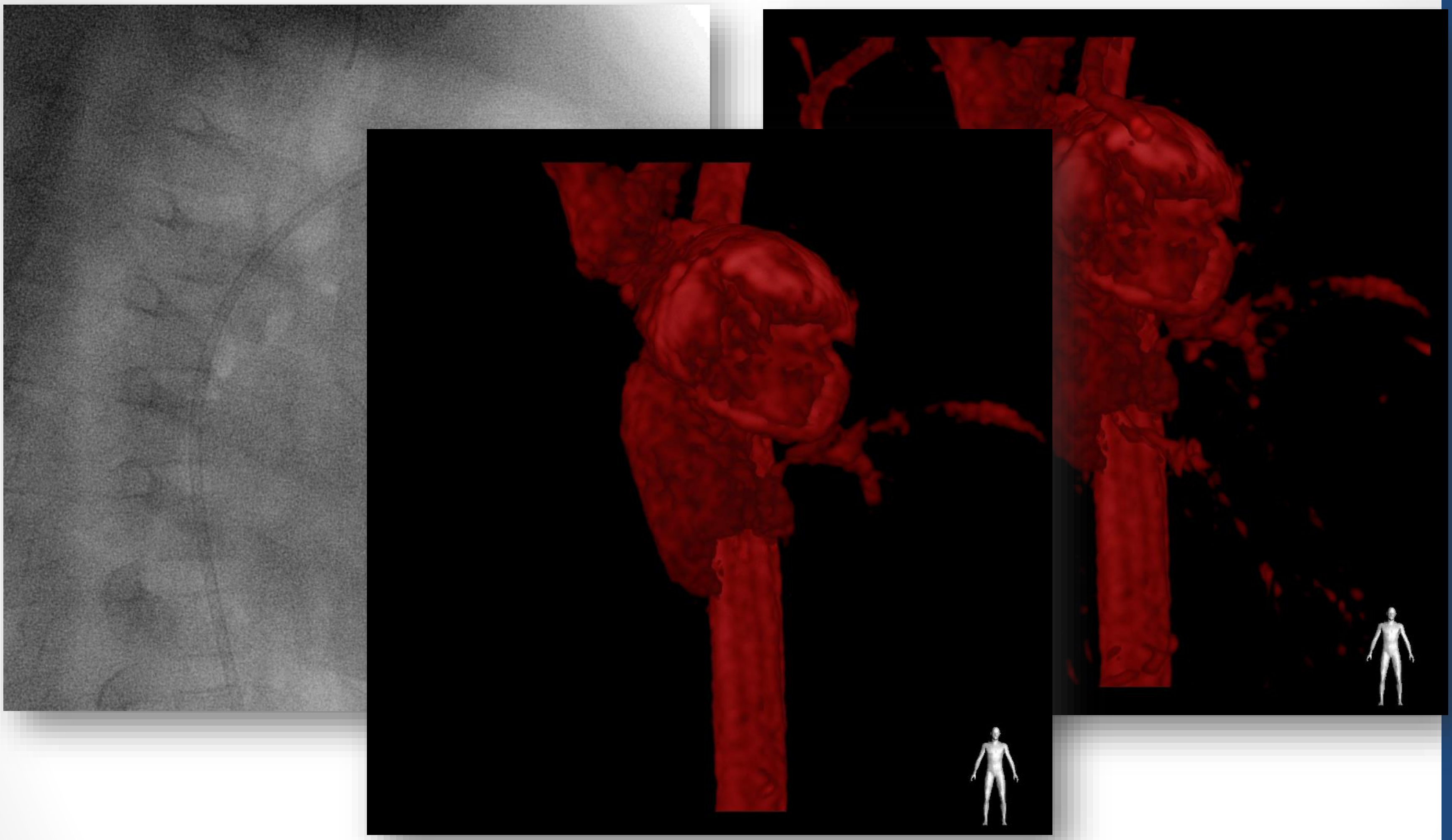
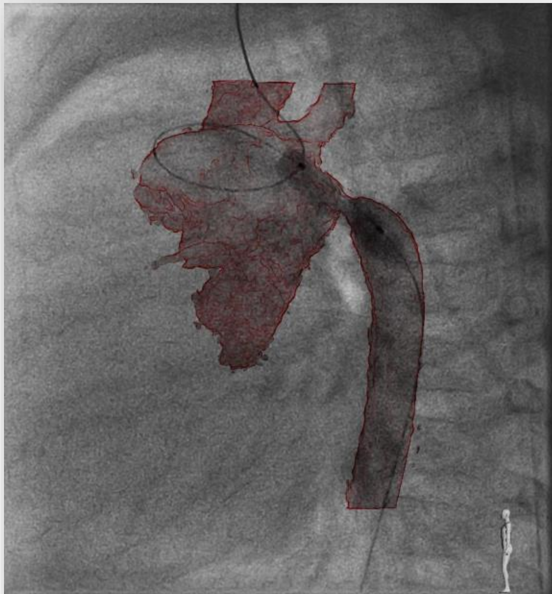
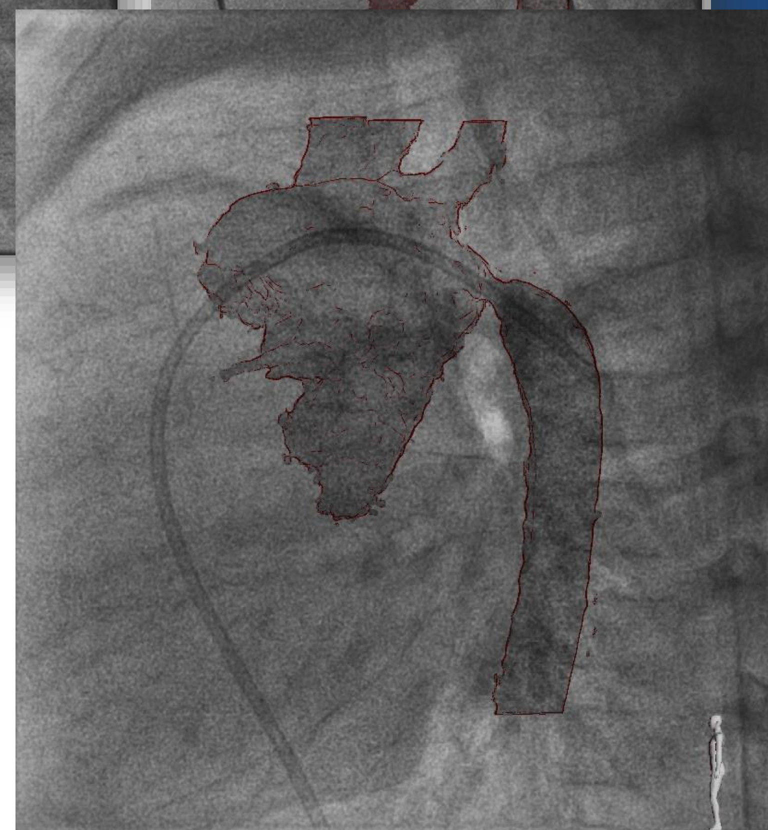
CoA post Nowrood



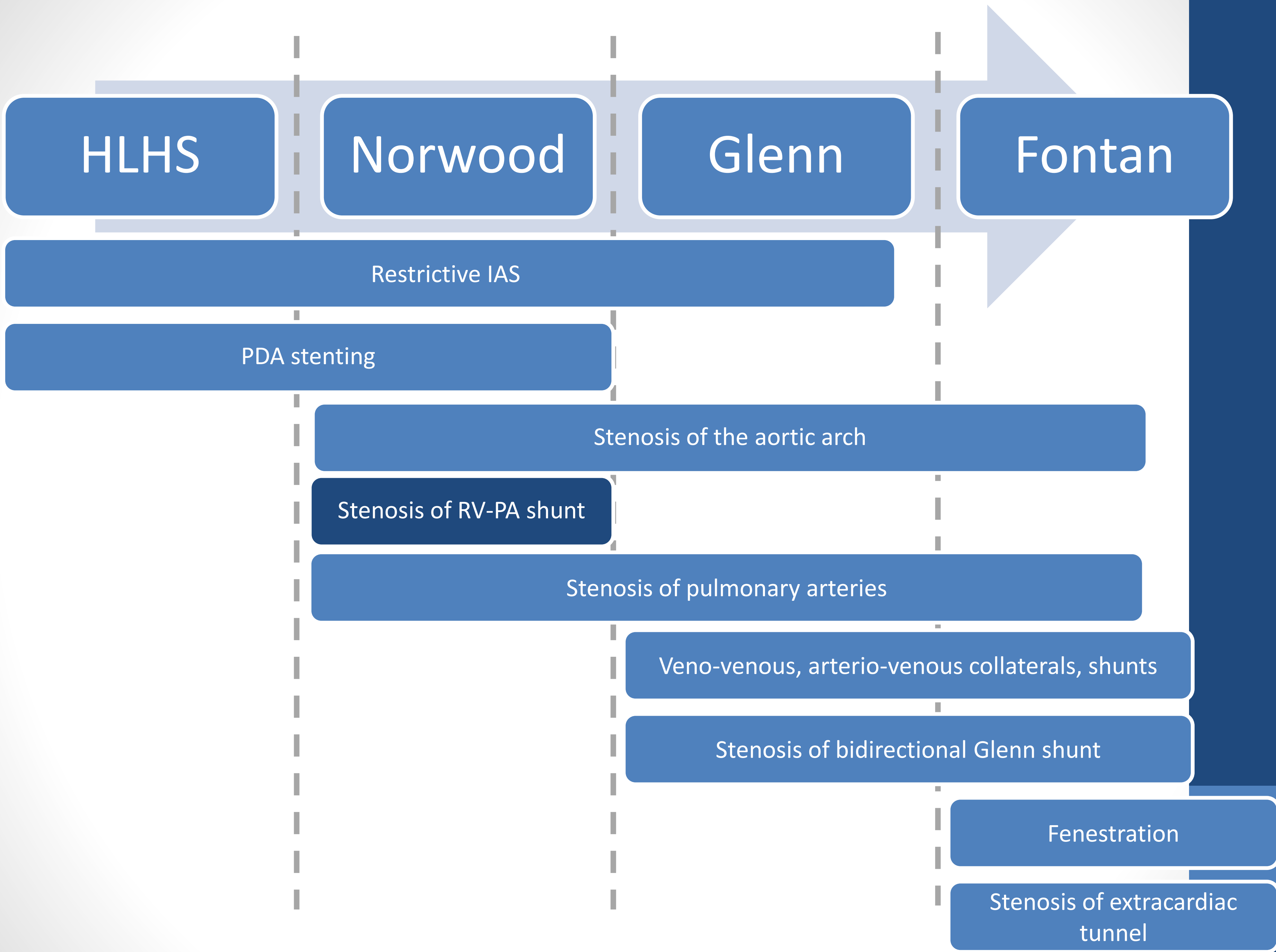
- HLHS, 5 months old, 5kg,
- RA with 70% stenght contrast
- Total volume 25 ml
- Injected over 5 sec

CoA post Nowrood



- AO 106/45/71, DAO 55/43/49, Gr – 51 mmHg
- 4 x 15 mm coronary balloon (Apex)
- 6 x 20 mm high-pressure balloon (Cordis)
- 8 x 20 mm high-pressure balloon (Cordis)
- AO 96/48/69, DAO 90/45/64, Gr – 6 mmHg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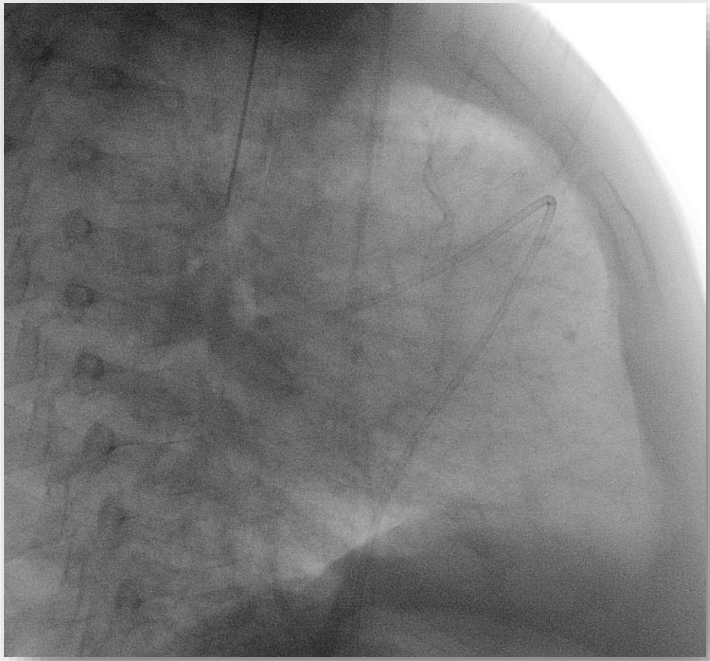
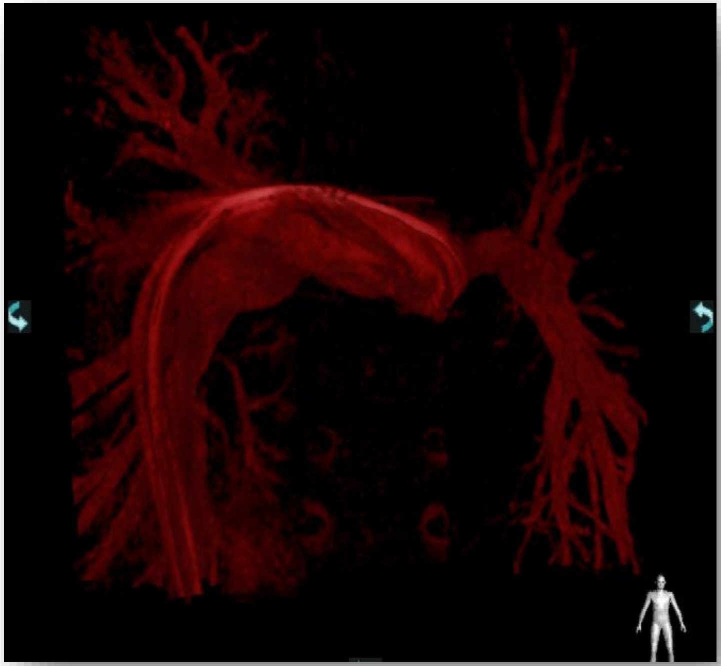
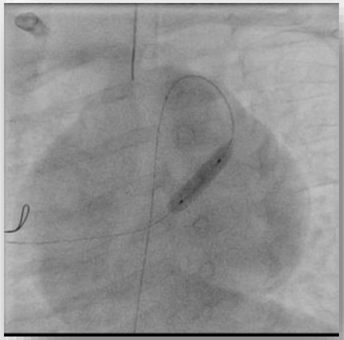
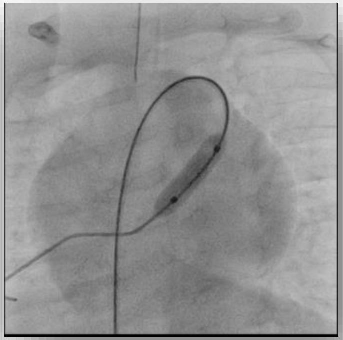
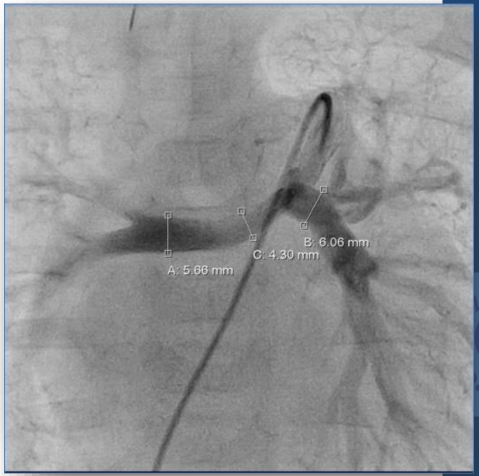
RV-PA Shunt and Pulmonary Arteries after NW





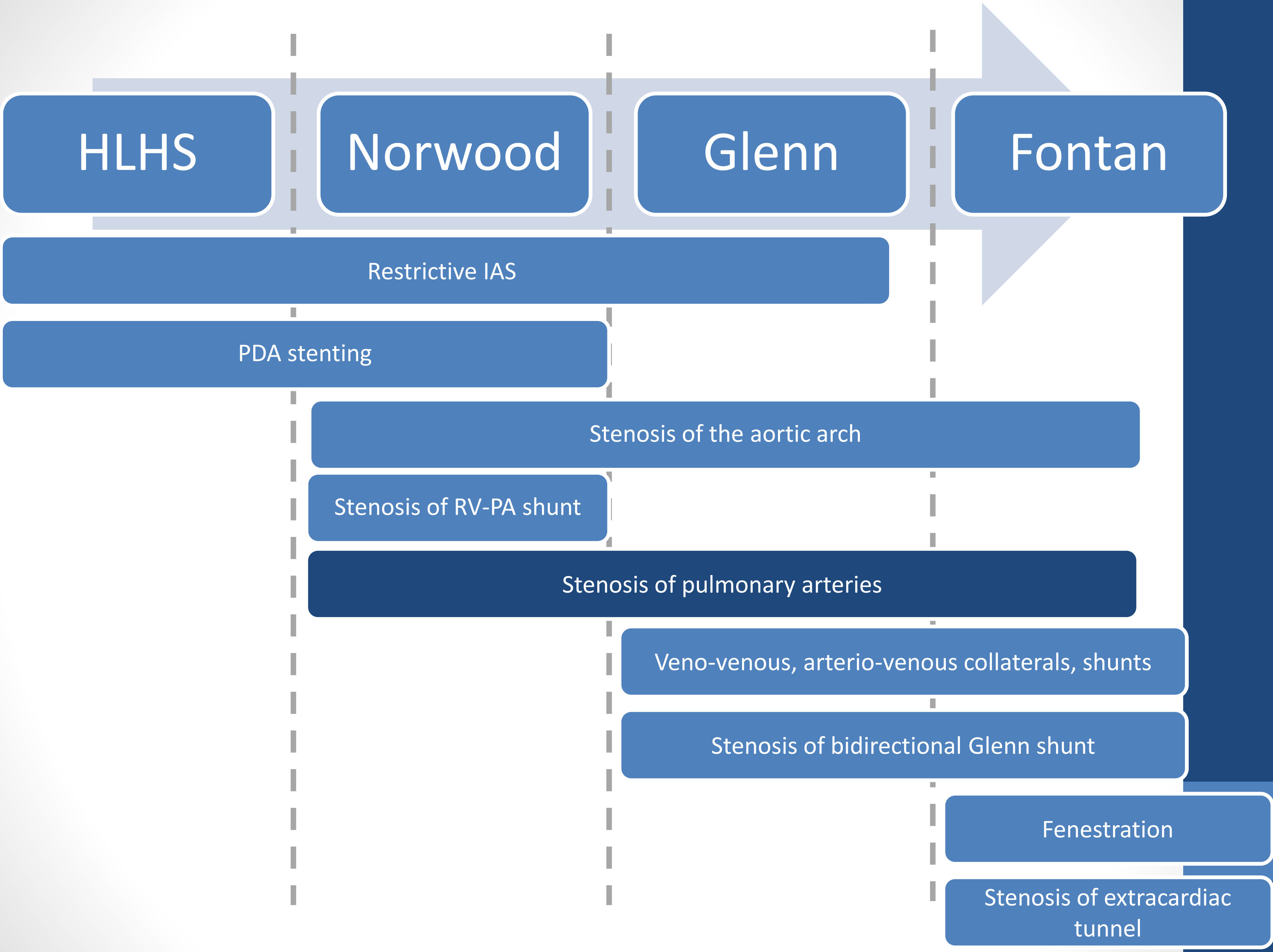






RV-PA Shunt and Pulmonary Arteries after NW

- 4 x 20 mm coronary balloon (Apex)
- 5 x 20 mm low-pressure balloon (Tyshak II)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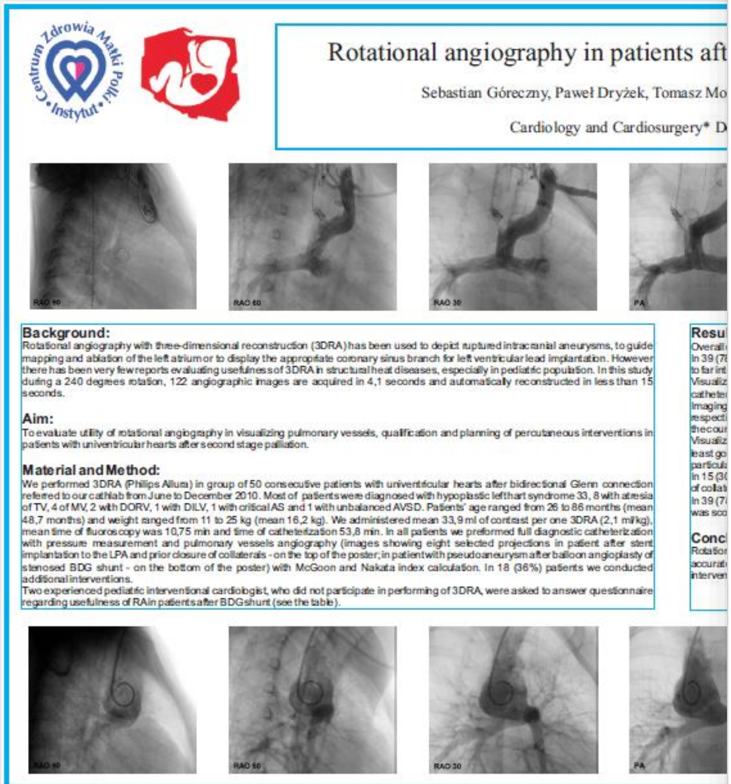
3DRA in patients after PCPC



Rotational angiography in patients aft

Sebastian Góreczny, Paweł Dryżek, Tomasz Mo

Cardiology and Cardiosurgery* D

RAO 90

RAO 60

RAO 30

PA

Background:
Rotational angiography with three-dimensional reconstruction (3DRA) has been used to depict ruptured intracranial aneurysms, to guide mapping and ablation of the left atrium or to display the appropriate coronary sinus branch for left ventricular lead implantation. However there has been very few reports evaluating usefulness of 3DRA in structural heat diseases, especially in pediatric population. In this study during a 240 degrees rotation, 122 angiographic images are acquired in 4,1 seconds and automatically reconstructed in less than 15 seconds.

Aim:
To evaluate utility of rotational angiography in visualizing pulmonary vessels, qualification and planning of percutaneous interventions in patients with univentricular hearts after second stage palliation.

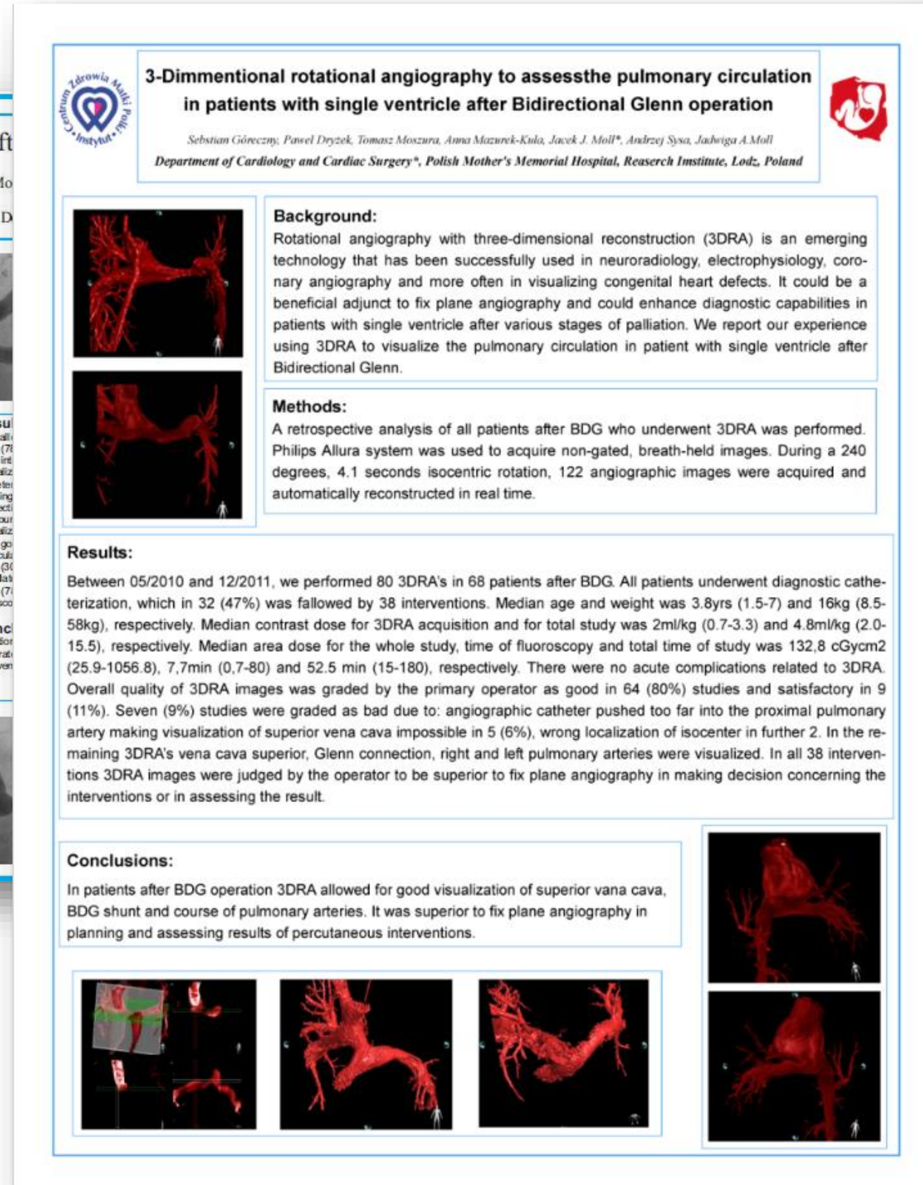
Material and Method:
We performed 3DRA (Philips Allura) in group of 50 consecutive patients with univentricular hearts after bidirectional Glenn connection referred to our cathlab from June to December 2010. Most of patients were diagnosed with hypoplastic left hart syndrome 33, 8 with atresia of TV, 4 of MV, 2 with DORV, 1 with DILV, 1 with critical AS and 1 with unbalanced AVSD. Patients' age ranged from 26 to 86 months (mean 48,7 months) and weight ranged from 11 to 25 kg (mean 16,2 kg). We administered mean 33,9 ml of contrast per one 3DRA (2,1 ml/kg), mean time of fluoroscopy was 10,75 min and time of catheterization 53,8 min. In all patients we preformed full diagnostic catheterization with pressure measurement and pulmonary vessels angiography (images showing eight selected projections in patient after stent implantation to the LPA and prior closure of collaterals - on the top of the poster; in patient with pseudoaneurysm after balloon angioplasty of stenosed BDG shunt - on the bottom of the poster) with McGoon and Nakata index calculation. In 18 (36%) patients we conducted additional interventions.
Two experienced pediatric interventional cardiologist, who did not participate in performing of 3DRA, were asked to answer questionnaire regarding usefulness of RA in patients after BDG shunt (see the table).

RAO 90

RAO 60

RAO 30

PA



3-Dimmentional rotational angiography to assessthe pulmonary circulation in patients with single ventricle after Bidirectional Glenn operation

Sebstian Góreczny, Pawel Dryżek, Tomasz Moszura, Anna Mazurek-Kula, Jacek J. Moll, Andrzej Sysa, Jadwiga A.Moll*

Department of Cardiology and Cardiac Surgery*, Polish Mother's Memorial Hospital, Reaserch Institute, Lodz, Poland

Background:
Rotational angiography with three-dimensional reconstruction (3DRA) is an emerging technology that has been successfully used in neuroradiology, electrophysiology, coronary angiography and more often in visualizing congenital heart defects. It could be a beneficial adjunct to fix plane angiography and could enhance diagnostic capabilities in patients with single ventricle after various stages of palliation. We report our experience using 3DRA to visualize the pulmonary circulation in patient with single ventricle after Bidirectional Glenn.

Methods:
A retrospective analysis of all patients after BDG who underwent 3DRA was performed. Philips Allura system was used to acquire non-gated, breath-held images. During a 240 degrees, 4.1 seconds isocentric rotation, 122 angiographic images were acquired and automatically reconstructed in real time.

Results:
Between 05/2010 and 12/2011, we performed 80 3DRA's in 68 patients after BDG. All patients underwent diagnostic catheterization, which in 32 (47%) was fallowed by 38 interventions. Median age and weight was 3.8yrs (1.5-7) and 16kg (8.5-58kg), respectively. Median contrast dose for 3DRA acquisition and for total study was 2ml/kg (0.7-3.3) and 4.8ml/kg (2.0-15.5), respectively. Median area dose for the whole study, time of fluoroscopy and total time of study was 132,8 cGycm2 (25.9-1056.8), 7,7min (0,7-80) and 52.5 min (15-180), respectively. There were no acute complications related to 3DRA. Overall quality of 3DRA images was graded by the primary operator as good in 64 (80%) studies and satisfactory in 9 (11%). Seven (9%) studies were graded as bad due to: angiographic catheter pushed too far into the proximal pulmonary artery making visualization of superior vena cava impossible in 5 (6%), wrong localization of isocenter in further 2. In the remaining 3DRA's vena cava superior, Glenn connection, right and left pulmonary arteries were visualized. In all 38 interventions 3DRA images were judged by the operator to be superior to fix plane angiography in making decision concerning the interventions or in assessing the result.

Conclusions:
In patients after BDG operation 3DRA allowed for good visualization of superior vana cava, BDG shunt and course of pulmonary arteries. It was superior to fix plane angiography in planning and assessing results of percutaneous interventions.

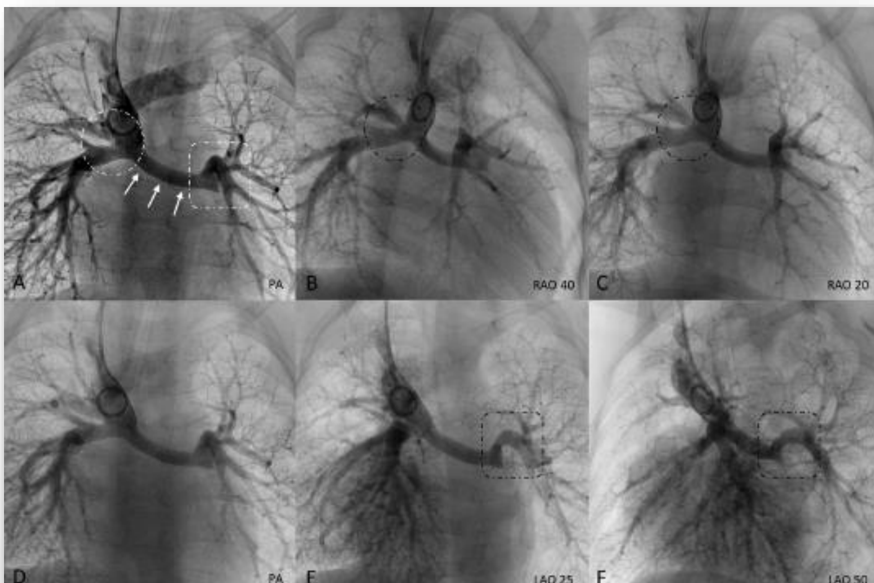
Left pulmonary artery stent implantation guided with three-dimensional rotational angiography (3DRA)

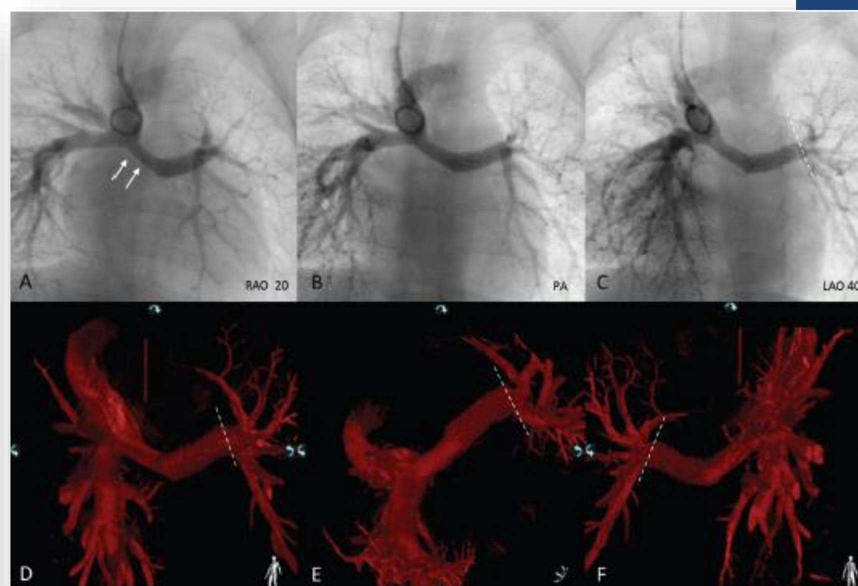
Sebastian Góreczny, Paweł Dryżek, Jadwiga Anna Moll, Tomasz Moszura

Abstract

Patients with hypoplastic left heart syndrome require multistage surgical treatment, often supported with additional percutaneous interventions. In this population normal development of pulmonary vasculature is crucial, as it belongs to key factors reducing complication rate at all stages of palliation. Transcatheter interventions allow for significant improvement of pulmonary blood flow but they can be very challenging in the youngest patients. Three-dimensional rotational angiography (3DRA) is an emerging imaging modality that enables detailed visualization of pulmonary arteries, not achievable in standard angiography. In presented patient with univentricular heart and pulmonary artery hypoplasia 3DRA proved helpful in qualification, monitoring and final evaluation of stent implantation.

Key words: hypoplastic left heart syndrome, imaging, percutaneous intervention





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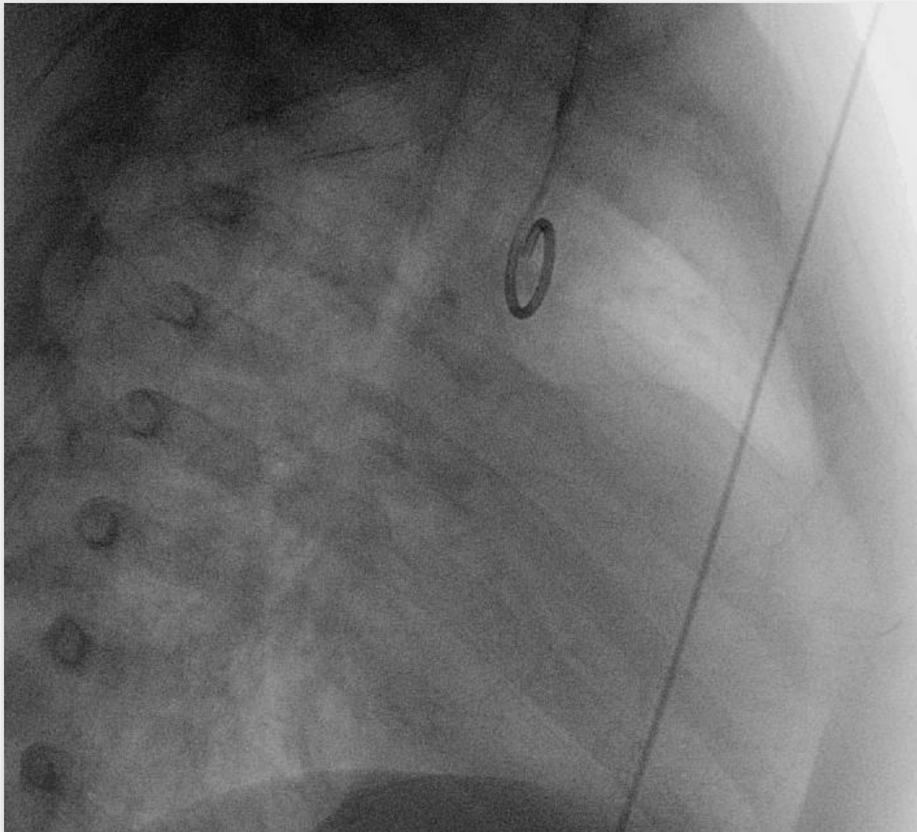

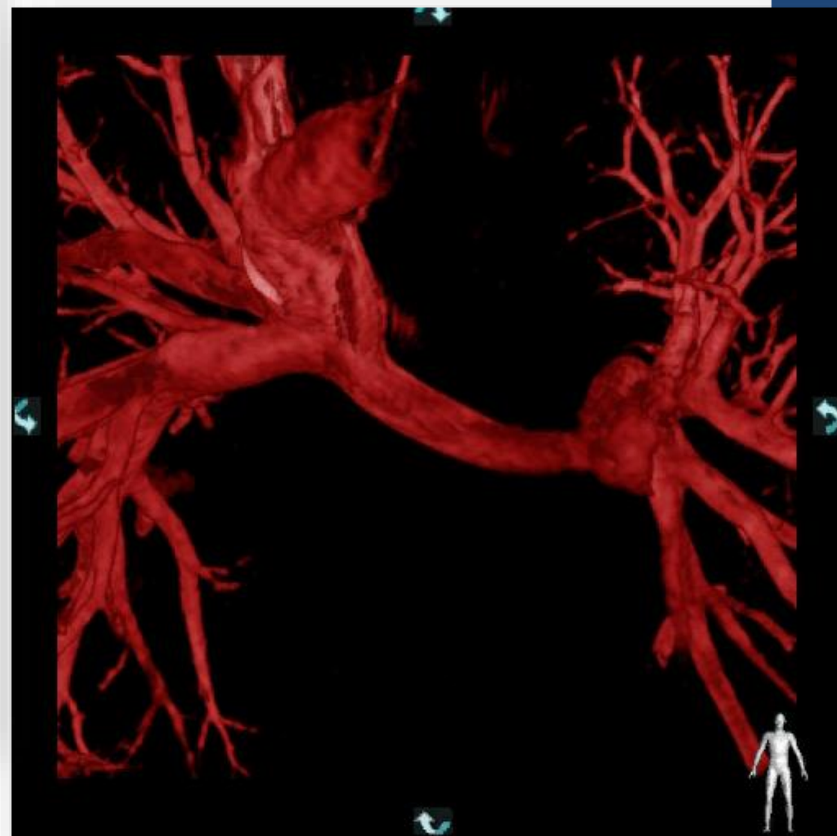

- HLHS
- 2.5 years, 12 kg
- S/p NW1, BDG
- RA – 24/6 ml of plain contrast

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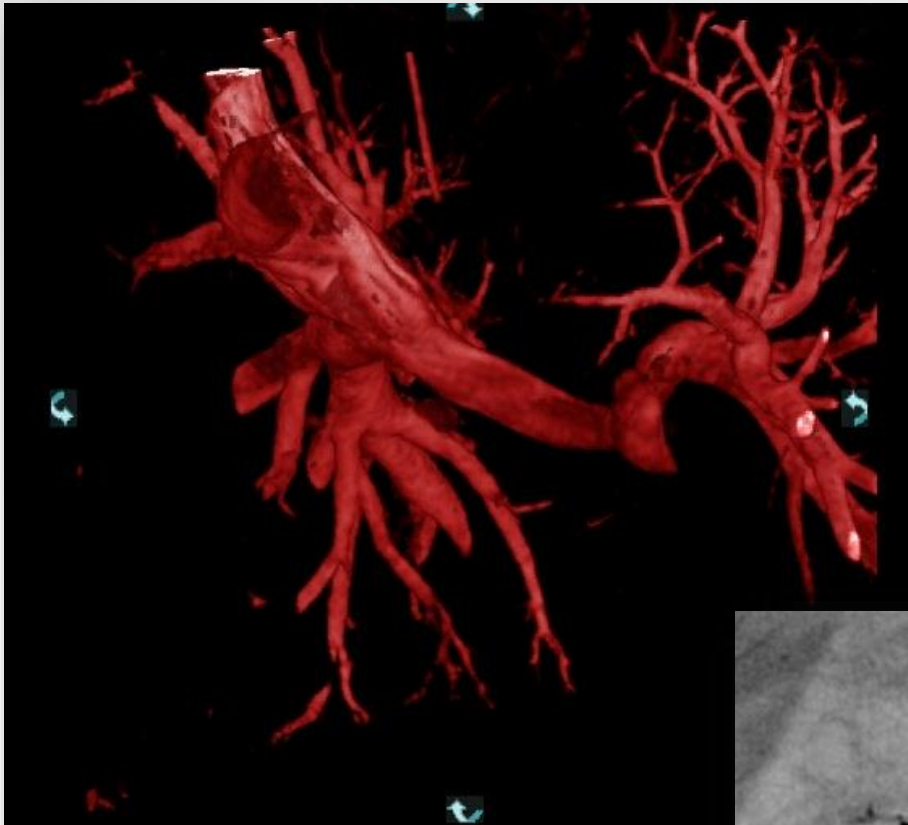
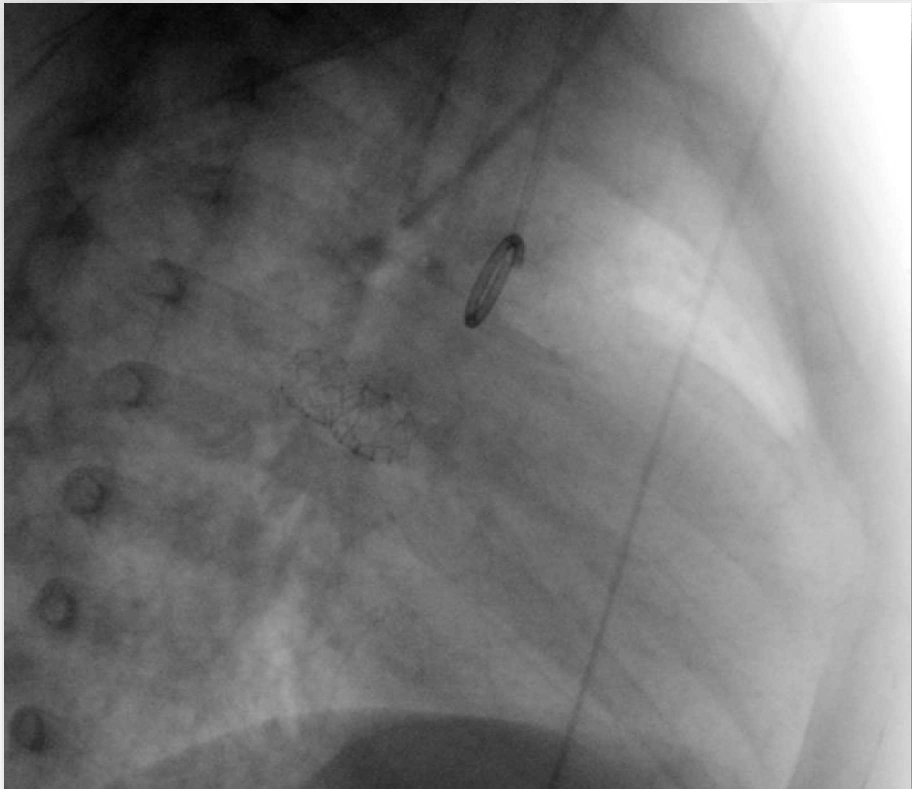


- 2D guided Palmaz-Genesis stent (8 x 24 mm) implantation



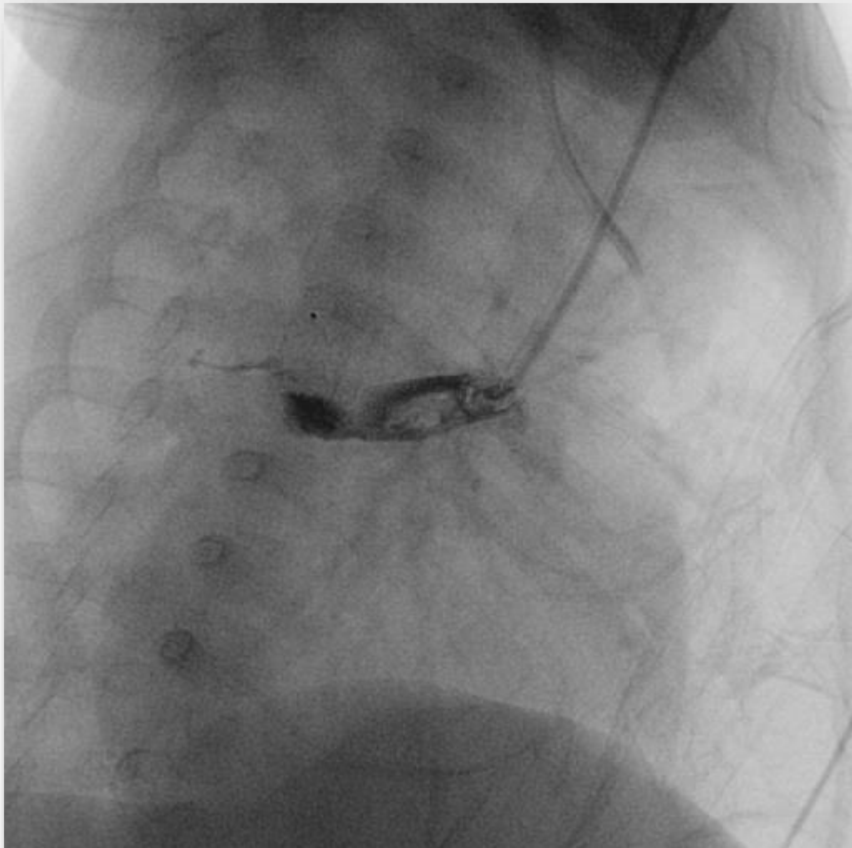
Left pulmonary artery stent implantation guided with three-dimensional rotational angiography (3DRA)

Sebastian Góreczny, Paweł Dryżek, Jadwiga Anna Moll, Tomasz Moszura

RA and 3DR used for:

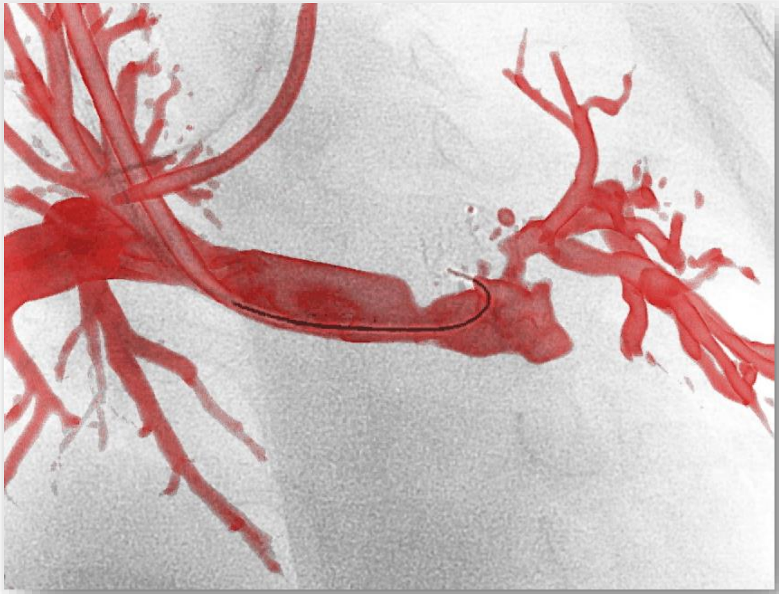
- Extensive vizualization of pulmonary arteries
- Mesurements ('dynamic' RA and 'static' 3DR images)
- Selection of the best angle for the intervention
- Evaluation of the final result

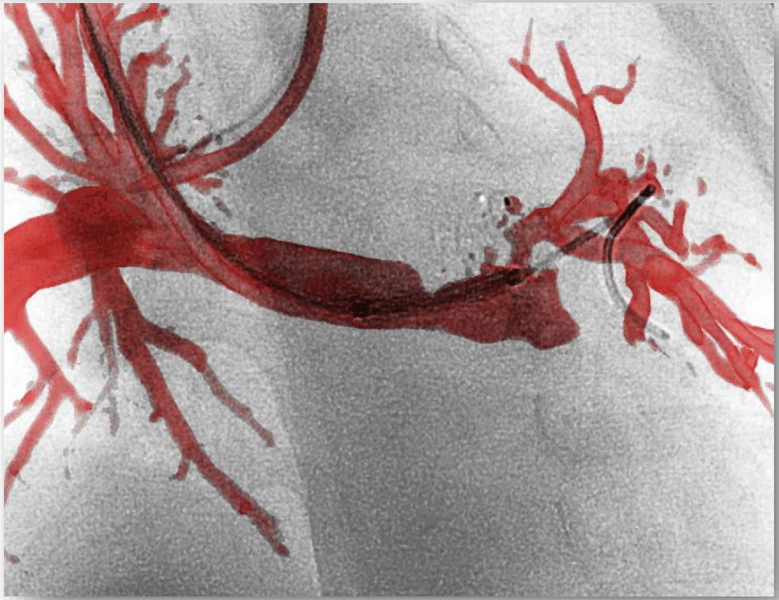
HLHS s/p hybrid stage I and NW + BDG



- Deferential contrast flow to the right lung
- Earlier venous return from the right lung
- Proximal stenosis to the RPA
- Part of self-expandable stent in the ligated DA
- Critical stnosis to the proximal LPA
- Diminished contrast filling of the left lung

HLHS s/p hybrid stage I and NW + BDG





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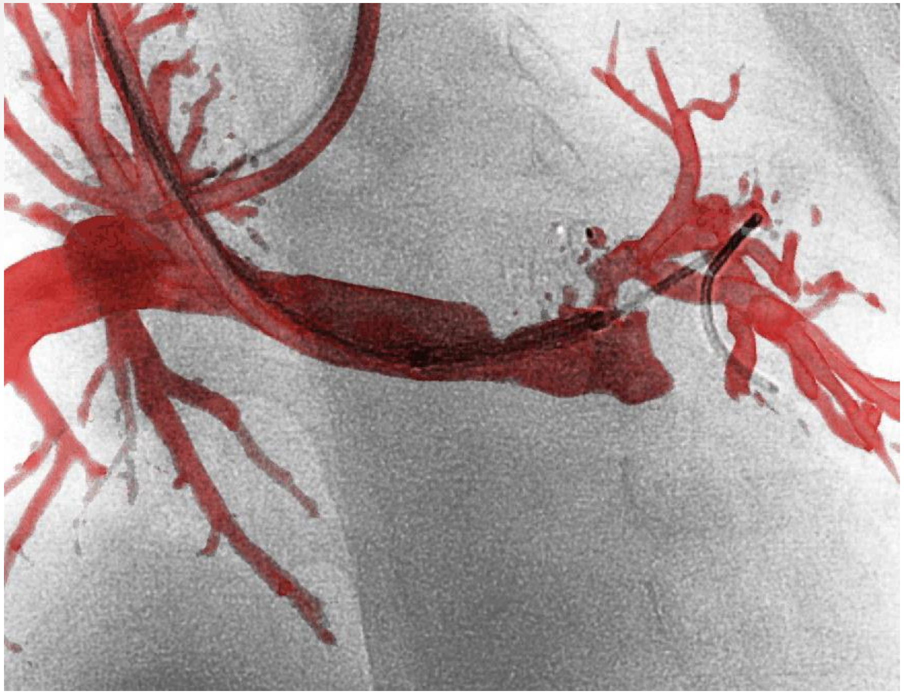

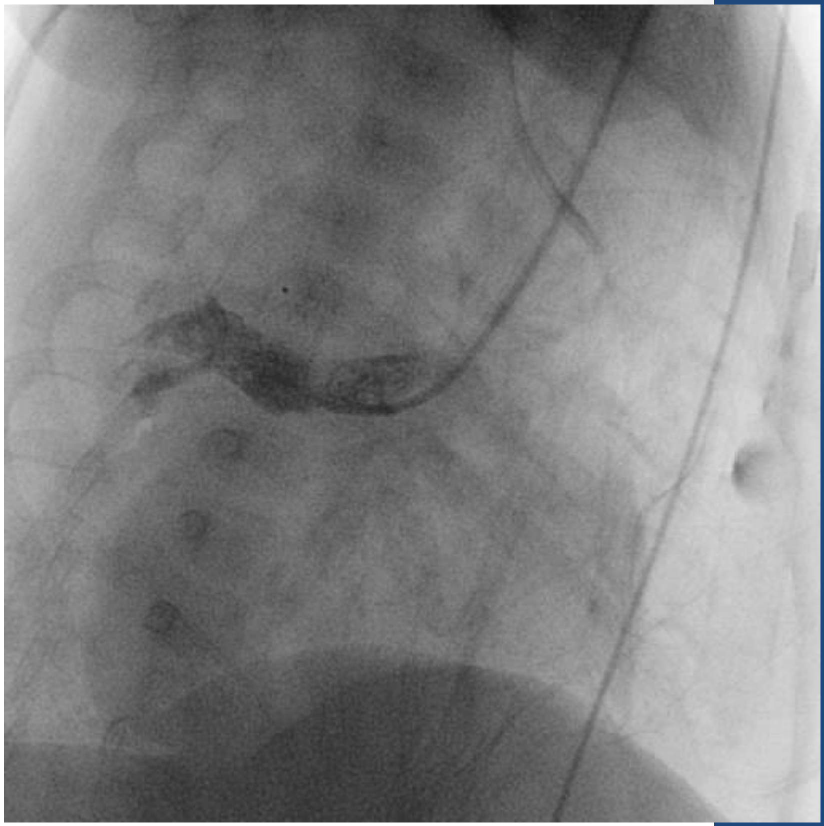

RA and 3DR used for:

- Extensive vizualization of pulmonary arteries
- Mesurements ('dynamic' RA and 'static' 3DR images)
- Selection of the best angle for the intervention
- **Positioning of the balloon and/or stent**
- Evaluation of the final result

POLISH MOTHER'S MEMORIAL HOSPITAL
REASERCH INSTITUTE
ŁÓDŹ, POLAND

CASE # 1
FEBRUARY 6th, 2015

PREPARED BY:
ANNA MAZUREK-KULA, SEBASTIAN GÓRECZNY

OPERATORS:
TOMASZ MOSZURA, PAWEŁ DRYŻEK, SEBASTIAN GÓRECZNY

Third European Symposium on 3DRA and Advanced Imaging in CHD
February 6 - 7, 2015
UMC Utrecht, The Netherlands

Case # 1, PP

History:
- 18 month old male, prenatally diagnosed with HLHS
- Status post
- Norwood/Sano operation (5 mm Gore-Tex tube) 07/2013
- Balloon angioplasty of RV-PA shunt and RPA 12/2013
- Bidirectional Glenn operation 01/2014

Clinical Findings:
- HGB 16.7 g/dl, HCT 49%, 02 sats 78-82%
- Wt 10.4 kg

Echocardiogrpahy
- Preserved RV function; TAPSE – 9.5 mm, MPI – 0.26
- Trivial TR, mild PR
- IAS – 11 mm communication (V – 0.9 m/s)
- SVC-RPA with laminar flow (0.4 – 0.7 m/s), no respiratory variation
- Ao arch min diam 7 mm (V – 1.1 m/s)

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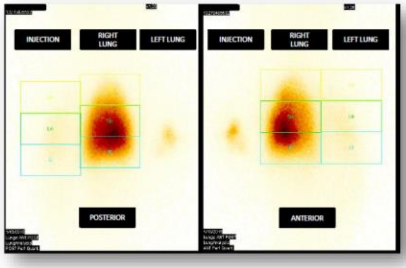
Planar lung perfusion scintigraphy 12/2014

Peripheral injection of ^{99m}Tc – MAA (macroaggregated albumin)



	Posterior Kct				Geometric Mean Kct				Anterior Kct			
	Left		Right		Left Lung		Right Lung		Right		Left	
	%	Kct	%	Kct	%	Kct	%	Kct	%	Kct	%	Kct
Upper Zone:	1.4	6.68	9.6	46.40	1.4	5.92	10.5	43.73	11.5	41.22	1.5	5.32
Middle Zone:	3.2	15.62	47.5	230.84	3.5	14.58	47.2	196.66	46.7	167.64	3.8	13.61
Lower Zone:	2.6	12.72	35.6	173.87	3.1	12.91	34.3	143.25	32.9	118.03	3.7	13.11
Total Lung:	7.2	34.92	92.8	451.11	8.0	33.41	92.0	383.64	91.1	326.78	8.9	32.04

Differantial left and right lung perfusion was 8% compared with 92%

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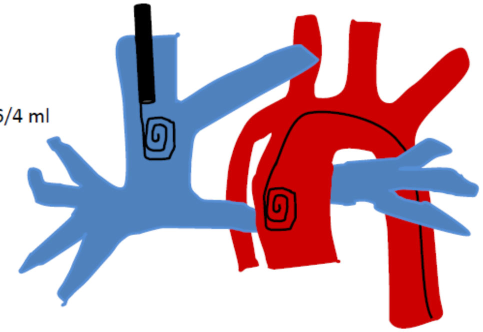
Case # 1, PP

Intended intervention:
- Three Dimentional Rotational Angiography
- 3D guided pulmonary artery dilation ± stent implantation

Rotational Angiography:
- Multi-site contrast injection
- 4 Fr Pigtail in SVC – 16/4 ml
- 4 Fr Pigtail in Neo Aorta – 16/4 ml
- 70% strength contrast
- RV rapid pacing
- Breath hold
- 1.5 sec delay
- 4.1 sec run



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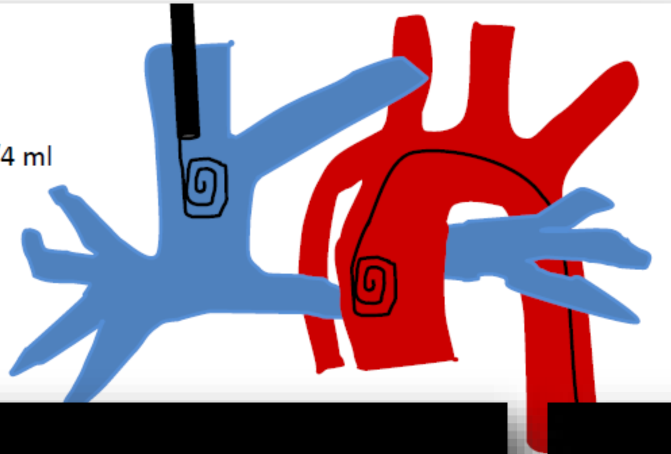

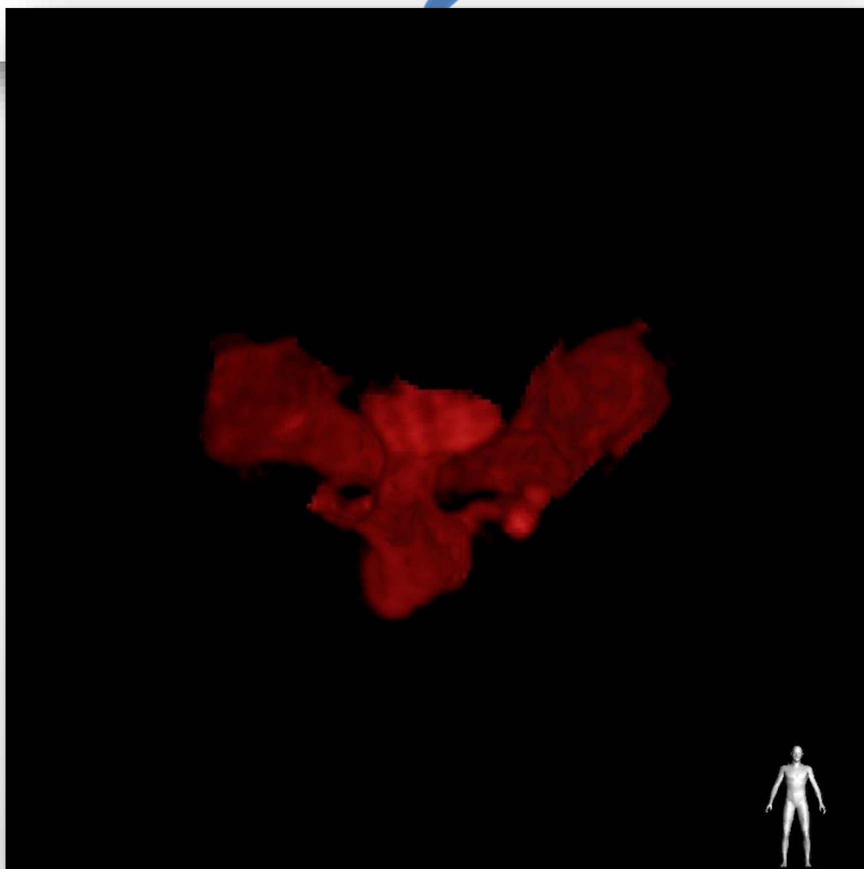

Intended intervention:
3D guided pulmonary artery dilation
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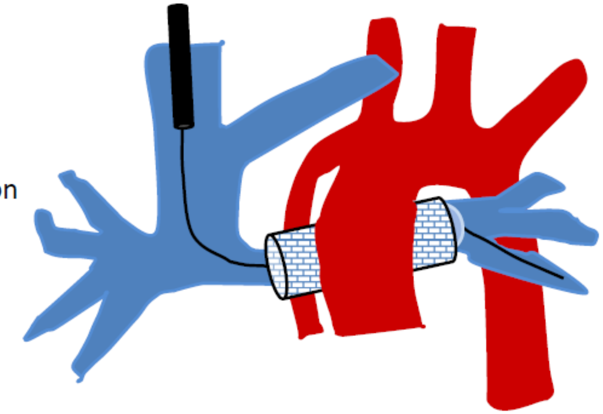
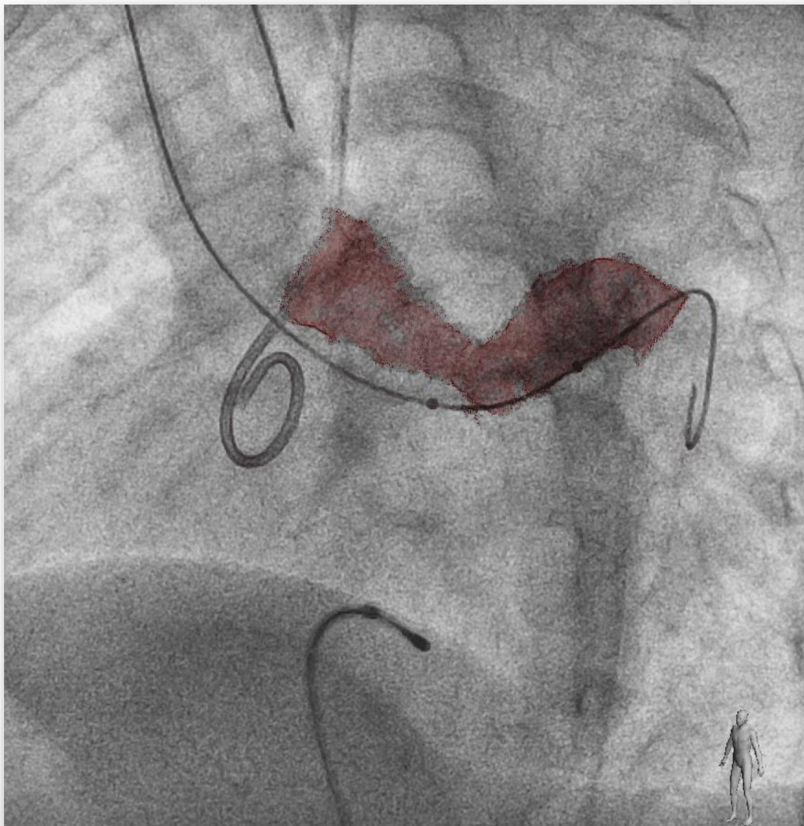
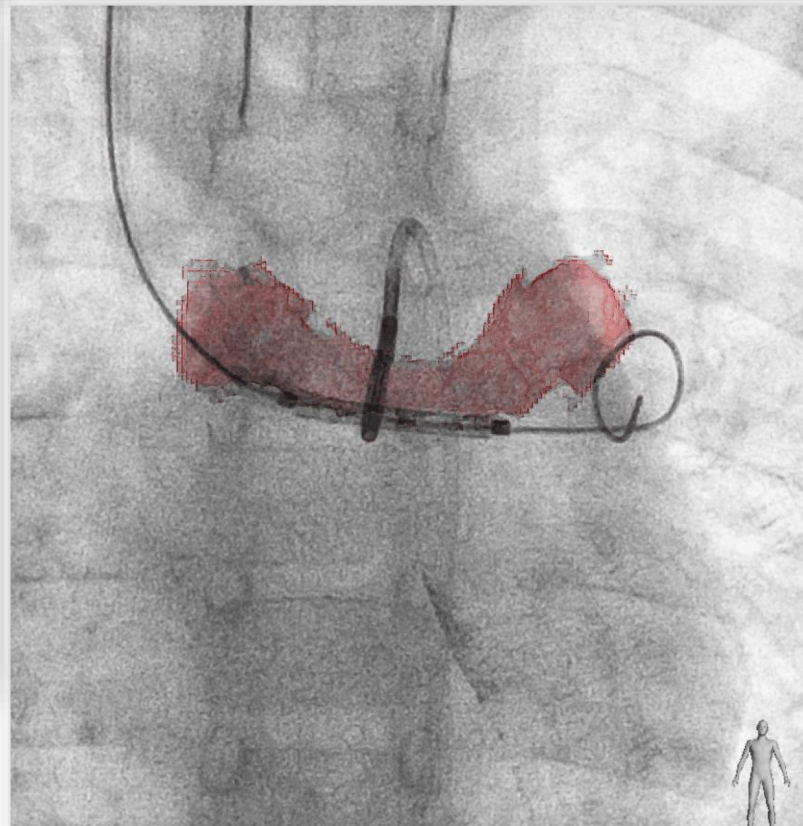
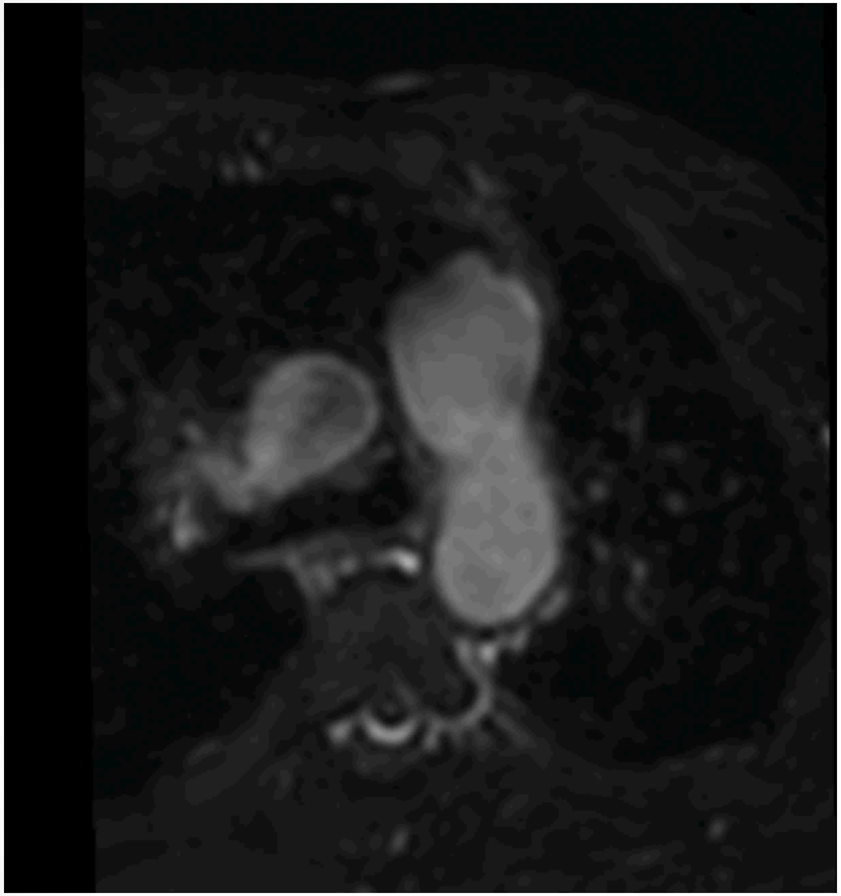


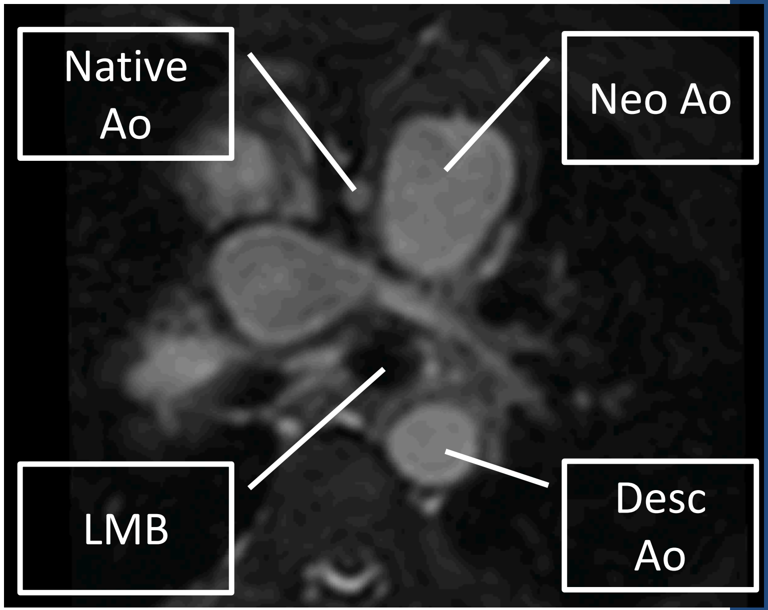


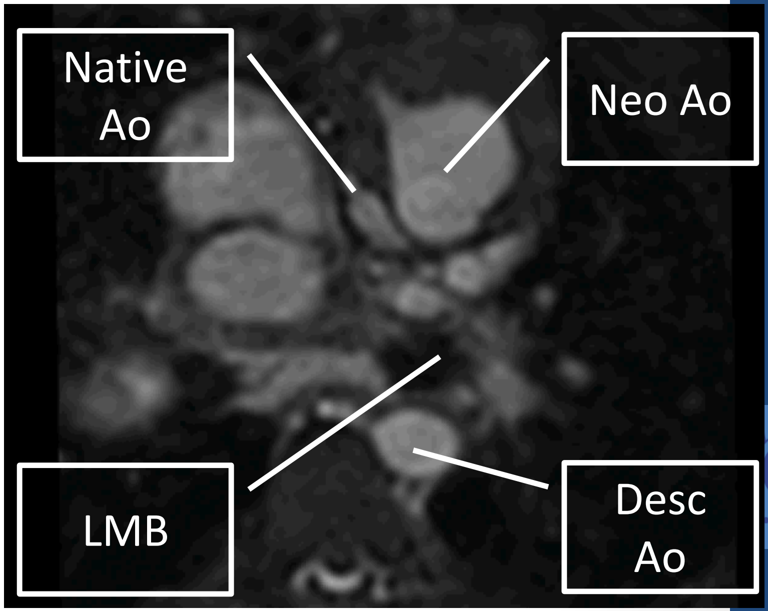


What about the airway?

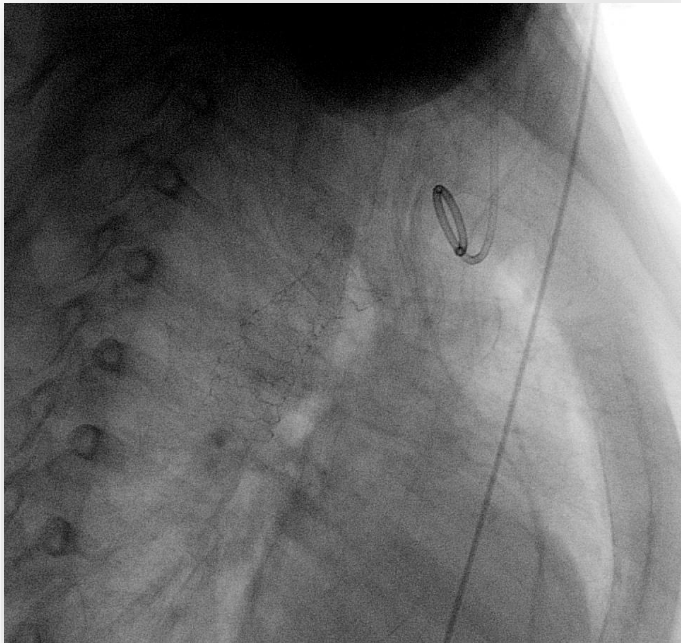
LPA vs. LMB vs. Ao

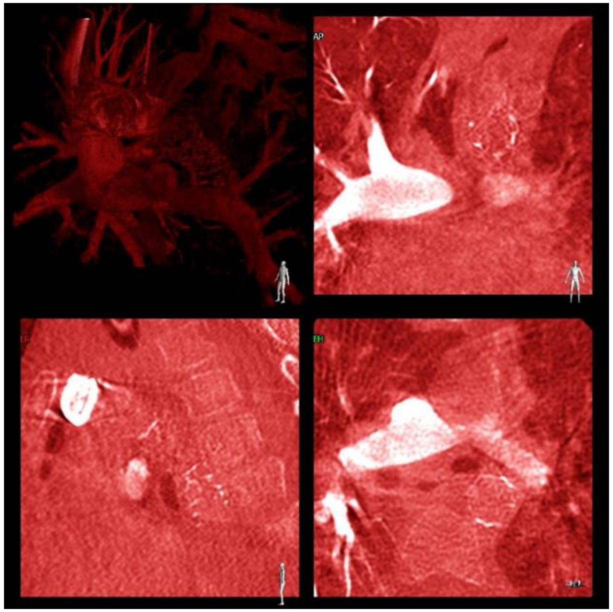


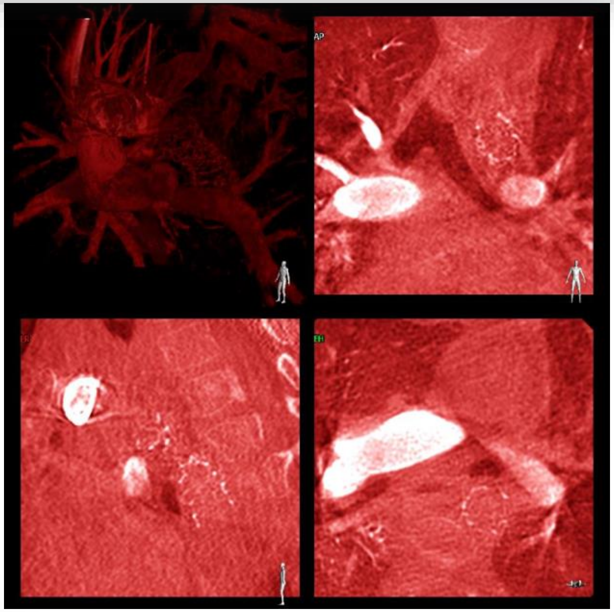


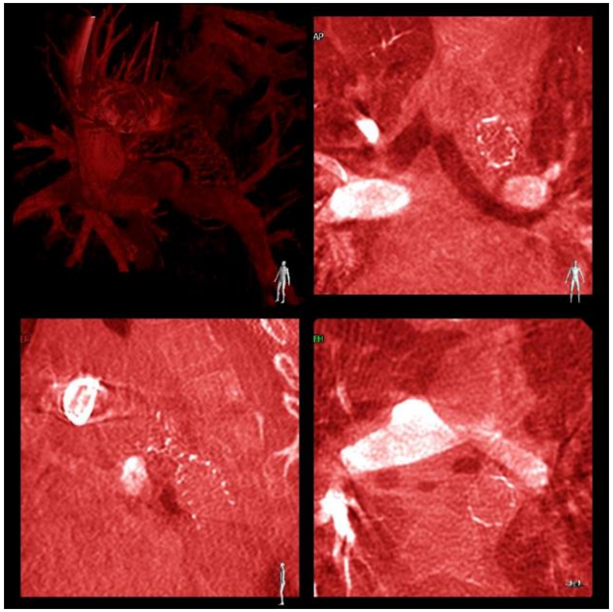


MPR – LPA vs. LMB vs. Stent in Ao





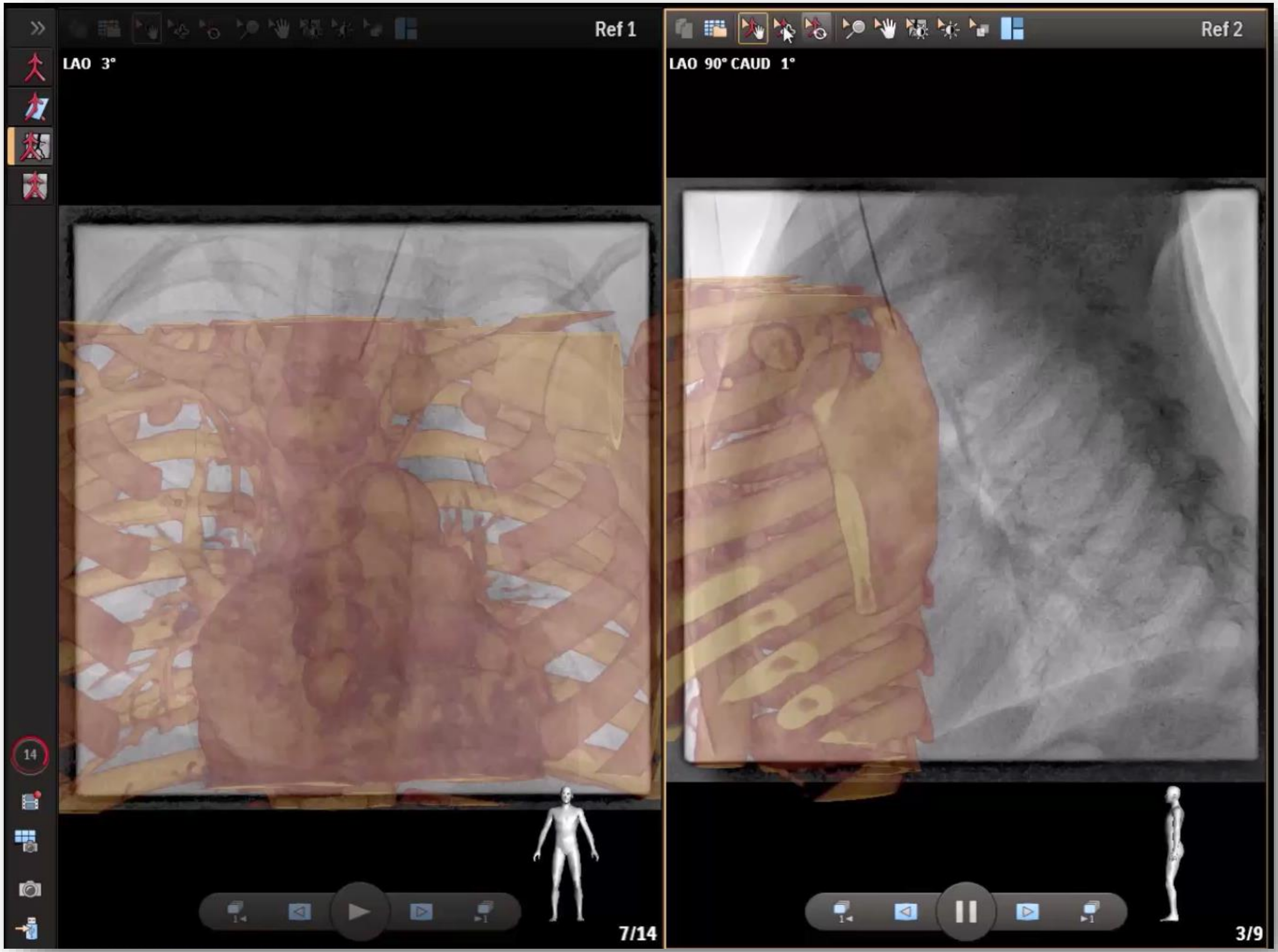




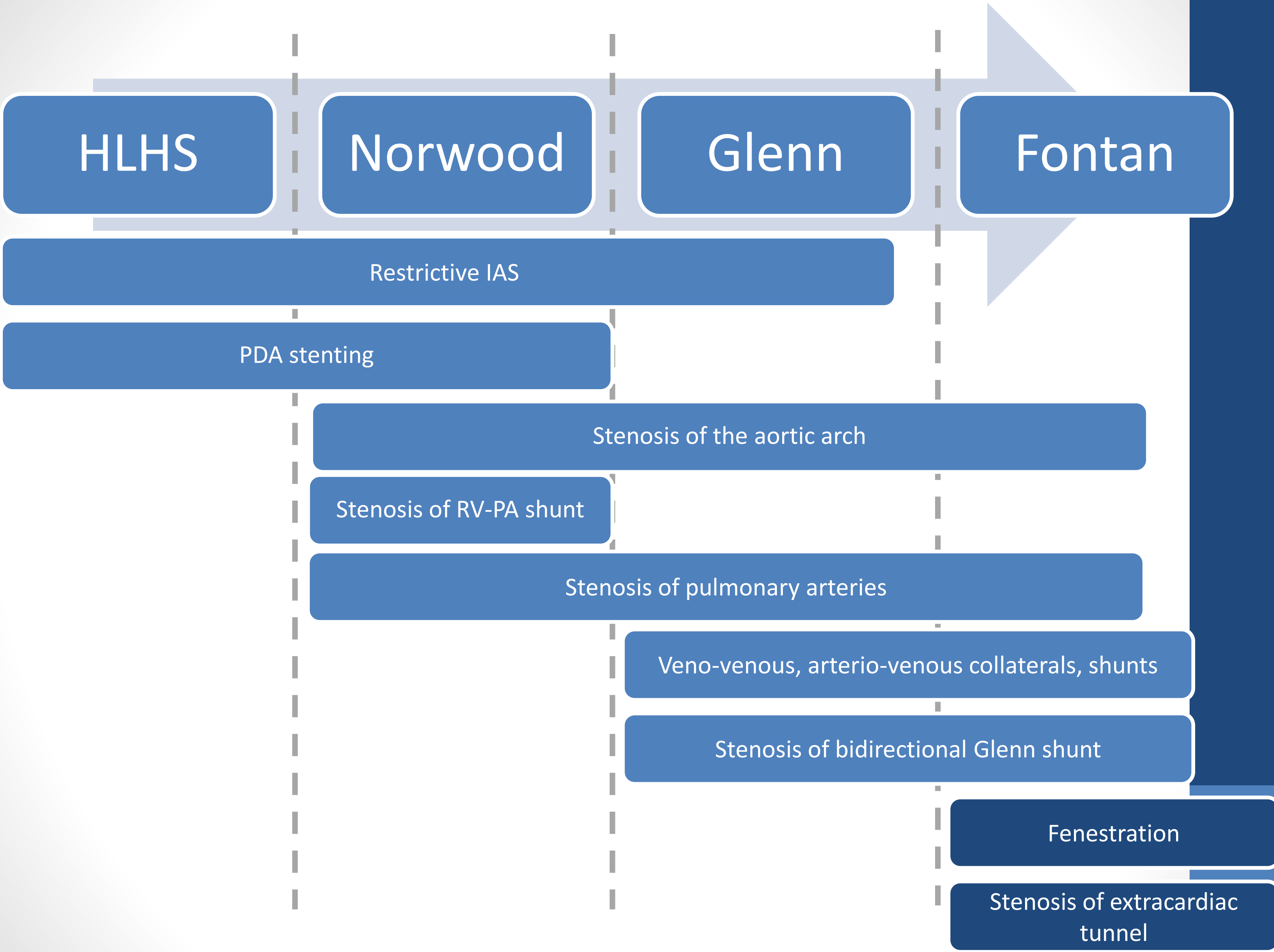
LPA vs. LMB vs. NeoAo

- Poor quality CT
- Blue rings – stent's landing zone
- Green ring – left main bronchus
- Yellow ring – neo-aorta

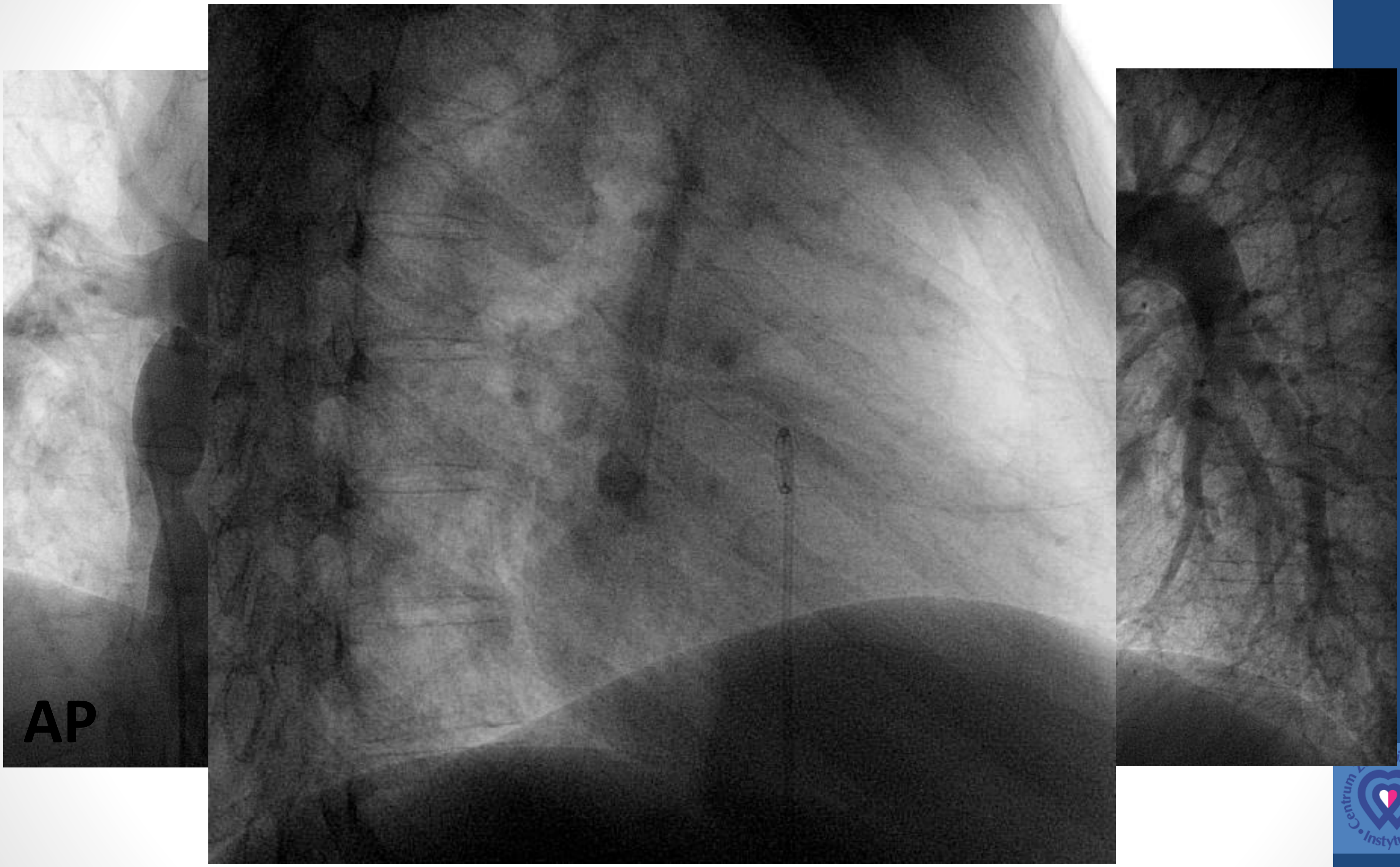
LPA vs. LMB vs. NeoAo



- 7 x 17 mm Palamaz-Genesis stent implantation to the proximal LPA and RPA


HLHS
Norwood
Glenn
Fontan
Restrictive IAS
PDA stenting
Stenosis of the aortic arch
Stenosis of RV-PA shunt
Stenosis of pulmonary arteries
Veno-venous, arterio-venous collaterals, shunts
Stenosis of bidirectional Glenn shunt
Fenestration
Stenosis of extracardiac tunnel

DILV + VSD + PS, 24 yo, 65 kg, After hemi-Fontan and Fontan operations
Ascites, lower extremities edema, increased Vmax in VCI



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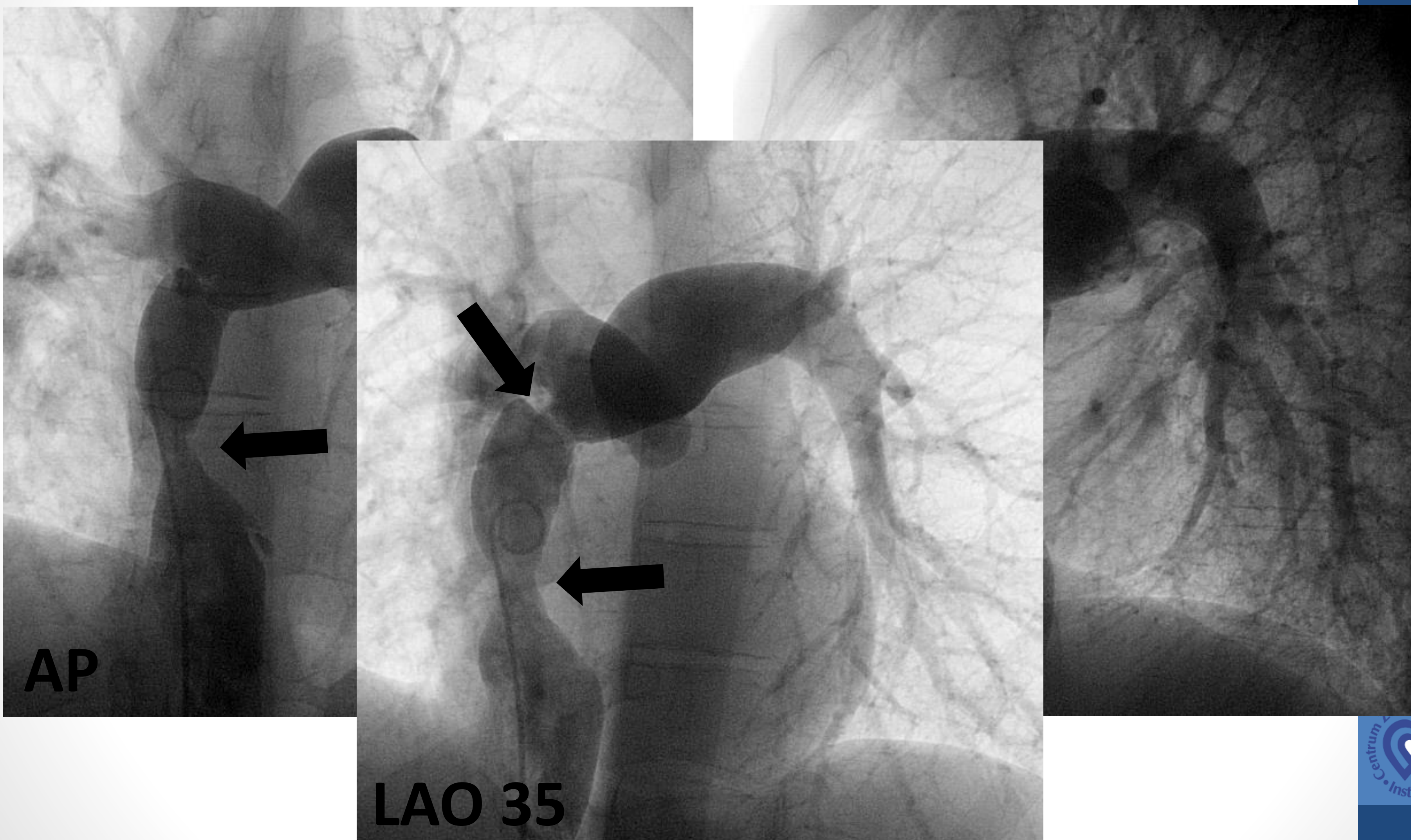

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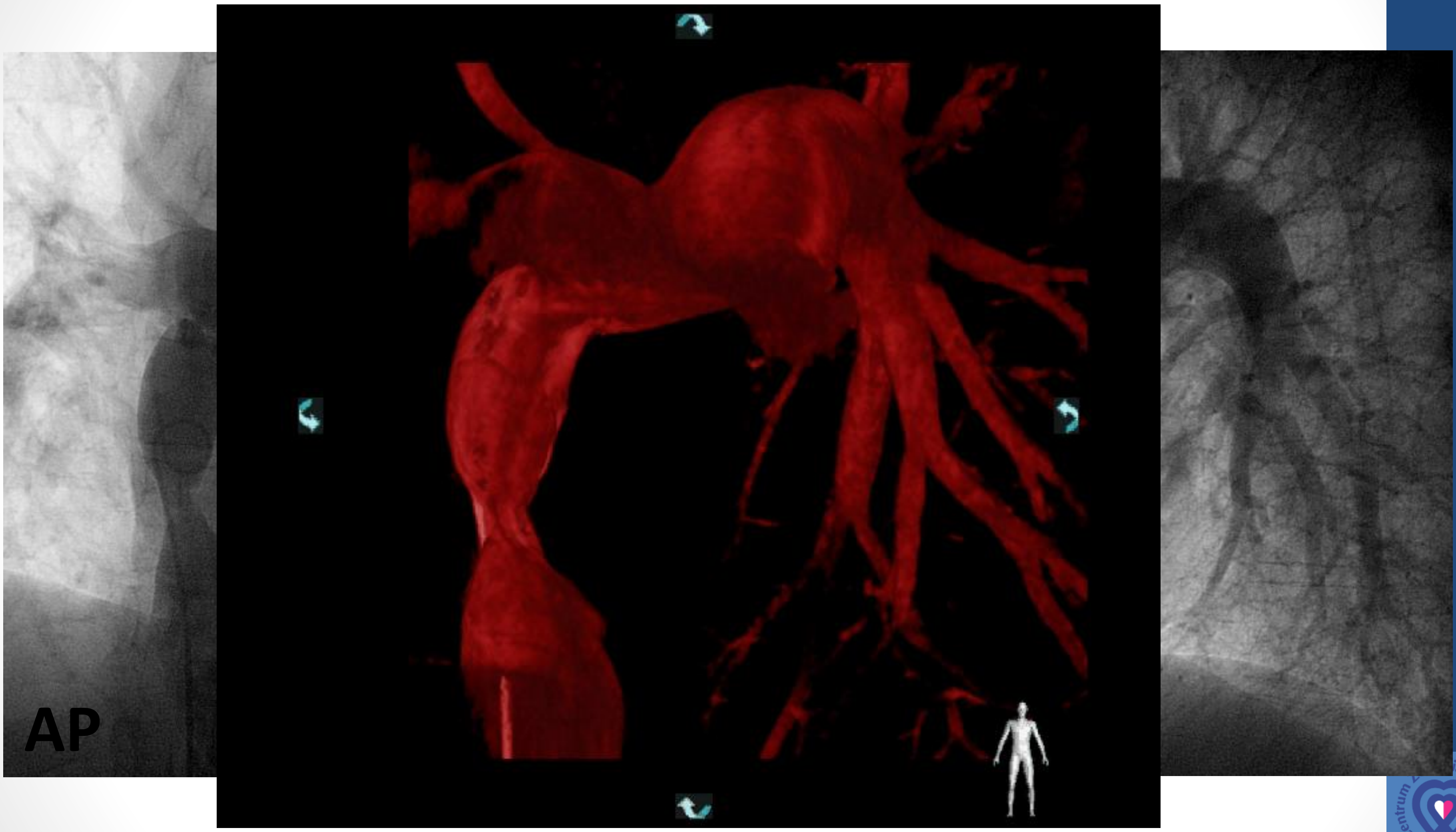
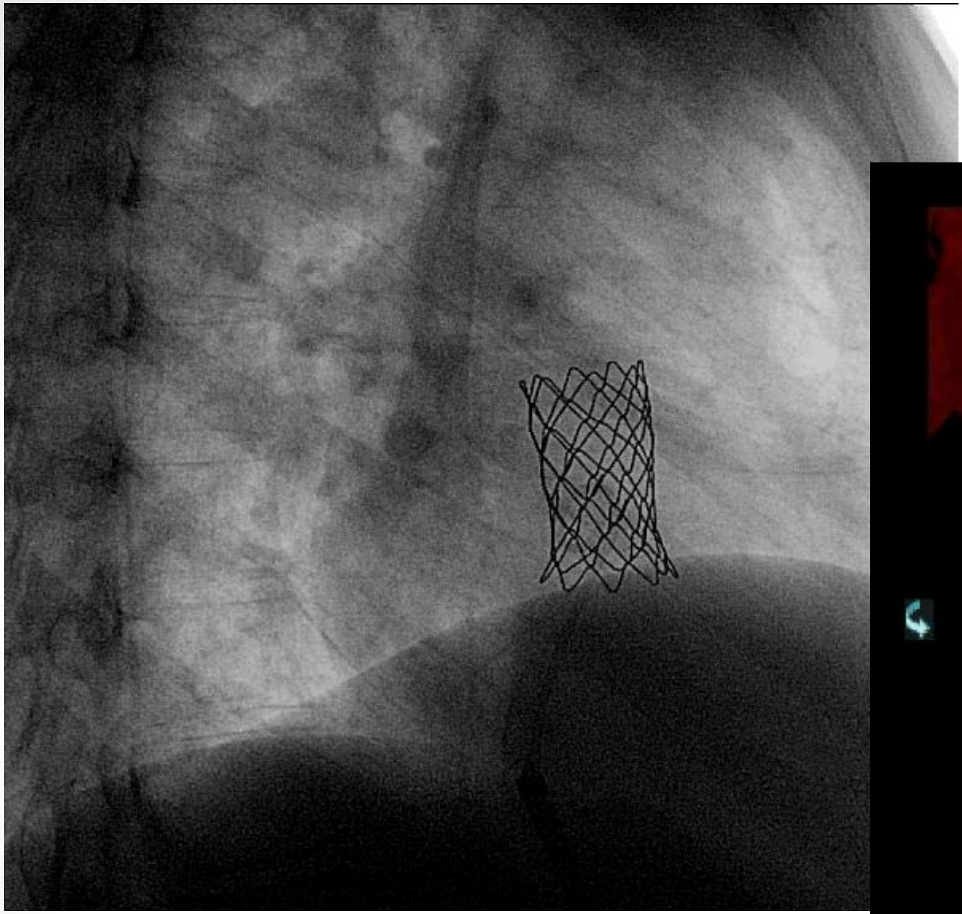
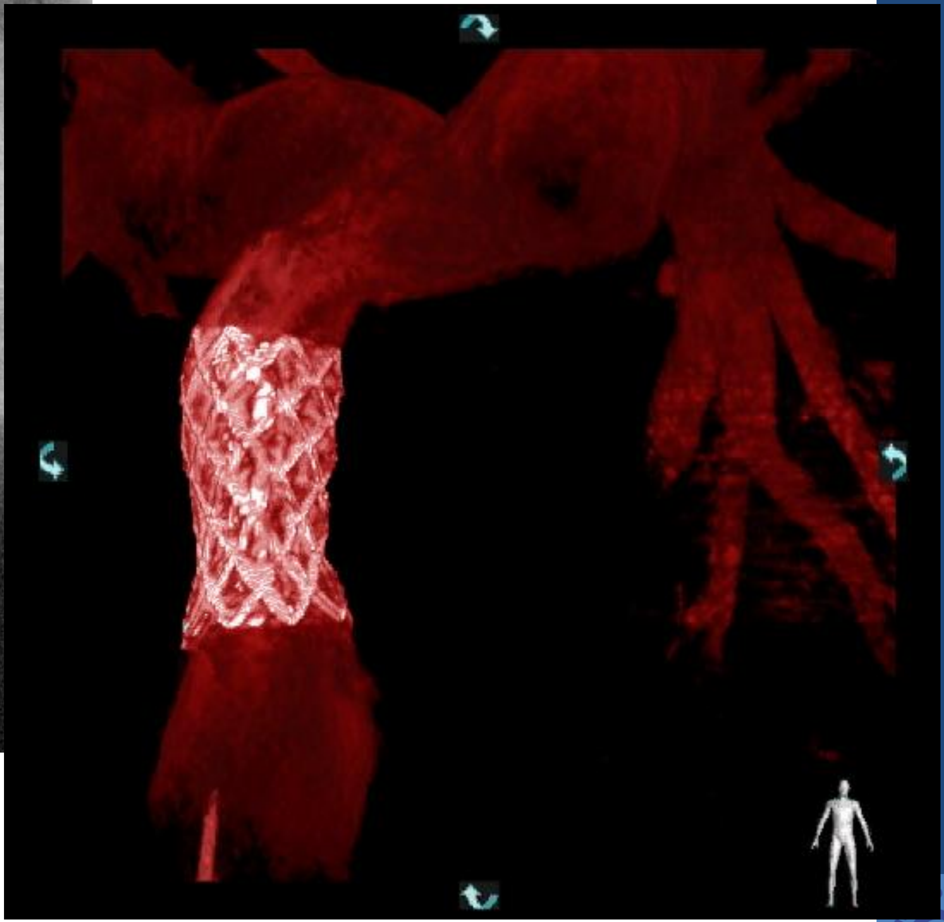
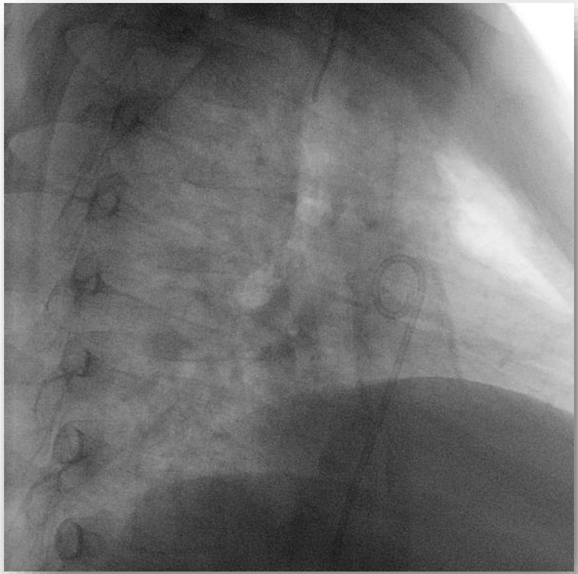


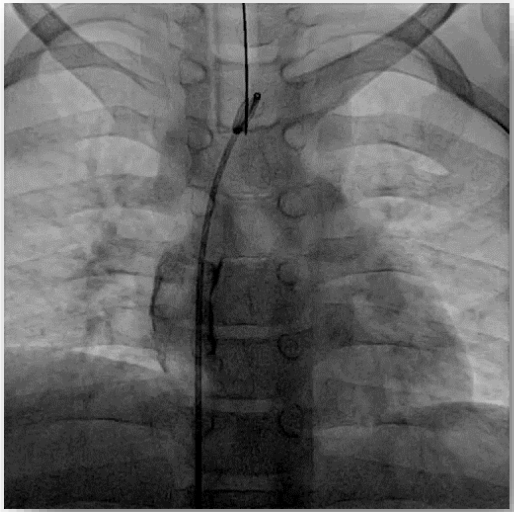


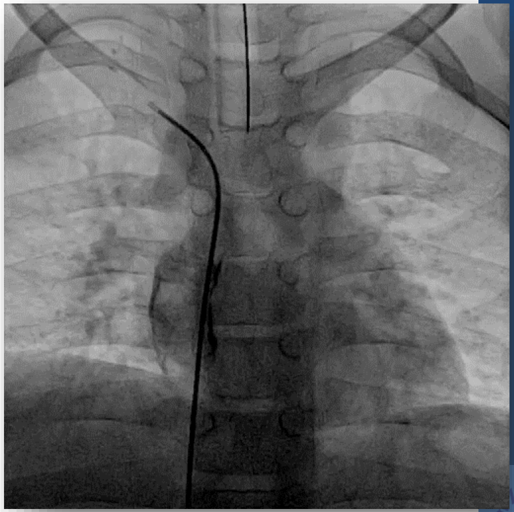


Cordis OPTA 16 x 40 mm
CP 8z45 mm on BIB 20 x 45 mm

Visualization of the complete venous pathway in patients after Total Cavo-Pulmonary Connection







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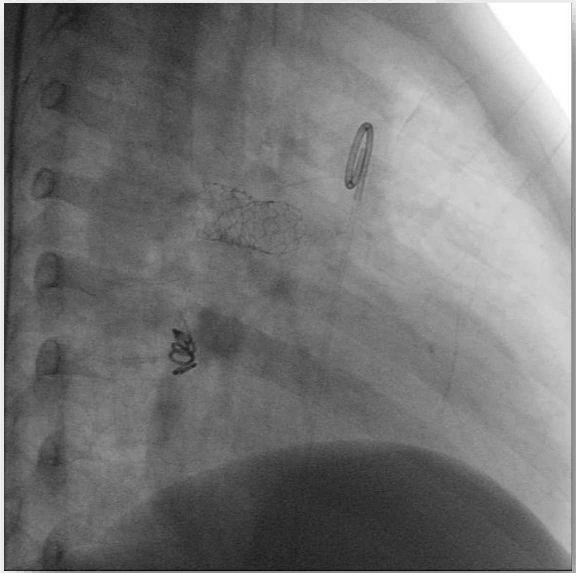

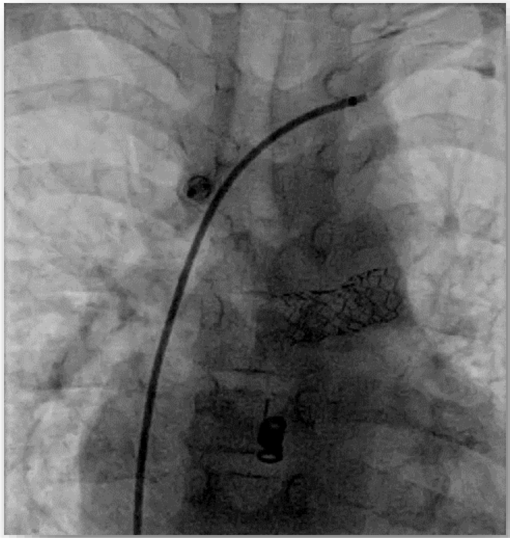

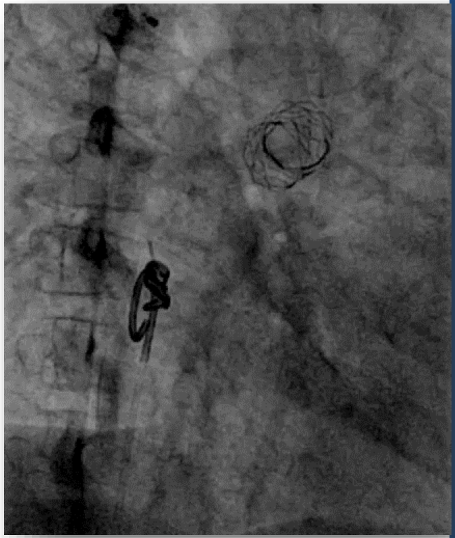

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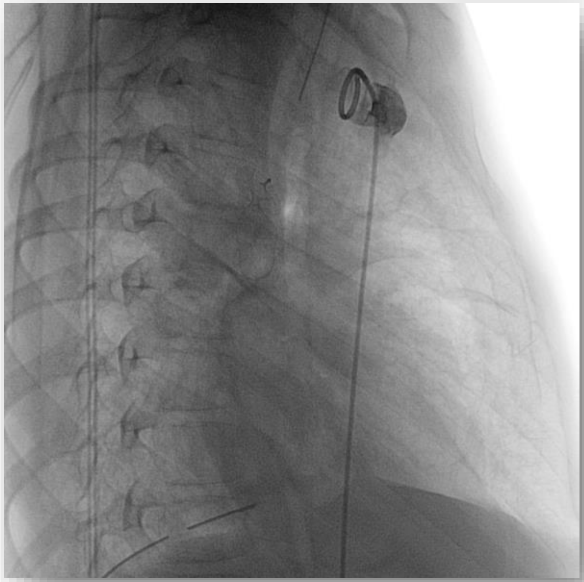
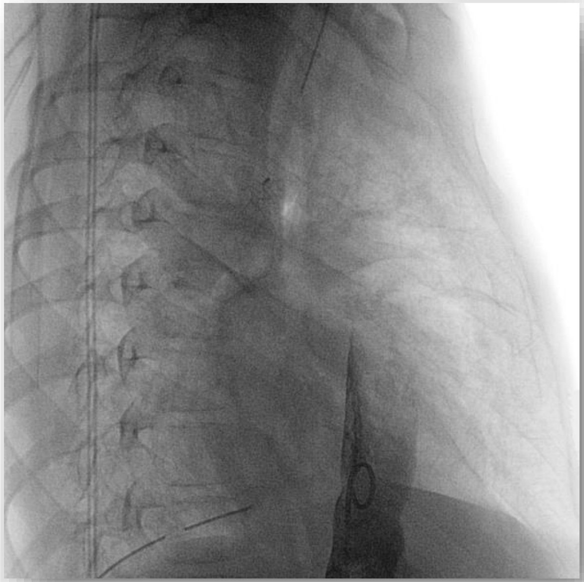




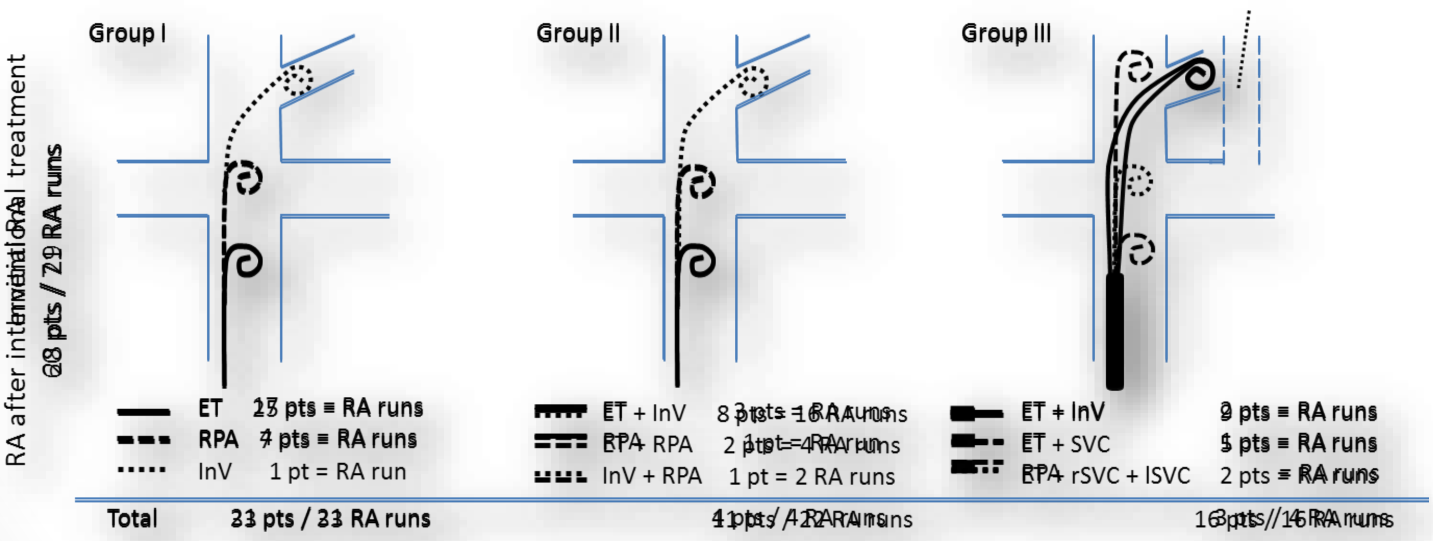
Simultaneous Multi-Site Three Dimensional Rotational Angiography Reduces Contrast and Radiation Dose in Patients after Total Cavo-Pulmonary Connection Undergoing Catheterization

OBJECTIVE

- The aim of this study was to compare various 3DRA protocols in patients after TCPC.

METHODES

- We performed a retrospective review of all patients after TCPC who underwent 3DRA.
- Patients were assigned to three groups:
  - one single-site RA (group I – 35 patients),
  - two serial single-site RAs (group II – 11 patients)
  - simultaneous multi-site RA (group III – 16 patients).



Simultaneous Multi-Site Three Dimensional Rotational Angiography Reduces Contrast and Radiation Dose in Patients after Total Cavo-Pulmonary Connection Undergoing Catheterization

RESULTS

- One hundred RAs were performed in 62 TCPC patients.
- Baseline characteristics were not different amongst the groups.

	ALL	Group I	Group II	Group III	P
Number of patients (%)	62	35 (56.4)	11 (17.8)	16 (25.8)	
Age (years)	6.7 (3.7-24)	7.1 (4.1-24)	6.5 (4-19.1)	6.4 (3.7-14.9)	NS
Weight (kg)	20 (13-80)	22 (13-80)	20 (15.5-55)	20 (13-58)	NS
BSA (m^2)	0.83 (0.52-2)	0.85 (0.52-2)	0.84 (0.69-1.7)	0.8 (0.62-1.64)	NS

Simultaneous Multi-Site Three Dimensional Rotational Angiography Reduces Contrast and Radiation Dose in Patients after Total Cavo-Pulmonary Connection Undergoing Catheterization

	ALL	Group I	Group II	Group III	P
Number of patients (%)	62	35 (56.4)	11 (17.8)	16 (25.8)	
Additional 2D angiography					
No of patients (%)	37 (59.7)	29 (82.8)	6 (54.5)	2 (12.5)	I vs III P<0.0001 II vs III P<0.034
No of injections (range)	64 (1-5)	55 (1-5)	7 (1-2)	2 (1-1)	
Contrast medium					
Single RA / weight (ml/kg)	1.8 (0.55-2.5)	1.8 (0.55-2.5)	1.85 (1-2.1)	1.5 (0.6-2.2)	II vs III P=0.026
Total RA / weight (ml/kg)	2.1 (0.6-6.8)	2.1 (0.6-6.8)	4.2 (3.3-5.7)	1.6 (1-4.3)	I vs II P<0.001 II vs III P<0.001
2D angiography / weight (ml/kg)	2.5 (0.4-9.1)	3 (0.4-9.1)	2.6 (0.5-7.6)	1.7 (0.5-4)	I vs III P=0.039
Total study / weight (ml/kg)	4.9 (1-12.6)	5.2 (1-11.4)	6.9 (4.4-12.6)	3.85 (1.8-5.9)	I vs III P=0.010 II vs III P<0.001
Radiation dose					
Single RA run (µGym2)	213.9 (99.8-1032.7)	233.6 (99.8-1005.0)	209.4 (150.6-376.3)	165.0 (120.0-1032.7)	NS
All RA runs (µGym2)	359.5 (135.0-2925.0)	342.1 (151.5-2925.0)	522.3 (360.0-919.3)	210.0 (135.0-1163.4)	NS
Total (µGym2)	814.3 (185.8-4638.3)	880.4 (398.8-4638.3)	960.9 (212.6-3449.0)	610.8 (185.8-1551.8)	I vs III P=0.0028 II vs III P=0.063
All RA share in Total dose (%)	44.3 (9.4-93.7)	31.0 (9.4-93.7)	68.9 (47.2-78.1)	45.1 (15.8-92.0)	NS
Fluoroscopy time (min)	13.3 (4.1-54.4)	13.4 (4.4-54.4)	13.3 (9.1-49.5)	9.5 (4.1-21.3)	II vs III P = 0.0568
Total study time (min)	70 (20-235)	70 (20-125)	70 (20-235)	52.5 (35-110)	II vs III P<0.05

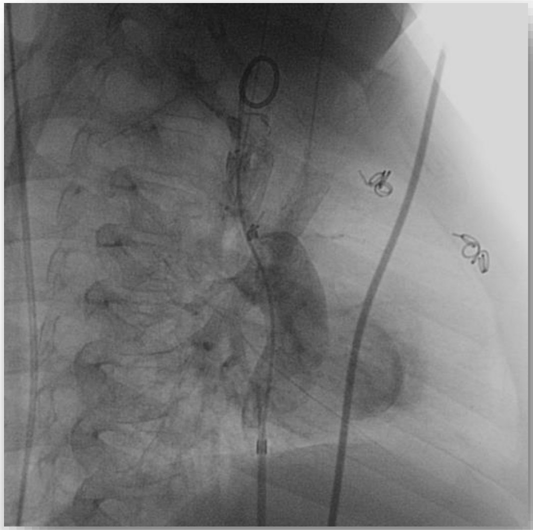
Simultaneous Multi-Site Three Dimensional Rotational Angiography Reduces Contrast and Radiation Dose in Patients after Total Cavo-Pulmonary Connection Undergoing Catheterization

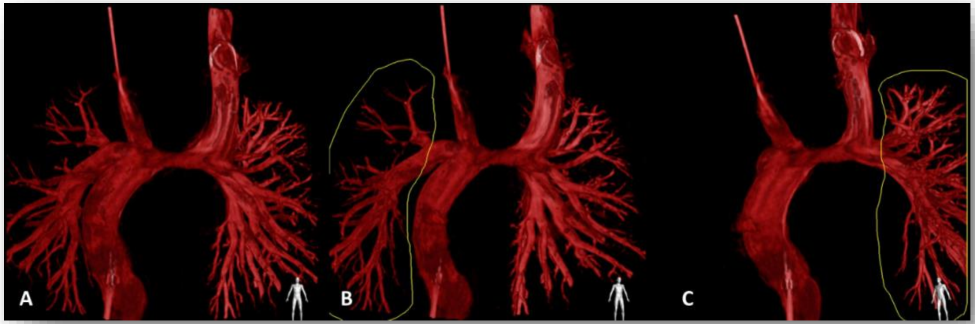
RESULTS

- In group I, 29 patients (83%) received 52 additional standard 2DA,
- 6 patients (55%) had 7 additional 2DA in group II
- 2 patients (13%) had 1 additional 2DA in group III.

- Patients in group III received significantly less contrast per kg for RA, additional 2DA and total study.

- They received lower radiation dose especially when compared with those from group I and had shorter fluoroscopy and total study times.



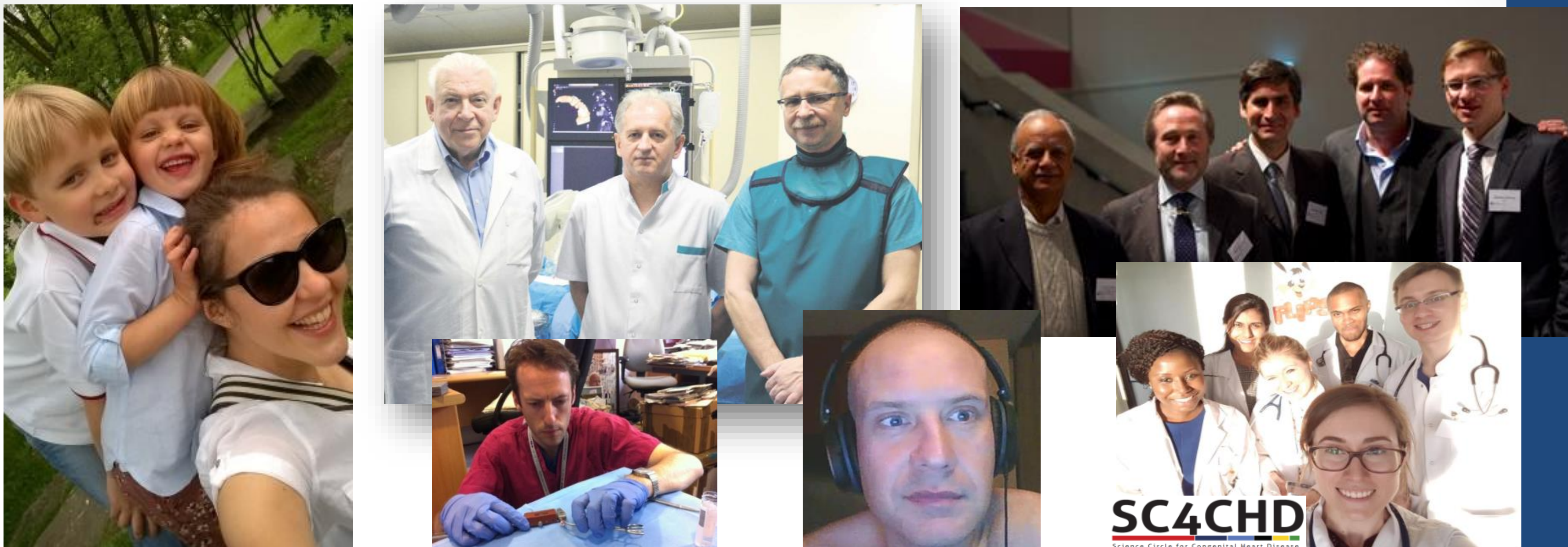


- CONCLUSIONS
  - In TCPC circulation, 3DRA with simultaneous multi-site contrast injections may contribute to **reduced radiation** and **contrast dose** when compared with single-site injection 3DRA.
  - Multi-site 3DRA facilitates visualization of the entire Fontan pathway in the majority of patients and **reduces the number of adjunctive 2DA** performed.

Conclusions

- Rotational angiography claryfies **anatomy of the dynamic vessels**
- 3D reconstruction provides **unlimited views** and allows to **profile any lesion**
- 3D roadmapping **facilitates catheterization** and **accelerates the interventions**
- Final **results** of interventions are **more predictable**

Acknowledgements



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THANK YOU !-)

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