Tratamento percutâneo da Coarctação da Aorta

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InCor – Universidade de São Paulo - Brasil

INTRODUÇÃO

- Tratamento ideal

  Melhorar gradiente a longo prazo

  Morbidade

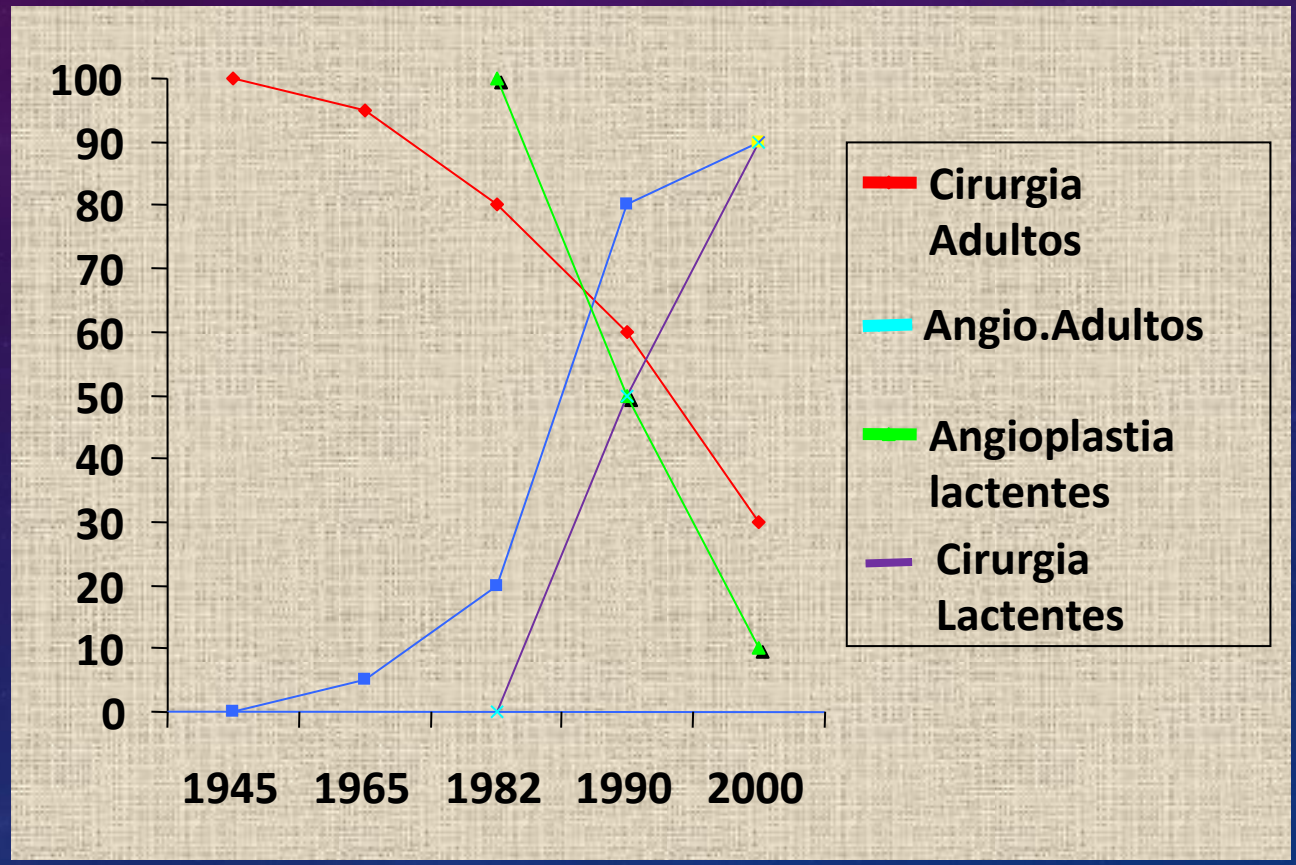
  - Hipertensão arterial
  - Re-coarctação

  Baixo índice de Complicações

  - Imediatas
  - Tardias (Aneurismas)

Introdução

Evolução do tto Percutâneo



Escolha do Tratamento da CoAo (InCor)

< 1 ano :

Cirurgia (escolha)

Percutâneo

Crianças graves , ReCoa,Hibridos

< 25 Kg:

Nativa: Angioplastia com Balão/Hibrido (stent)

Re CoAo: Angioplastia com balão /Hibrido (stent)

CX:

hipoplasia do Arco

Coarctação segmentar

Cardiopatia associada

> 25 Kg:

Angioplastia com stent (Escolha)

Cx: hipolasia do arco , segmentar

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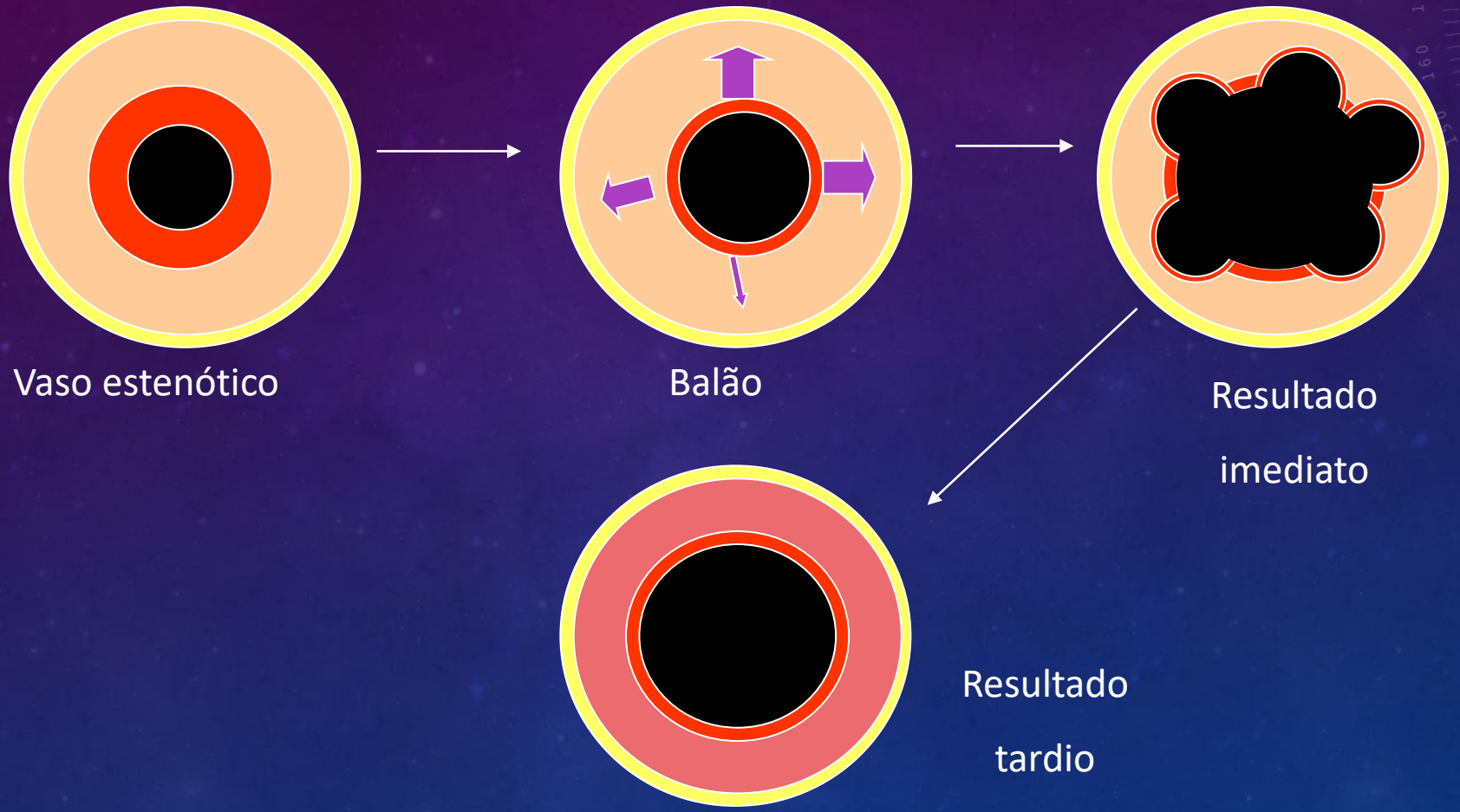
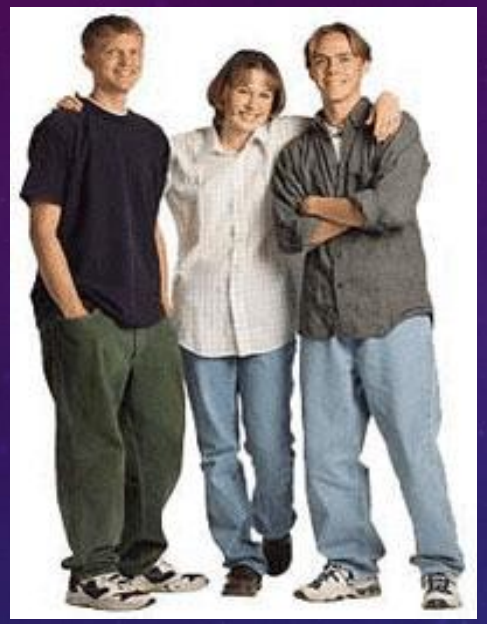
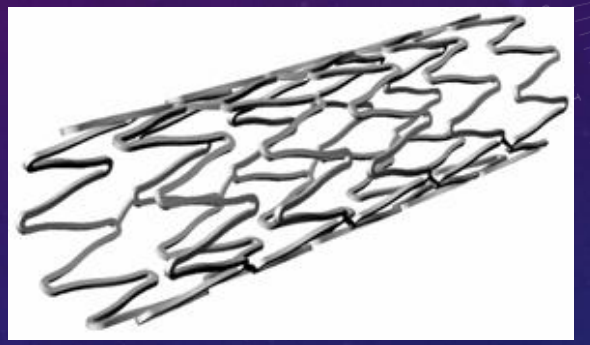
Principio do Tto percutâneo



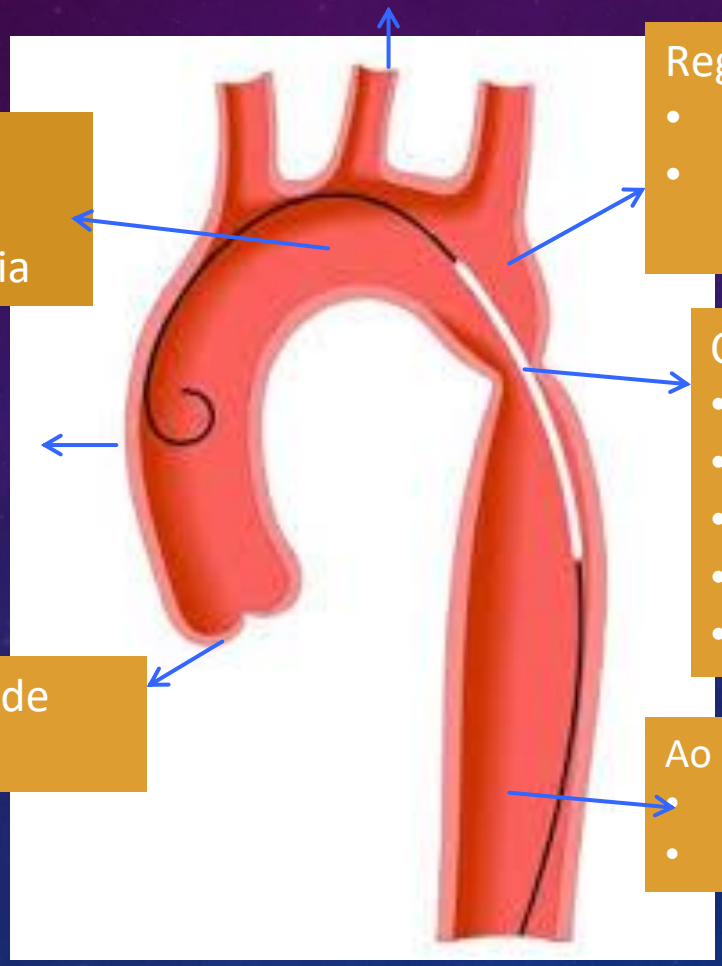
PACIENTES > 25 KG





INCOR·HC
FUNDAÇÃO ZERBINI
CIÊNCIA E HUMANISMO

Que devemos saber??!!!



Arco :
- Forma: Gótico?
- Grau de hipoplasia

Raiz Aorta

Válvula Bicúspide
- CD+CE

Região Ístmica
- Diâmetro
- Relação Subclavia

Coao
- Extensão
- Continuidade
- Medida
- Aneurismas
- Cálcio

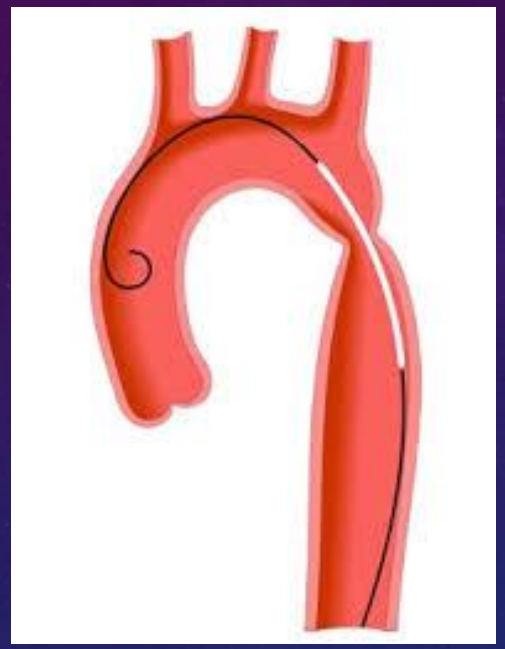
Ao Descendente
- Medida nível do diafragma
- Aneurismas

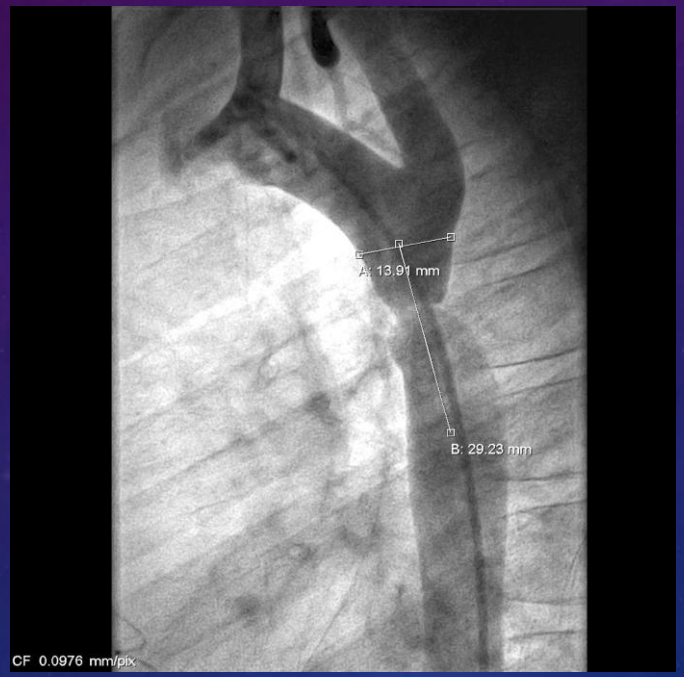
IMAGENS

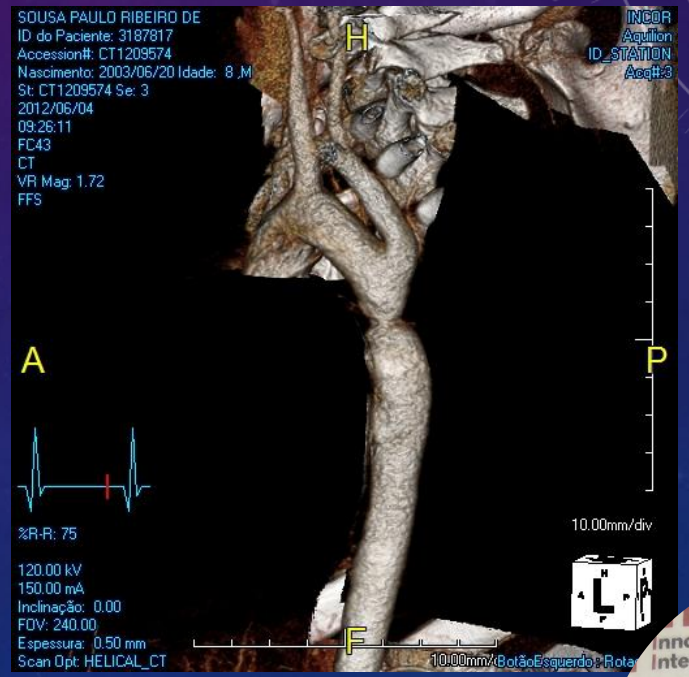
- **Ecocardiógrafa :**
- **Ressonância**
- **Tomografia**

O que devemos da saber com os exames de imagens??!!!

Anatomia : tomografia !!!

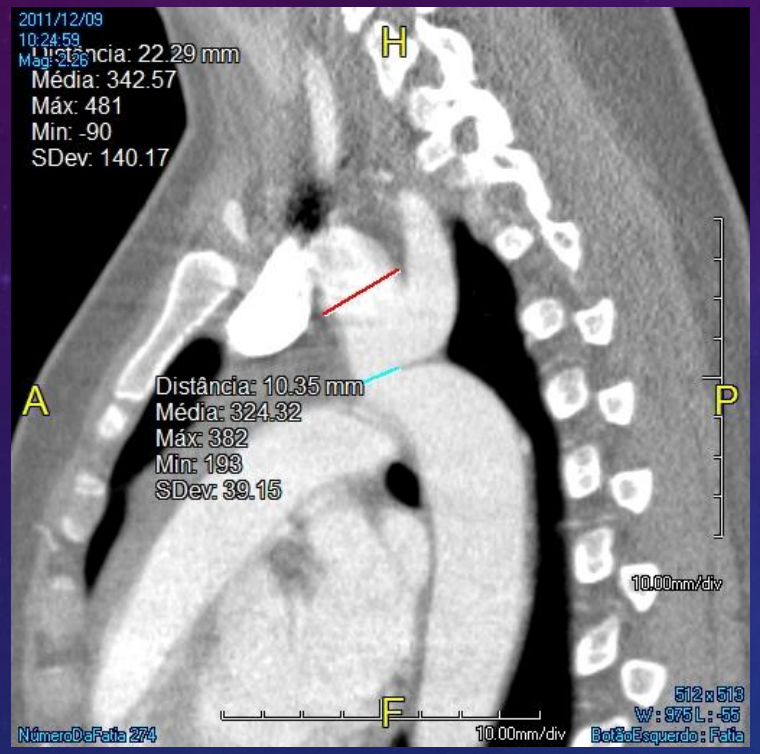


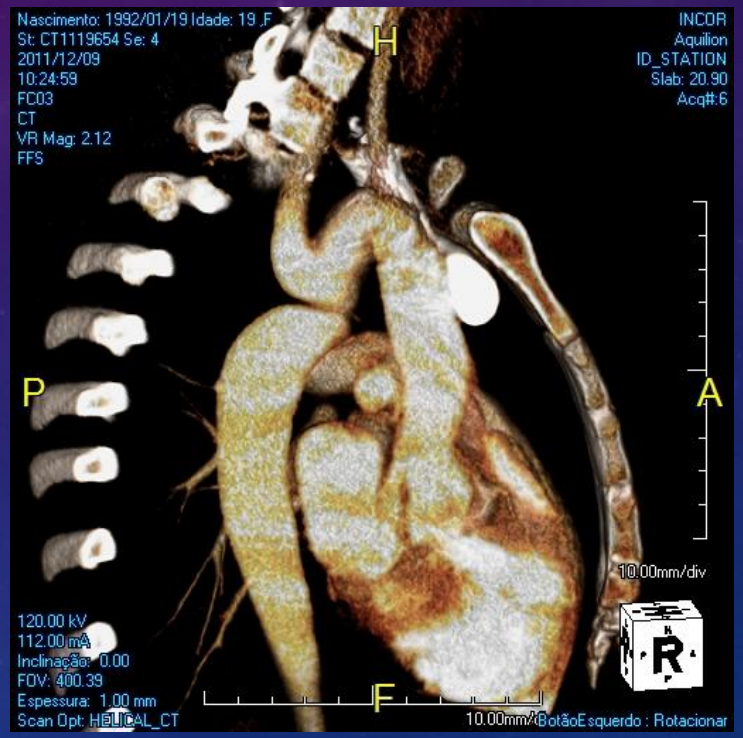




O que devemos da saber com os exames de imagens??!!!

Anatomia : tomografia !!!

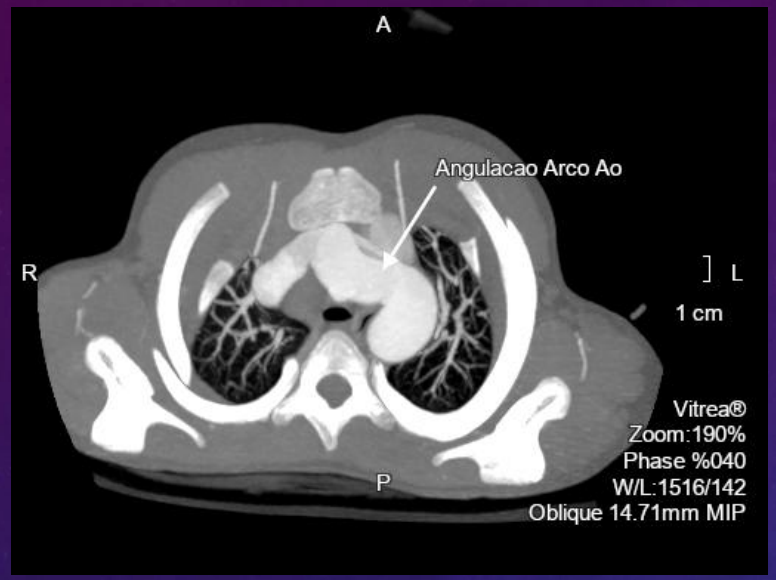


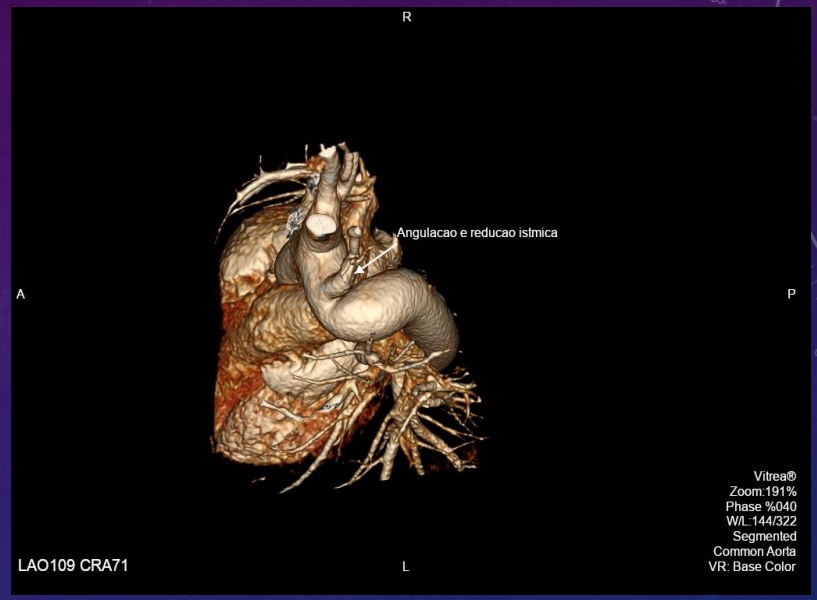


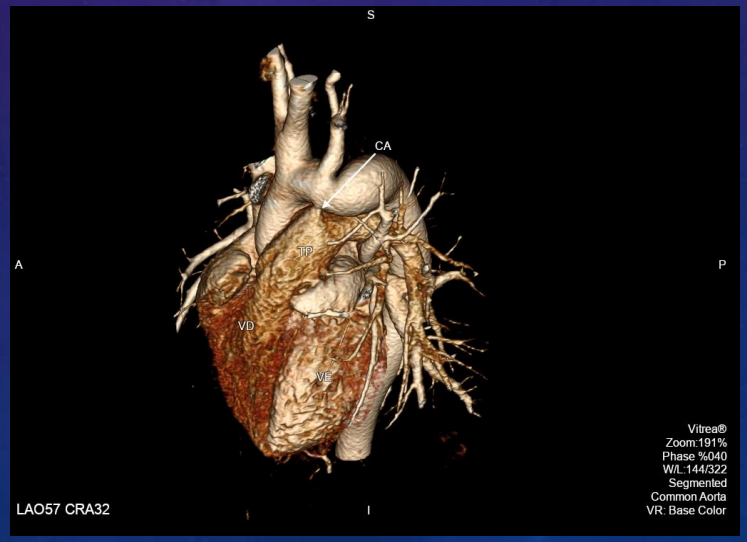
Arco Gotico + Subclavia justaCoAo

PSEUDO COAO E PCA

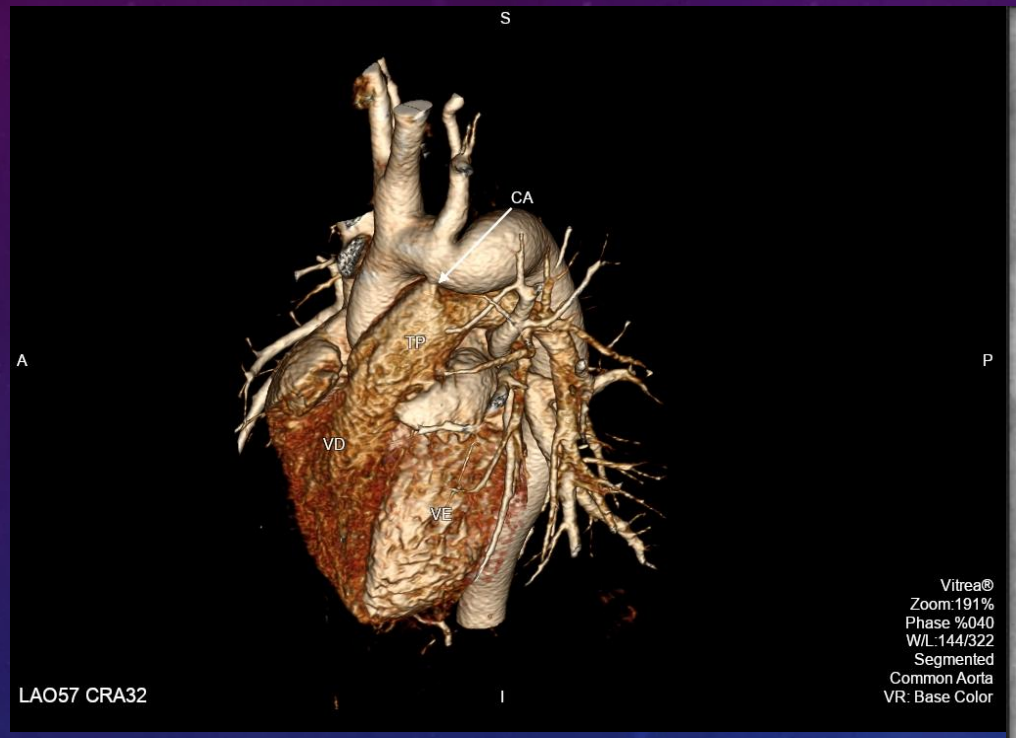
Eco : Grad 32 mmHg

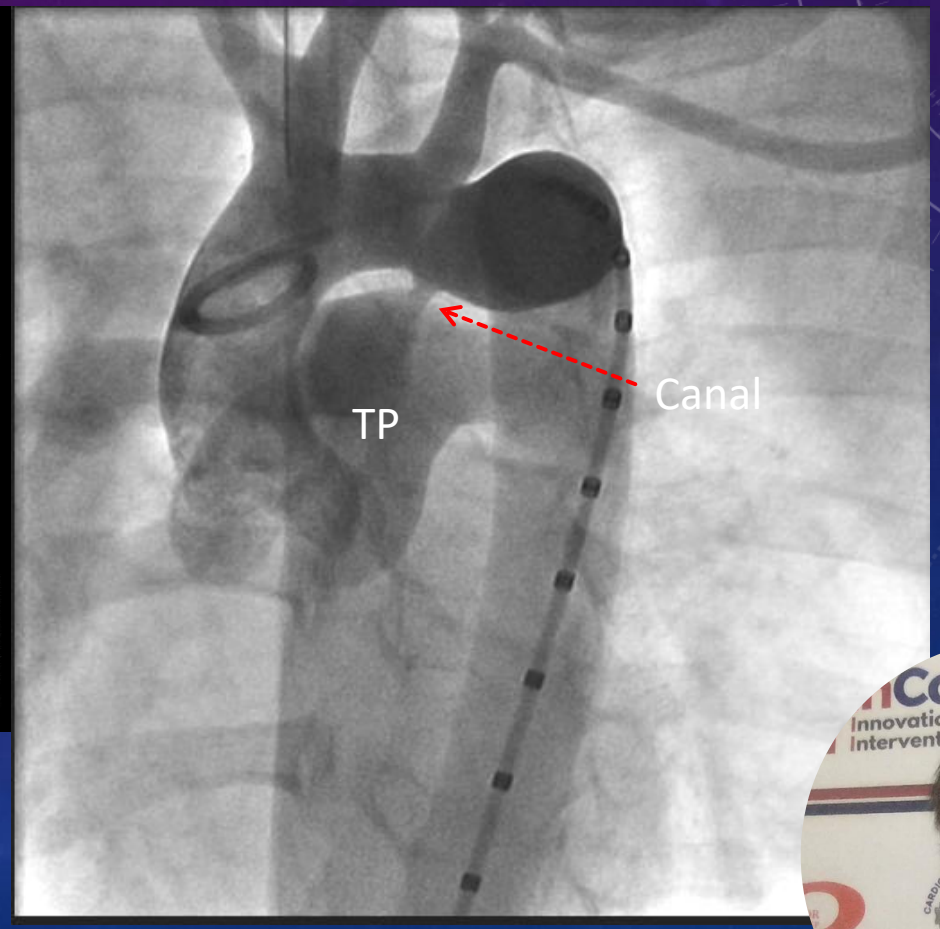




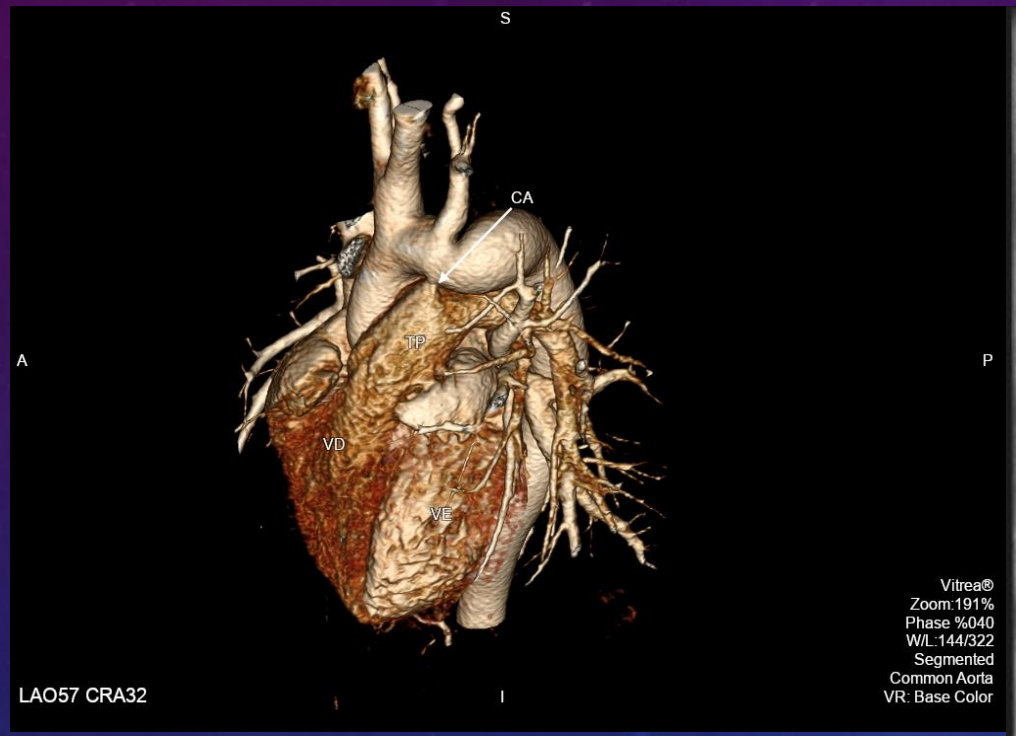


PSEUDO COAO E PCA





PSEUDO COAO


S
A
P
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CA
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VD
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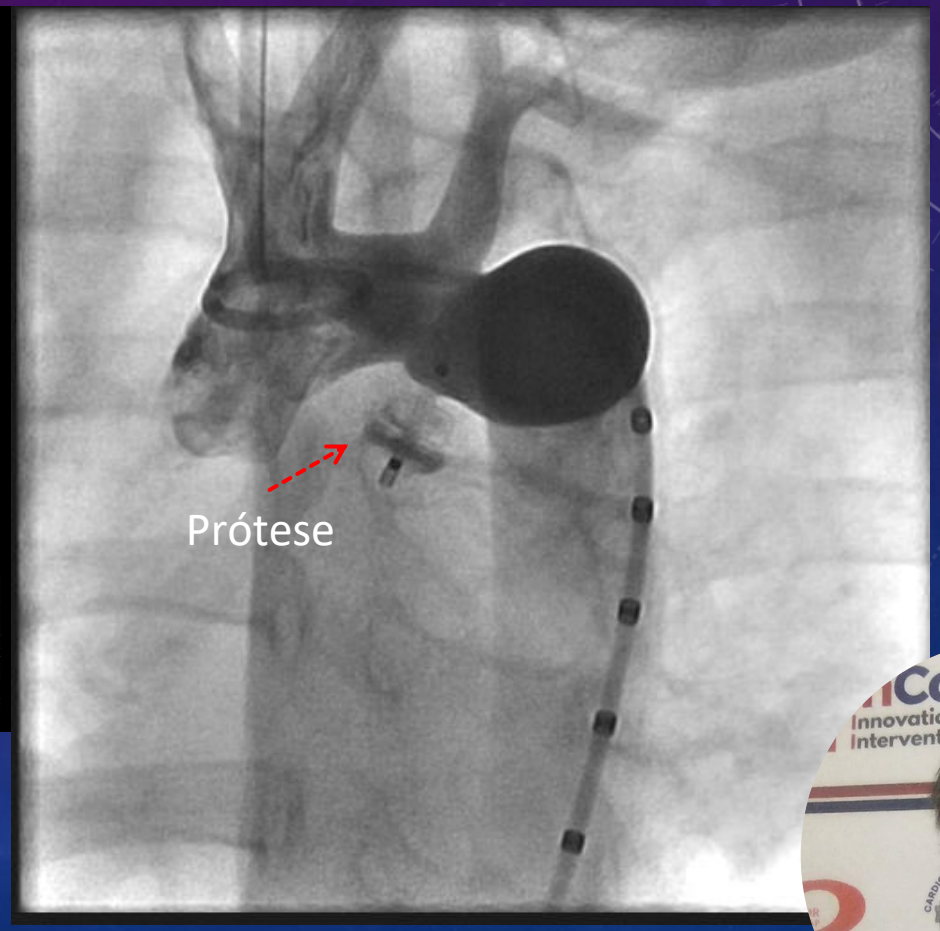
LAO57 CRA32
Vitrea®
Zoom:191%
Phase %040
W/L:144/322
Segmented
Common Aorta
VR: Base Color


Prótese

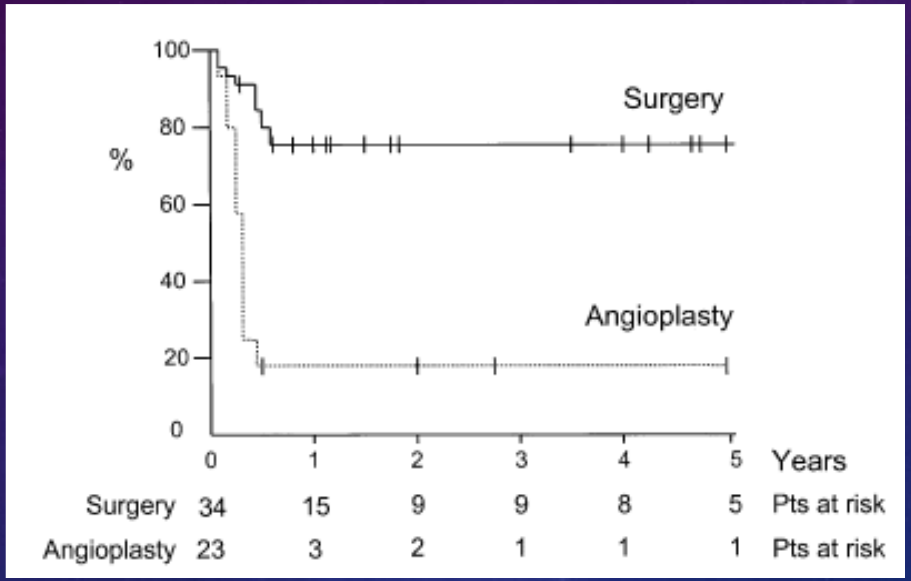
Crianças < 6 meses (’80)

Crianças < 6m (’90)

Set 1991 Jun 1999, 17 pts
Idade média 3 meses (2 sem–9 m)
Peso mediana 4.8 kg(2.8–7 kg).
Gradiente 43 ± 15 mmHg para 10 ± 8mmHg ($p < 0.001$),
Diâmetro min. 2.4 ± 0.9 mm para 5.2 ±1.0 mm ($p < 0.001$).
Mortalidade: 0 %
Seguimento médio 2.7 anos (0.15–7.75)
7(41%) re-coarcatação
4 cirurgia (media 4 meses)

Balloon Angioplasty of Native Coarctation of the Aorta in Infants and Neonates: Is It Worth the Hassle? Z.M. Hijazi Pediatr Cardiol 22:53–57, 2001

Crianças < 6m (’00)



Comparison of Angioplasty and Surgery for Neonatal Aortic Coarctation. Andrew C. Fiore, MD, Ann Thorac Surg 2005;80:1659–65

Crianças < 6 m(’00)

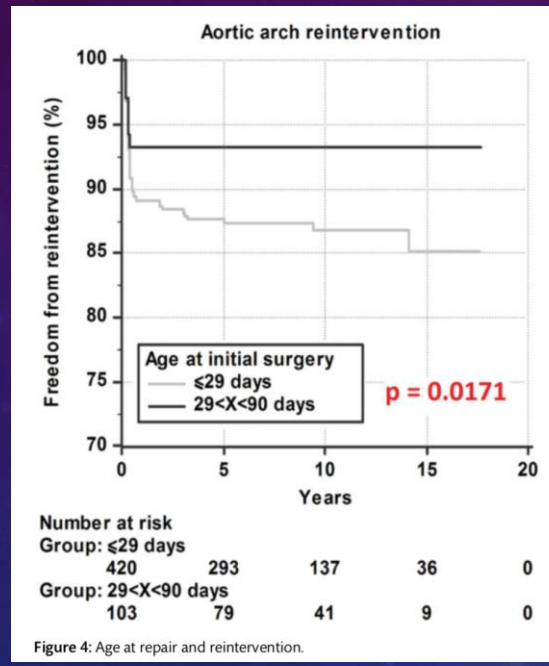


Figure 4: Age at repair and reintervention.

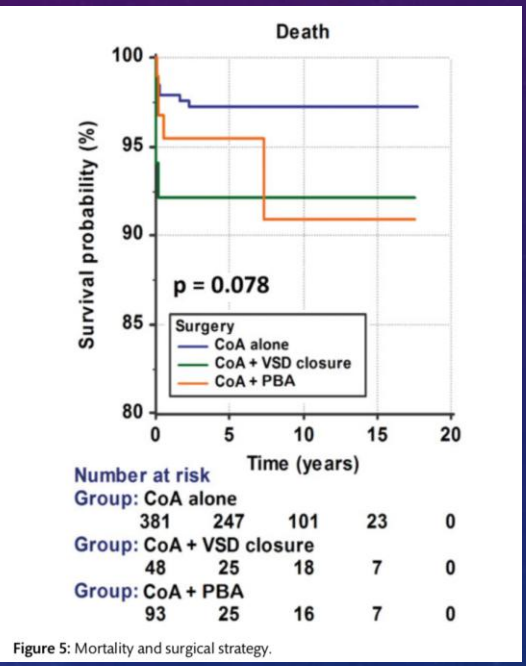


Figure 5: Mortality and surgical strategy.

Risk factors of mortality and recoarctation after coarctation repair in infancy

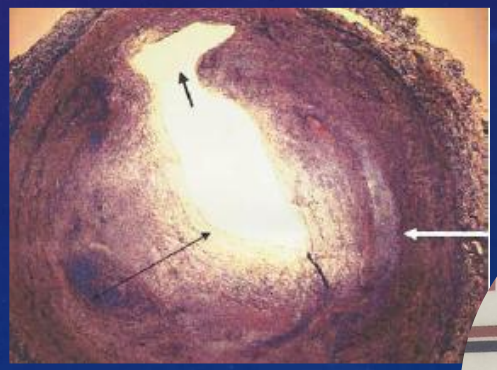
Ameʹ lia Lehnert [a,†], Olivier Villemain[a,b,*†], Reʹ gis Gaudin [a], Mathilde Meʹ ot[a,b], Olivier Raisky[a,b] and Damien Bonnet[a,b,c]

Interactive CardioVascular and Thoracic Surgery (2019) 1–7 doi:10.1093/icvts/ivz117

Crianças < 6 m
Tecido do canal arterial

TABLE 1 Relative Contribution of Matrix Proteins to the Structure of Excised Coarctation Segments

	Elastin	Collagen	Glycosaminoglycans
Intima			
Balloon	9 ± 13%	22 ± 20%	4 ± 5%
Primary repair	6 ± 4%	35 ± 28%	4 ± 4%
p Value	NS	NS	NS
Media			
Balloon	40 ± 25%	16 ± 7%	12 ± 10%
Primary repair	22 ± 9%	30 ± 16%	10 ± 6%
p Value	0.0005	0.009	NS
Adventitia			
Balloon	3 ± 2%	5 ± 4%	25 ± 20%
Primary repair	4 ± 2%	4 ± 3%	34 ± 15%
p Value	NS	NS	NS



Changes in Protein Distribution of the Aortic Wall Following Balloon Aortoplasty for Coarctation
Kamal K. Pourmoghadam, MD, THE AMERICAN JOURNAL OF CARDIOLOGY VOL. 89 JANUARY 1, 2002

CRIANÇAS < 6 MESES

Indicação

- Casos especiais
  - **CoAo Nativa**
    - **Neonatos graves**
    - Sem possibilidades de cirurgia
  - Re-CoAo
    - Pós cirúrgica
      - Norwood
      - Hibrido

Re-avaliar via acesso

NEONATOS
CoAo Nativa

Pt. no	Diagnosis	Age at stent (days)	Weight at stent (kg)	Diameter × length of stent (mm)	Age at surgery (months)	Weight at surgery (kg)	Type of definitive surgical repair
Group I: Patients with primary stent implantation							
1	Shone complex, hypopl. Ao-Arch, CoA, MS, VSD's	12	3.8	5 × 12	1.0	3.5	Ao-Arch patch angioplasty (Norwood-like)
2	TGA, VSD, subAS, hypopl. Ao-Arch, CoA	61	3.2	4 × 10	2.2	3.2	Ao-Arch patch angioplasty (Norwood-like), arterial switch, resection of subAs
3	crit. CoA, musc. VSDs	29	1.8	4 × 9	3.8	2.4	stent removal, ETE
4	crit. CoA, hypopl. Ao-Arch, bic. AoV	17	3.3	4 × 15	3.5	4.8	stent removal, ETE
5	crit. CoA, incomplete AVSD; CHARGE syndrome	8	2.7	5 × 15	–	–	–
6	crit. CoA, hypopl. Ao-Arch, bic. AoV	15	2.2	3.5 × 12	3	4.2	aortic arch patch angioplasty (Norwood-like)
7	crit. CoA, hypopl. Ao-Arch, VSD	9	1.9	4 × 8	3.3	4.9	stent removal, ETE
8	crit. CoA, hypopl Ao-Arch, bic. AoV, VSD	5	2.5	3.5 × 12	2.2	3.8	stent removal, ETE
9	crit. CoA, hypopl Ao-Arch, VSD, bic. AoV, PAPVD	3	2.6	4.5 × 16	–	–	–
10	crit. CoA, bic. AoV, VSD, borderline LV	5	1.8	4 × 9	4.2	4.9	stent removal, ETE
11	crit. CoA, bic. AoV, VSD	5	1.5	4 × 8	4.3	5.2	stent removal, ETE

Bailout Stenting for Critical Coarctation in Premature/ Critical/Complex/Early Recoarcted Neonates
Matthias Gorenflo,1 MD, PhD, Derize E. Boshoff,1 MMed, Ruth Heying,1 MD, Benedicte Eyskens,1 MD, PhD, Filip Rega,2 MD, PhD, Bart Meyns,2 MD, PhD, and Marc Gewillig,1* MD, Catheterization and Cardiovascular Interventions 75:553–561 (2010)

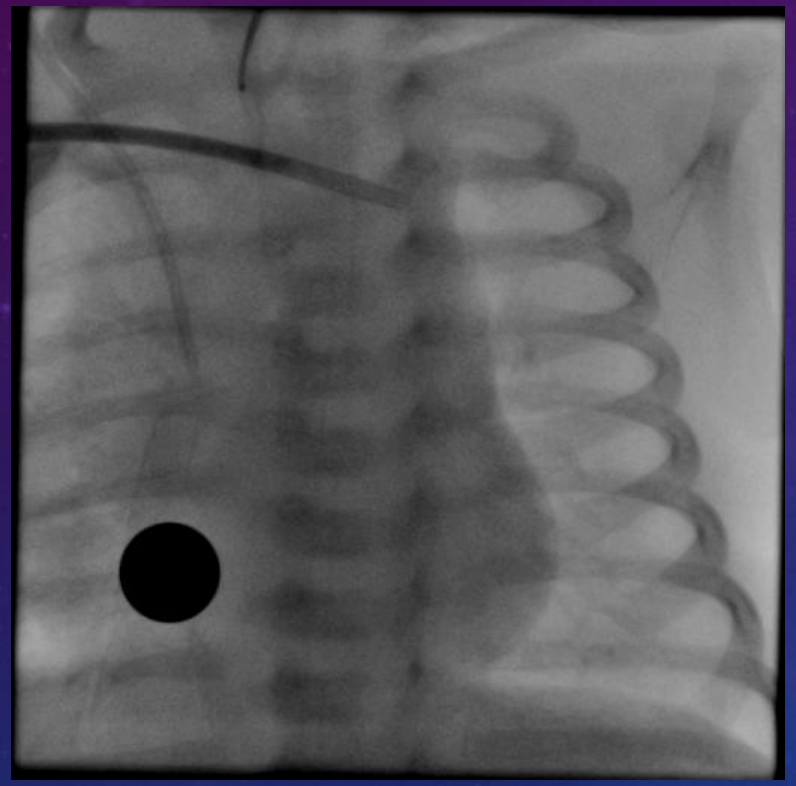
NEONATOS
CoAo Nativa

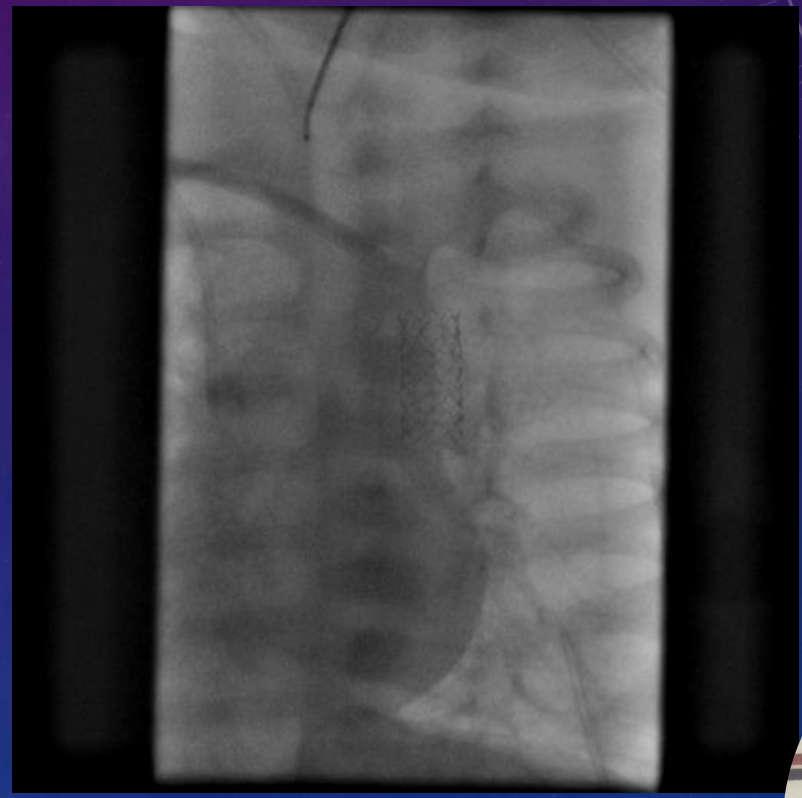
Age (wks)	Wt (kg)	Isthmus (mm)	Transverse arch (mm)	Associated lesions	Intervention	Residual gradient (mmHg)	Complications	ICU stay (days)	Hospital stay (days)	Follow up (months)	Outcome
4	3	4	4.5	Shone's syndrome	5 × 13 mm stent	8	Transient pulse loss	5	7	32	Stent redilation done after 3 months
1	2.8	3	3.2	Hypo plastic LV, hypo plastic transverse arch	4 × 10 mm stent	15	-	7	12	4	Refused surgery, no further follow up
3	3.5	4.3	4.8	Bicuspid aortic valve with aortic stenosis	Balloon (4 × 15 mm)	Nil	-	1	4	28	Redilation done twice
3	2.7	4.3	6.3	Nil	Balloon (6 × 20 mm)	Nil	-	1	6	6	Surgery planned
6	3.2	3.2	3.5	VSD, hypo plastic arch	4 × 9 mm stent	Nil	-	2	4	2	PA banding done then lost to follow up
4	0.97	2.7	3.8	VSD	Balloon (5 × 20 mm)	8	Transient cardiac arrest during procedure	2	5	9	VSD closure and CoA repair done 3 months later
1	3.1	3	7.5	VSD	4 × 8 mm stent	16	Sepsis	5	13	12	VSD closure and CoA repair 3 months later
4	3.1	3.4	3.6	Hypo plastic arch	4 × 10 mm stent	15	-	3	5	24	CoA repair 3 months later
1	3	5	6	Nil	Balloon (6 × 15 mm)	15	-	3	6	8	CoA repair one month later
2	3.3	3.7	4.8	Nil	Balloon (5 × 15 mm)	10	-	2	3	16	CoA repair 2 months later

Emergency balloon dilation or stenting of critical coarctation of aorta in newborns and infants: An effective interim palliation.Francis E, Gayathri S, Vaidyanathan B, Kannan BR, Kumar RK. Ann Pediatr Cardiol. 2009 Jul;2(2):111-5.

NEONATOS

CoAo Nativa





COAO NATIVA 6 MESES - 1 ANO

Tratamento percutâneo

- Coarctação localizada
- Arco normodesemvolvido

Balloon Angioplasty for Native Aortic Coarctation in 3- to 12-Month-Old Infants

Juan Pablo Sandoval , MD*; Sok-Leng Kang , MBBS, MSc*; Kyong-Jin Lee, MD; Lee Benson , MD; Kentaro Asoh , MD; Rajiv R. Chaturvedi , MD, PhD

Circ Cardiovasc Interv. 2020

COAO NATIVA 6 MESES - 1 ANO

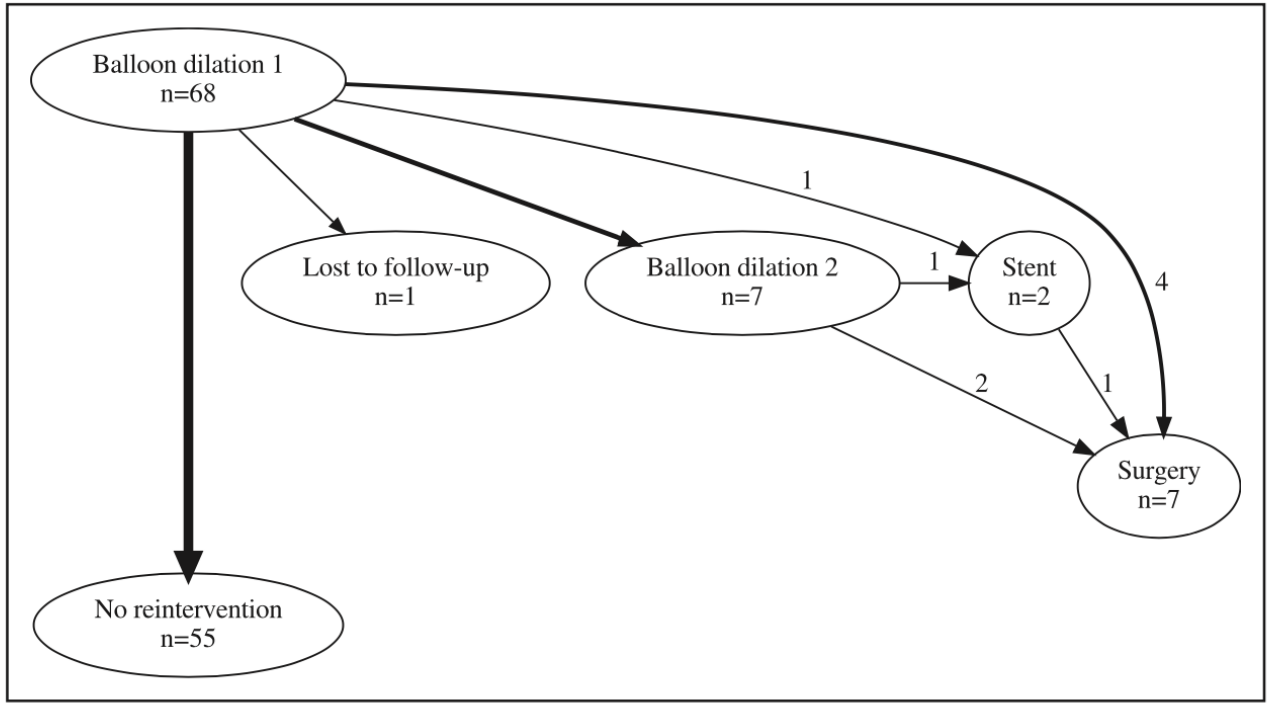


Figure 1. Clinical outcome of 3- to 12-mo-old infants after primary balloon angioplasty.
7 patients required surgical intervention.

Balloon Angioplasty for Native Aortic Coarctation in 3- to 12-Month-Old Infants

Circ Cardiovasc Interv. 2020

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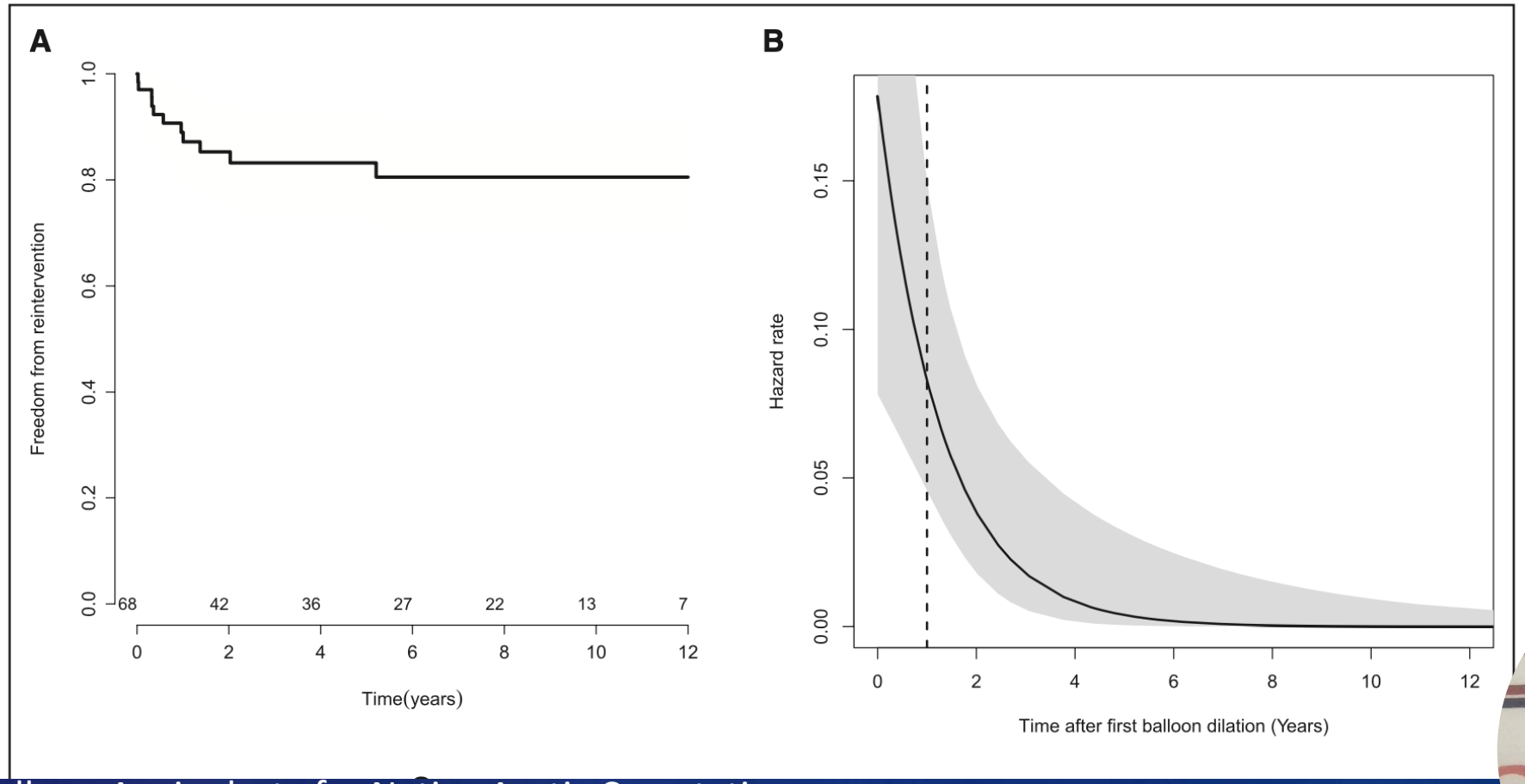

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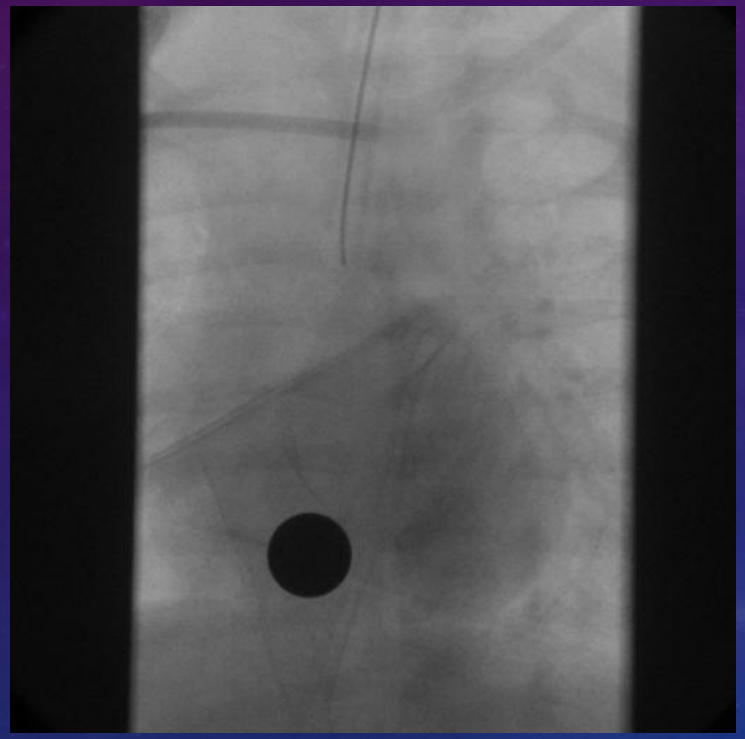
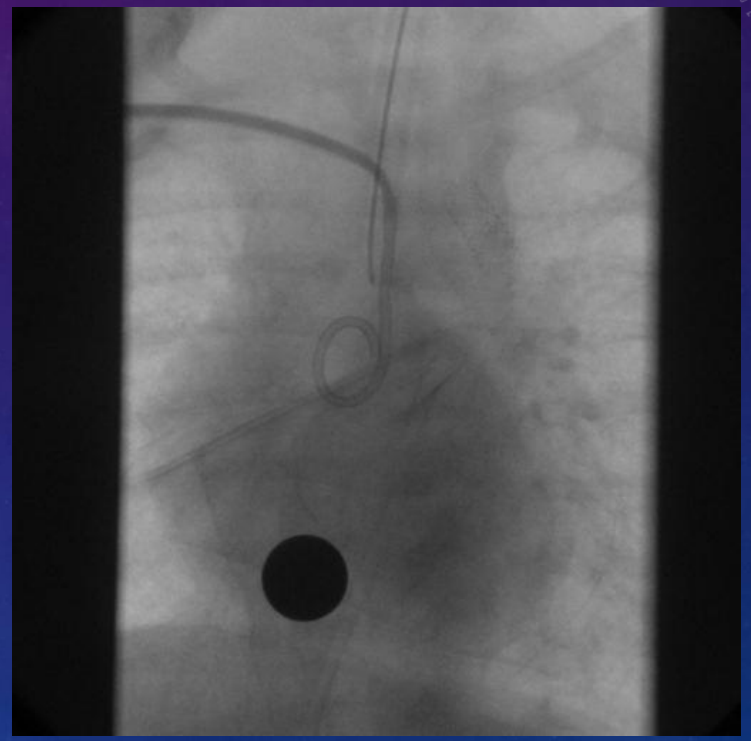
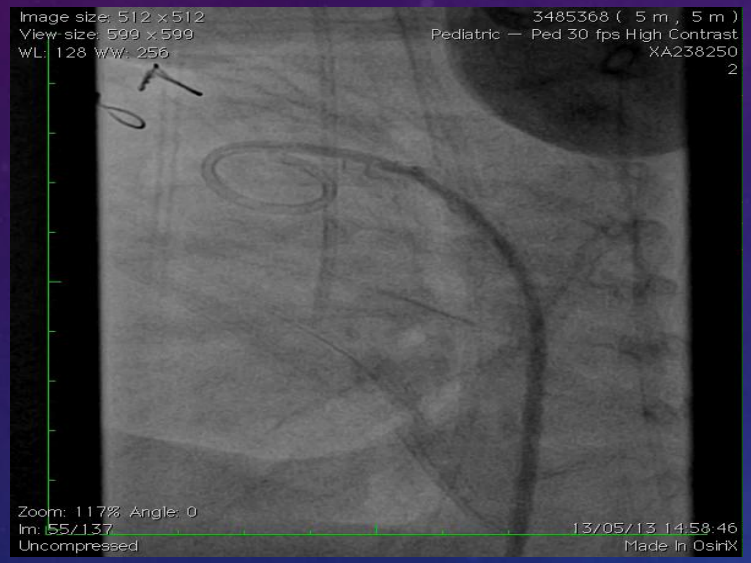
6 MESES -1 ANO

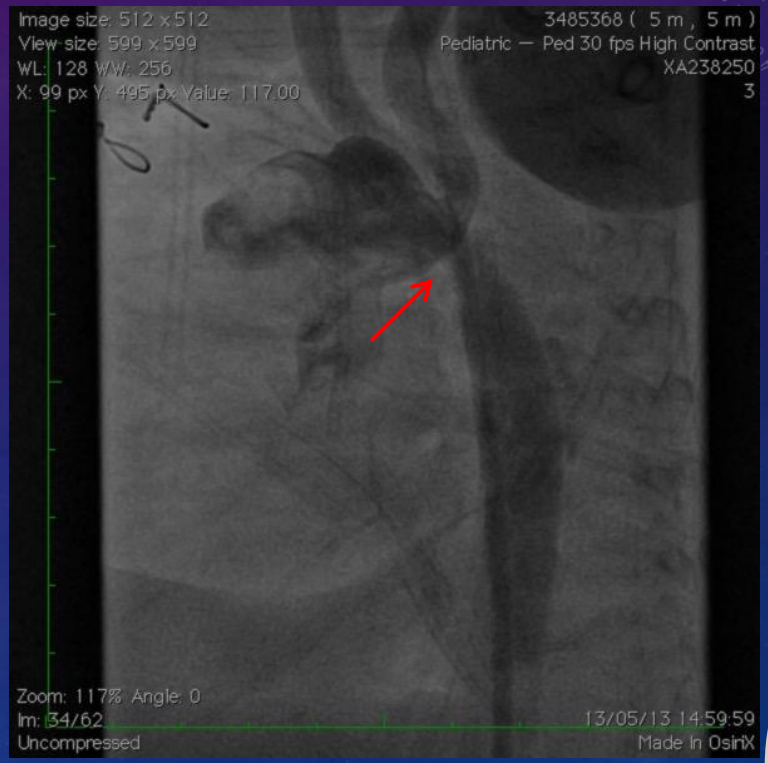
CoAo Nativa



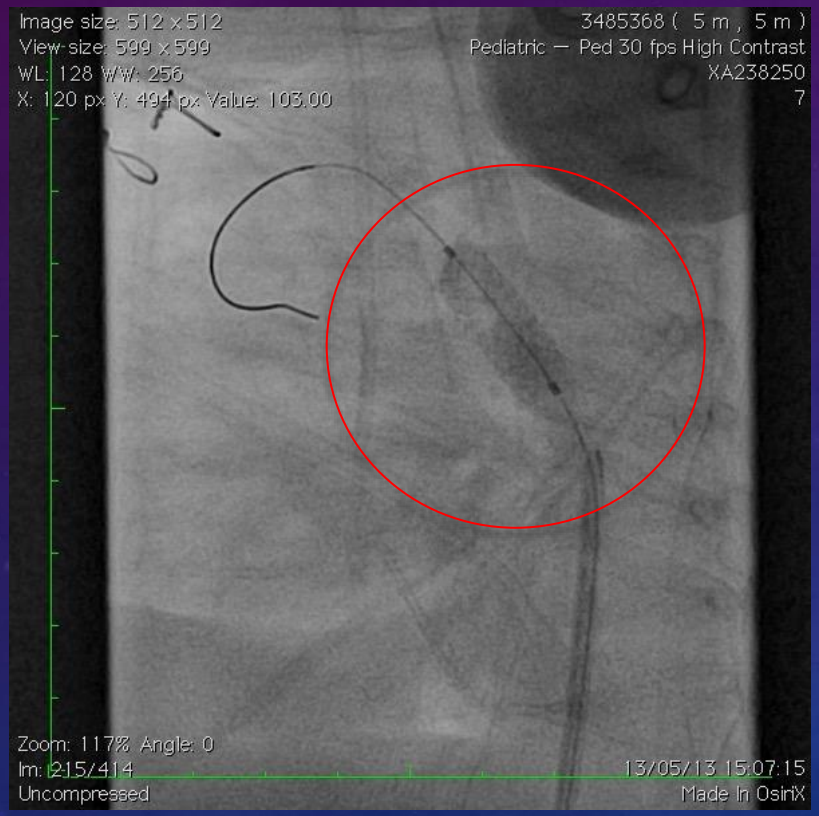


RE-COARCTAÇÃO
PO NORWOOD (5 M)





RE-COARCTAÇÃO
PO NORWOOD (5 M)



Escolha do Tratamento da CoAo (InCor)

< 1ano :

- Cirurgia (escolha)
- Percutâneo
  - Crianças graves , ReCoa,Hibridos

< 25 Kg:

- Nativa: Angioplastia com Balão/Hibrido (stent)
- Re CoAo: Angioplastia com balão /Hibrido (stent)
  - CX:
    - hipoplasia do Arco
    - Coarctação segmentar
    - Cardiopatia associada

> 25 Kg:

- Angioplastia com stent (Escolha)
- Cx: hipolasia do arco , segmentar

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CRIANÇAS (< 25 KG)

- Indicações
  - CoAo localizadas
  - Gradiente> 20 mmHg
  - Re-CoaAo
  - Stent ?
    - Casos selecionados

CRIANÇAS (< 25 KG)

- Sucesso 87-90%

	Before Angioplasty	After Angioplasty	p Value*
Pressure gradient (mm Hg)	31 ± 12 (n = 67)	8 ± 8 (n = 68)	< 0.001 (n = 67)
Ascending/descending aortic systolic pressure ratio	1.39 ± 0.21 (n = 67)	1.09 ± 0.10 (n = 68)	< 0.001 (n = 67)
CoA dimension (LAO projection) (mm)	4.6 ± 2.7 (n = 65)	8.9 ± 3.1 (n = 64)	< 0.001 (n = 62)
CoA dimension (LAT projection) (mm)	4.8 ± 29 (n = 68)	9.2 ± 2.9 (n = 66)	< 0.001 (n = 66)
CoA/diaphragmatic aorta diameter ratio (LAO projection)	0.36 ± 0.14 (n = 65)	0.70 ± 0.15 (n = 64)	< 0.001 (n = 62)
CoA/diaphragmatic aorta diameter ratio (LAT projection)	0.36 ± 0.14 (n = 68)	0.72 ± 0.14 (n = 66)	< 0.001 (n = 66)

Balloon angioplasty of native coarctation: clinical outcomes and predictors of success
Lee N. Benson *J. Am. Coll. Cardiol.* 2000;35;988-996

CRIANÇAS (< 25 KG)

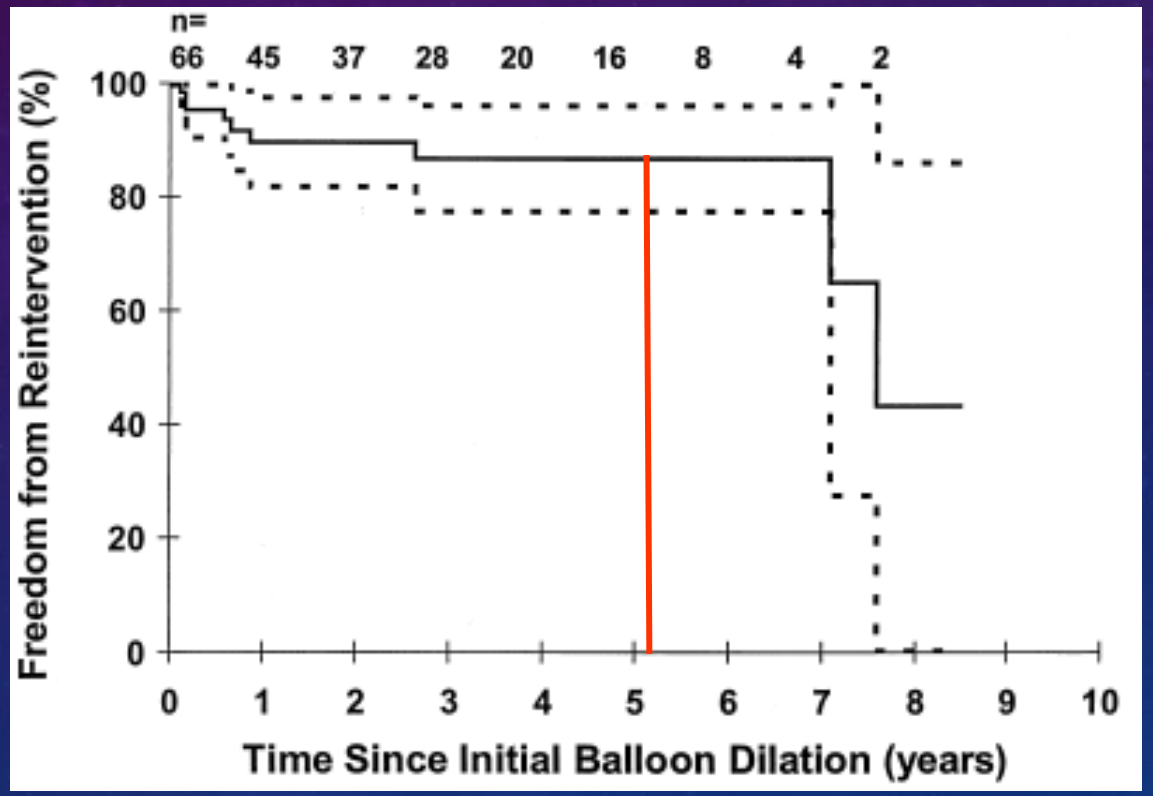
- Complicações precoces
  - Perda transitória do pulso (7%)
  - Crises HTA(15%)
  - Aneurismas : 9,48 %
    - Tto < 1%

Balloon angioplasty of native coarctation: clinical outcomes and predictors of success
Lee N. Benson *J. Am. Coll. Cardiol.* 2000;35;988-996

Crianças (< 25 Kg)

Re-intervenção

- Seguimento



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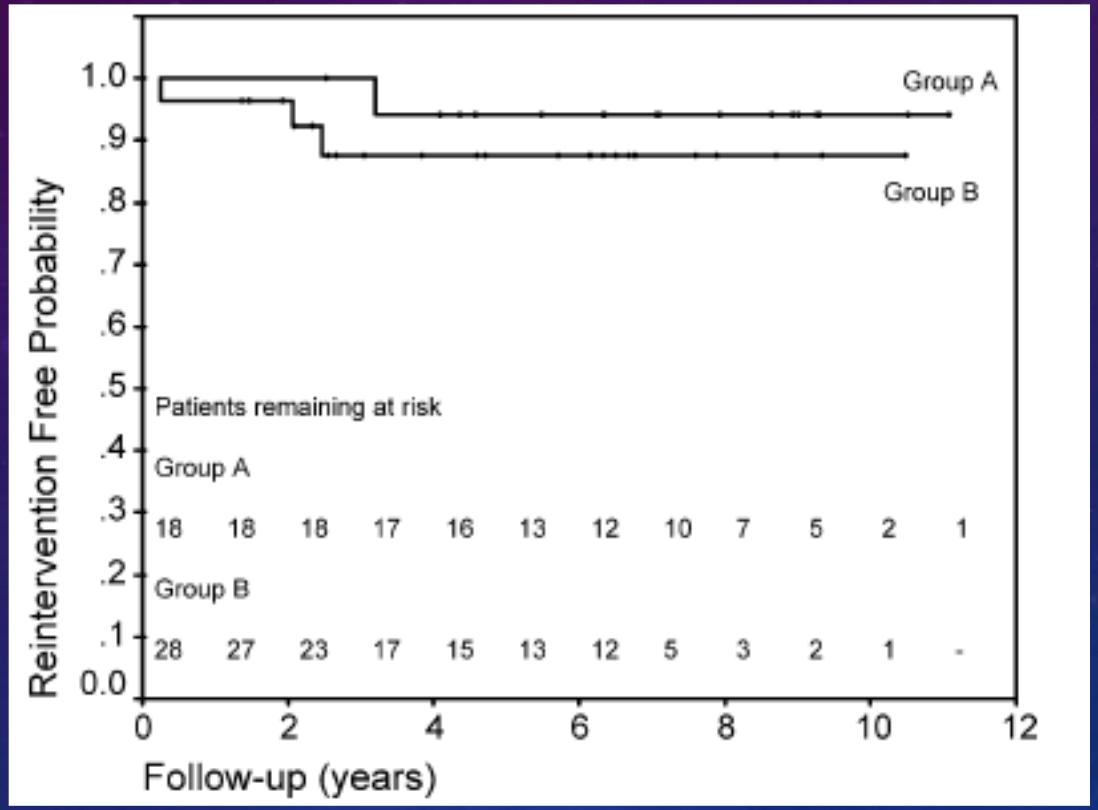
Crianças (< 25 Kg)

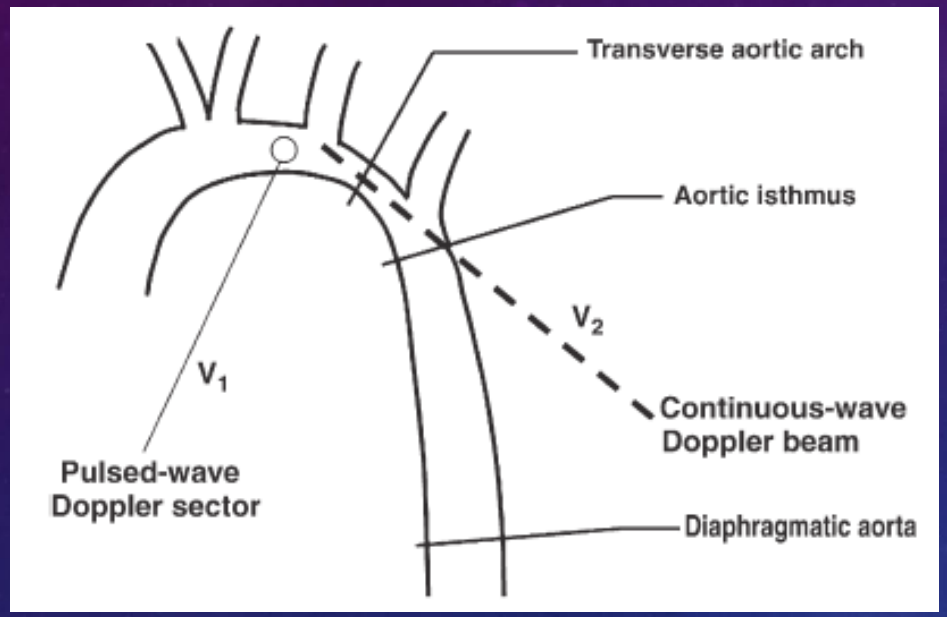
Re-intervenção

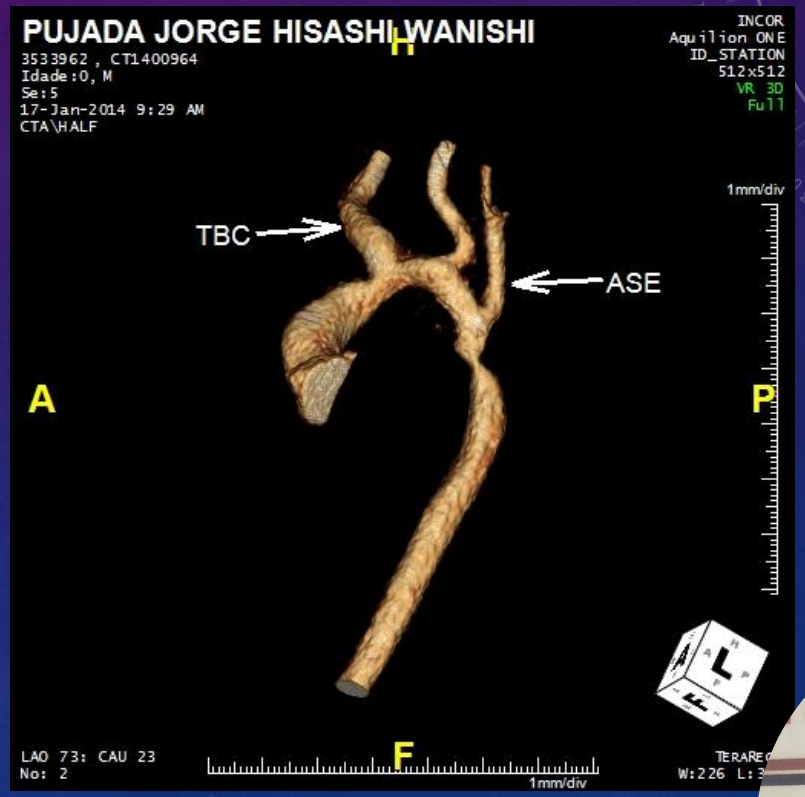


Comparison of surgical repair with balloon angioplasty for native coarctation in patients from 3 months to 16 years of age. Ronald J. Walhout, *European Journal of Cardio-thoracic Surgery 25 (2004) 722–727*

Crianças (< 25 Kg)

POT de CoAo 3m 6 Kg

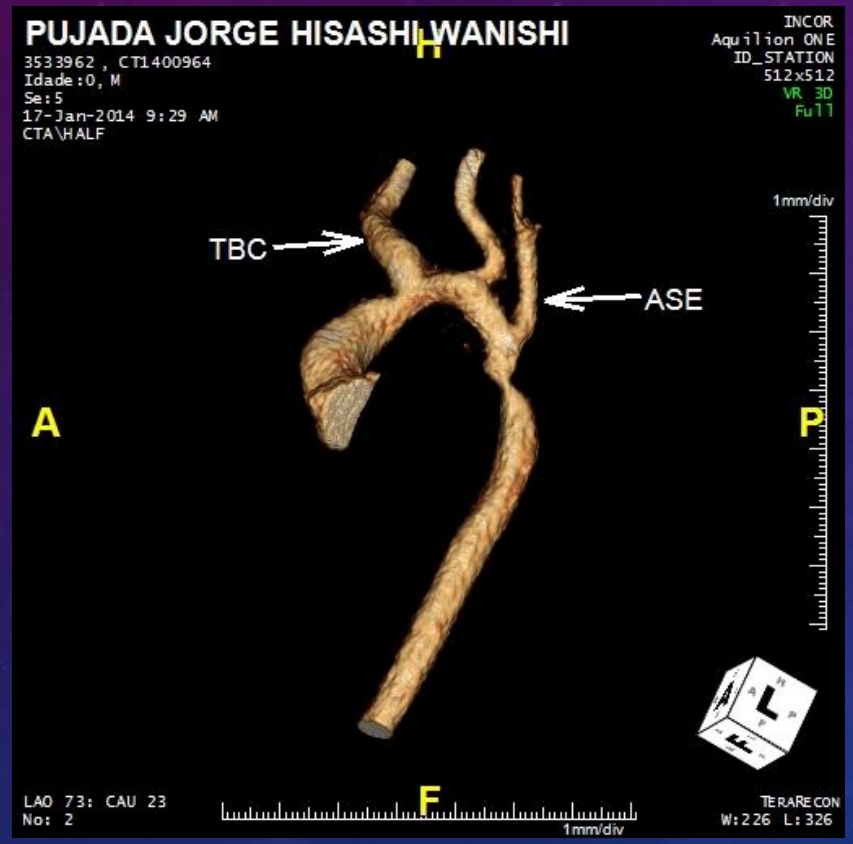


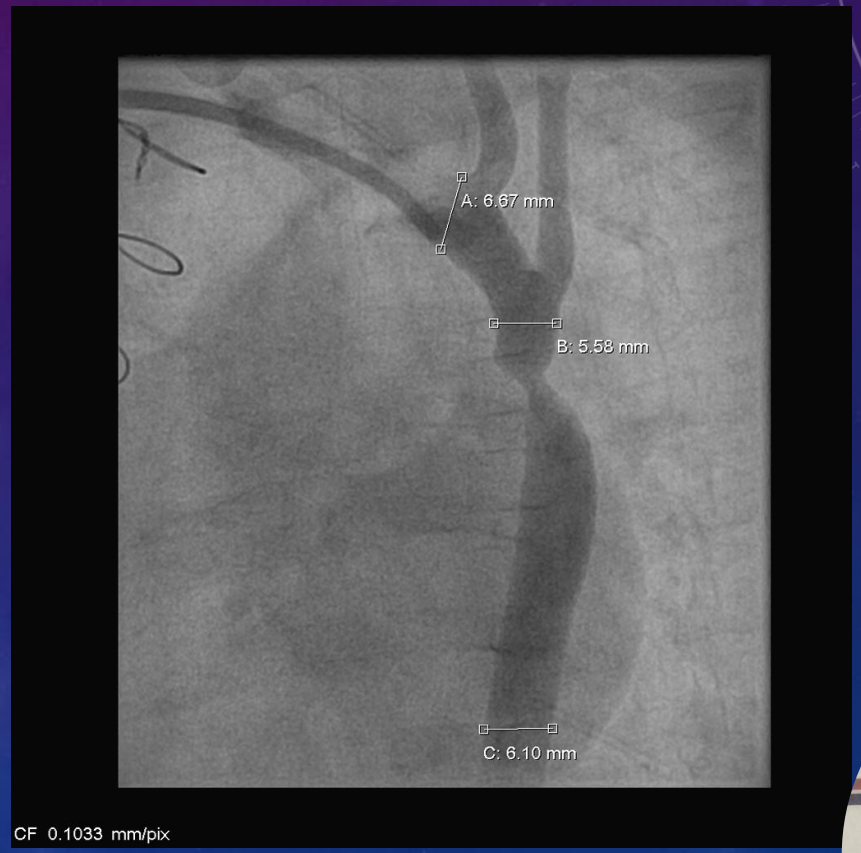


Hipoplasia do Arco

Impact of transverse aortic arch hypoplasia after surgical repair of aortic coarctation: An exercise echo and magnetic resonance imaging study.
Alessandro Giardini. *International Journal of Cardiology (2006)*

Crianças (< 25 Kg)





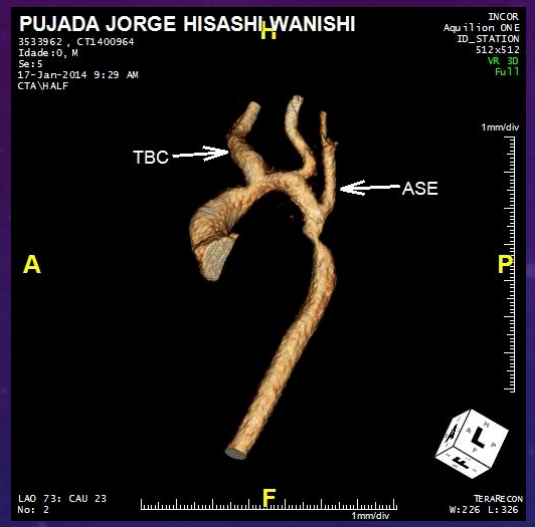
POT de CoAo 3 meses
6 Kg

Crianças (< 25 Kg)

POT de CoAo 3 meses

6 Kg

Angioplastia com Balão



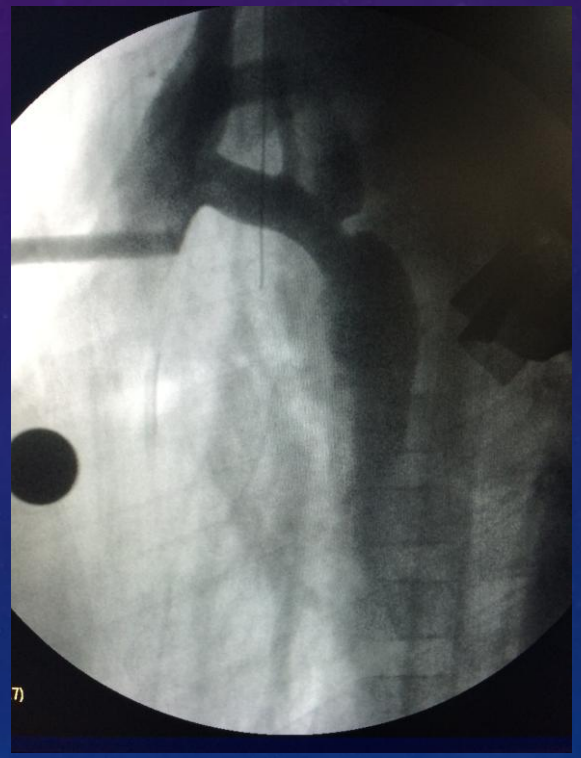
Imediato

1 ano apos

Crianças (< 25 Kg) Stent?

1ano 8Kg

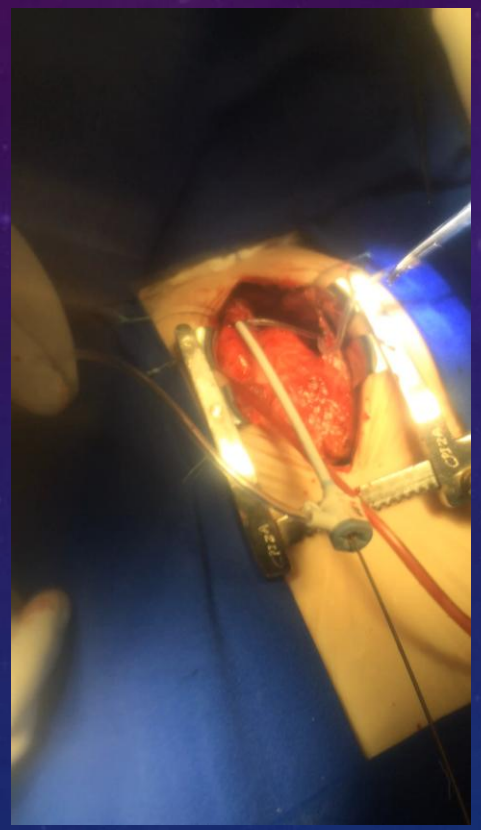
POT CoAo + CIV

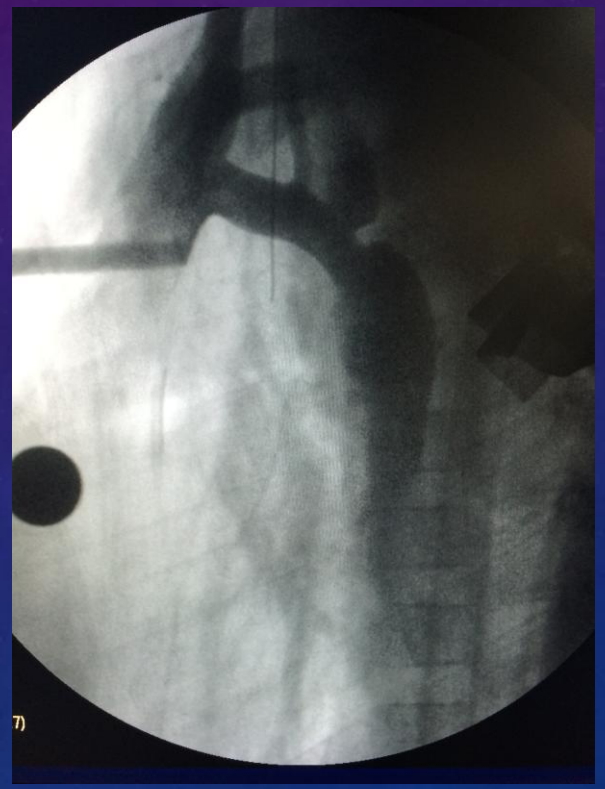


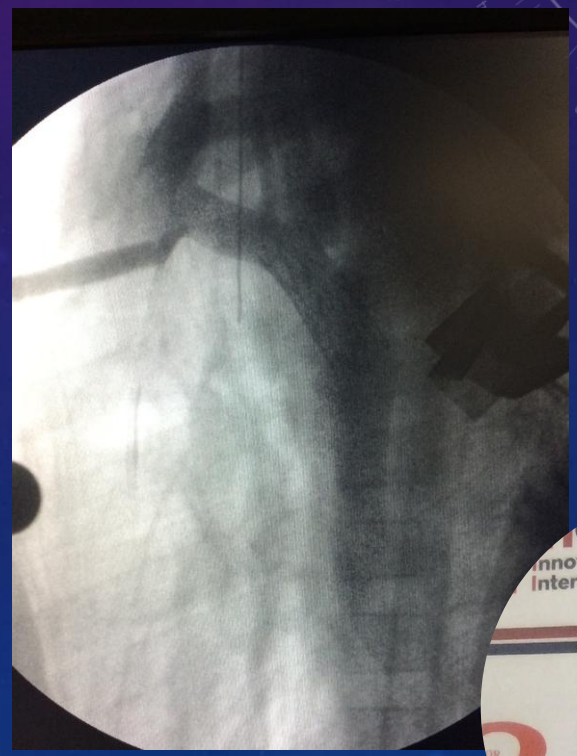
Membrana SubAo e Re CoAo

Crianças (< 25 Kg) Stent?

Hibrido







1ano 8kg

Hibrido: Stent coao + Ressecção membrana

Escolha do Tratamento da CoAo (InCor)

< 1 ano :

- Cirurgia (escolha)
- Percutâneo
  - Crianças graves , ReCoa,Hibridos

< 25 Kg:

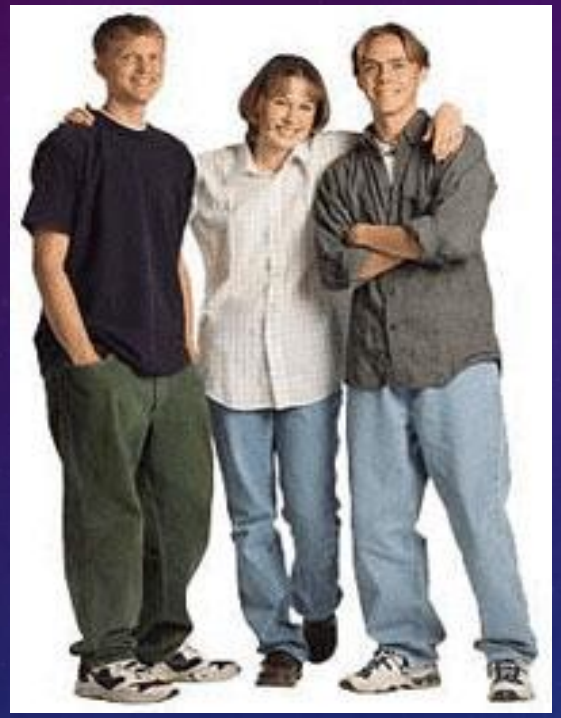
- Nativa: Angioplastia com Balão/Hibrido (stent)
- Re CoAo: Angioplastia com balão /Hibrido (stent)
  - CX:
    - hipoplasia do Arco
    - Coarctação segmentar
    - Cardiopatia associada

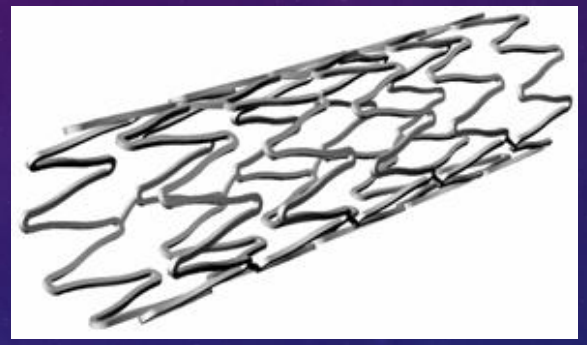
> 25 Kg:

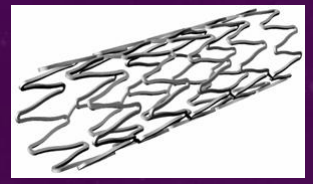
- Angioplastia com stent (Escolha)
- Cx: hipolasia do arco , segmentar

www.uptodate.com

PACIENTES > 25 KG

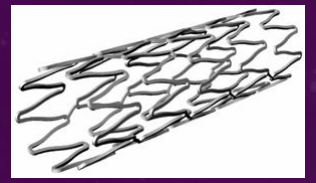






PACIENTES > 25 KG

- Potenciais problemas
  - Idade> 50 anos
  - Valva Aórtica Bicúspide (50%)
  - Hipoplasia do Arco
  - Dilatação Aneurismática Ao
  - Aneurismas cerebrais
  - Outras características anatômicas ...



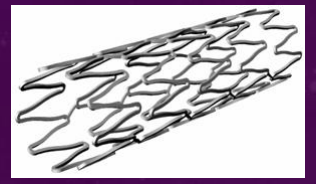
PACIENTES > 25 KG

Table 1. Published outcomes after balloon angioplasty for aortic coarctation in adult patients

Study	Patients, *N*	Mean age, *y*	Peak gradient predilatation (mm Hg)	Peak gradient postdilatation (mm Hg)	Suboptimal outcome, *n* (%)	Aneurysm formation, *n* (%)	Restenosis, *n* (%)	Deaths, *n*
Fawzy et al.[10]	37	23	69 ± 24	12 ± 8	3 (7)	3 (7)	3 (7)	0
Schrader et al.[11]	29	25	62 ± 18	21 ± 13	—	—	—	1[b]
Tyagi et al.[30]	35	22	79 ± 24	16 ± 12	9 (24)	3 (9)	2 (8)	0
Paddon et al.[31]	17	29	51 ± 18	11 ± 9	4 (24)	1 (6)	0[a]	0
Koerselman et al.[25]	19	29	49 ± 21	5 ± 8	1 (5)	0	0	0
Biswas et al.[32]	29	22	86 ± 16	8 ± 4	0	1 (3)	2 (7)	0
De Giovanni et al.[33]	27	32	46 ± 14	10 ± 10	11 (41)	1 (4)	3 (11)	0
Attia and Lababidi[34]	8	25	48 ± 19	7 ± 5	0	—	0	0

No patients had greater than 20% stenosis on magnetic resonance imaging.
Late death from aortic dissection away from the coarctation site, probably unrelated.

Interventions for Aortic Coarctation.HORNUNG, T. S. MRCP*;BENSON, L. N. MD†; McLAUGHLIN, P. R. Cardiol Rev. 2002 May-Jun;10(3):139-48.



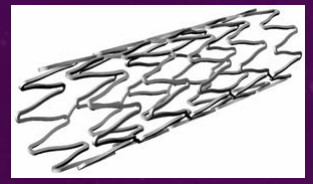
PACIENTES > 25 KG

Table 2. Published outcomes after endovascular stent implantation for aortic coarctation in adolescent and adult patients

Study	Patients, *N*	Median age, *y*	Peak gradient predilatation (mm Hg)	Peak gradient postdilatation (mm Hg)	Suboptimal outcome, *n*	Aneurysm formation, *n*	Restenosis, *n*	Vascular complications, *n*	Stent migration, *n*	Deaths, *n*
Alcibar et al.[26]	14	20	43 ± 19	2 ± 2	0	—	0	—	—	1[b]
Bulbul et al.[28]	6	19	37 ± 17	13 ± 23	1	0	0	1	0	0
Harrison et al.[22]	27	30	46 ± 20	3 ± 5	1	3	1	0	2	0
Ebeid et al.[29]	9	18.5	37 ± 7	4 ± 1	0	0	1	0	0	0
Magee et al.[21]	17	17	26 ± 11	5 ± 6	1	1	1	2	2	0
Marshall et al.[20]	33	14	25	5	1	0	—	1	1	0
Suarez de Lezo et al.[27]	48	14	42 ± 12	3 ± 4	0	3	3[a]	0	2	0
Thanopoulos et al.[23]	17	11	50 ± 25	2 ± 2	0	0	0	0	0	0
Ledesma et al.[35]	54	22	50 ± 20	5 ± 8	2	2	1	1	2	0

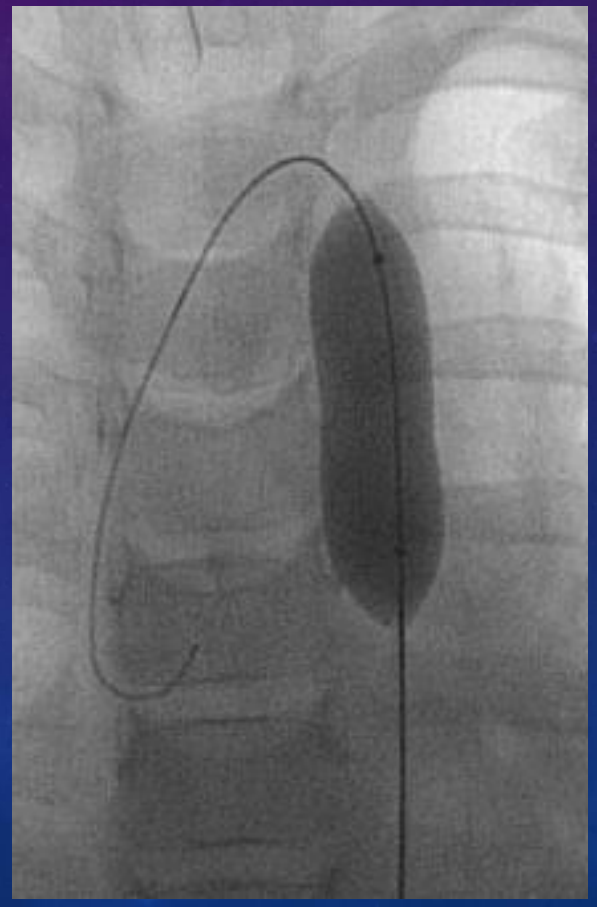
All 3 patients with restenosis had stents inserted during infancy.
Late death from sudden cardiac event.

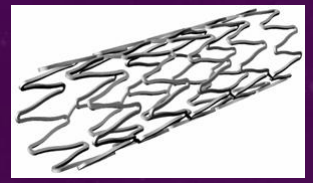
Interventions for Aortic Coarctation. HORNUNG, T. S. MRCP*;BENSON, L. N. MDt; McLAUGHLIN, P. R. Cardiol Rev. 2002 May-Jun;10(3):139-48.



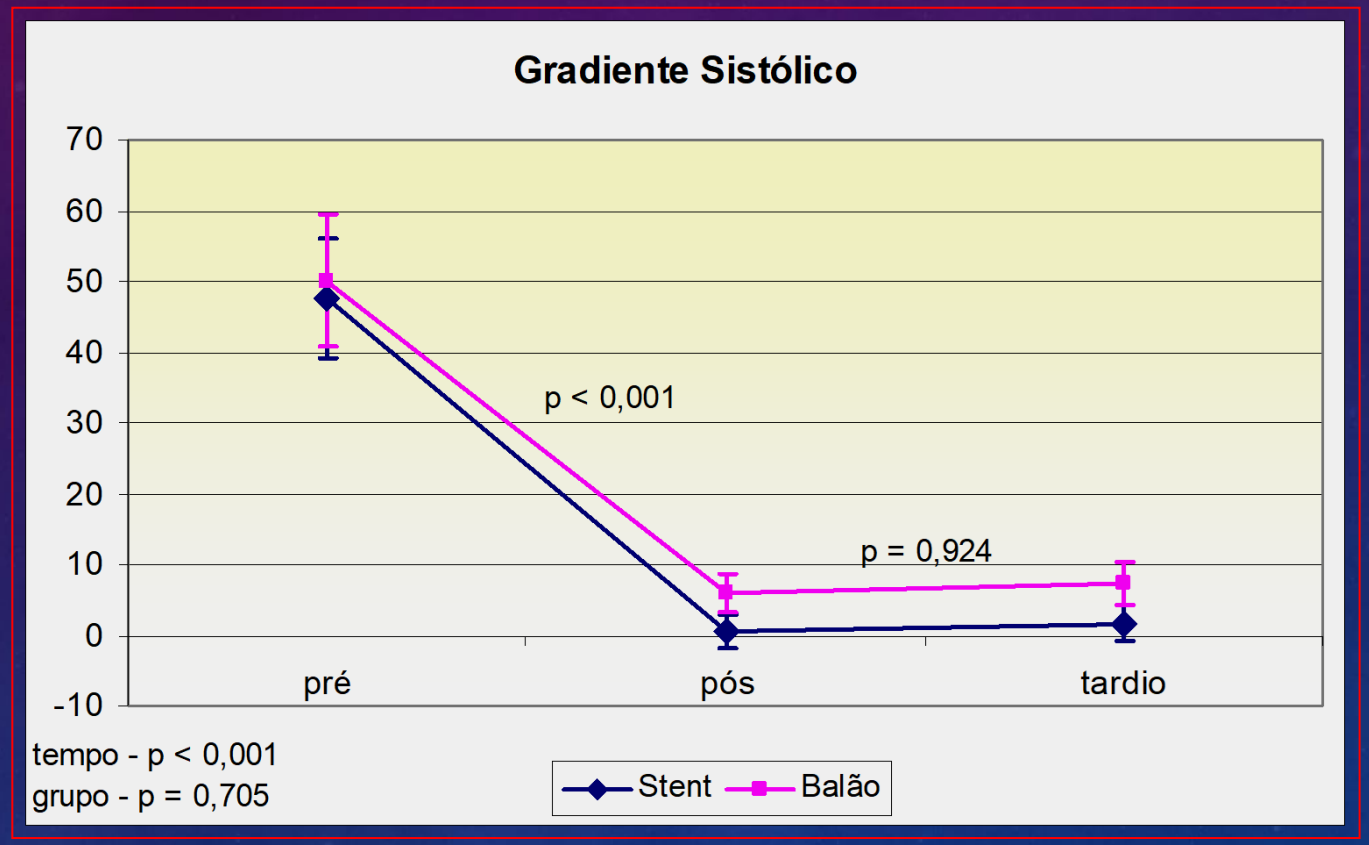
PACIENTES > 25 KG

- Quando Balão?

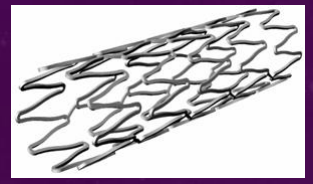




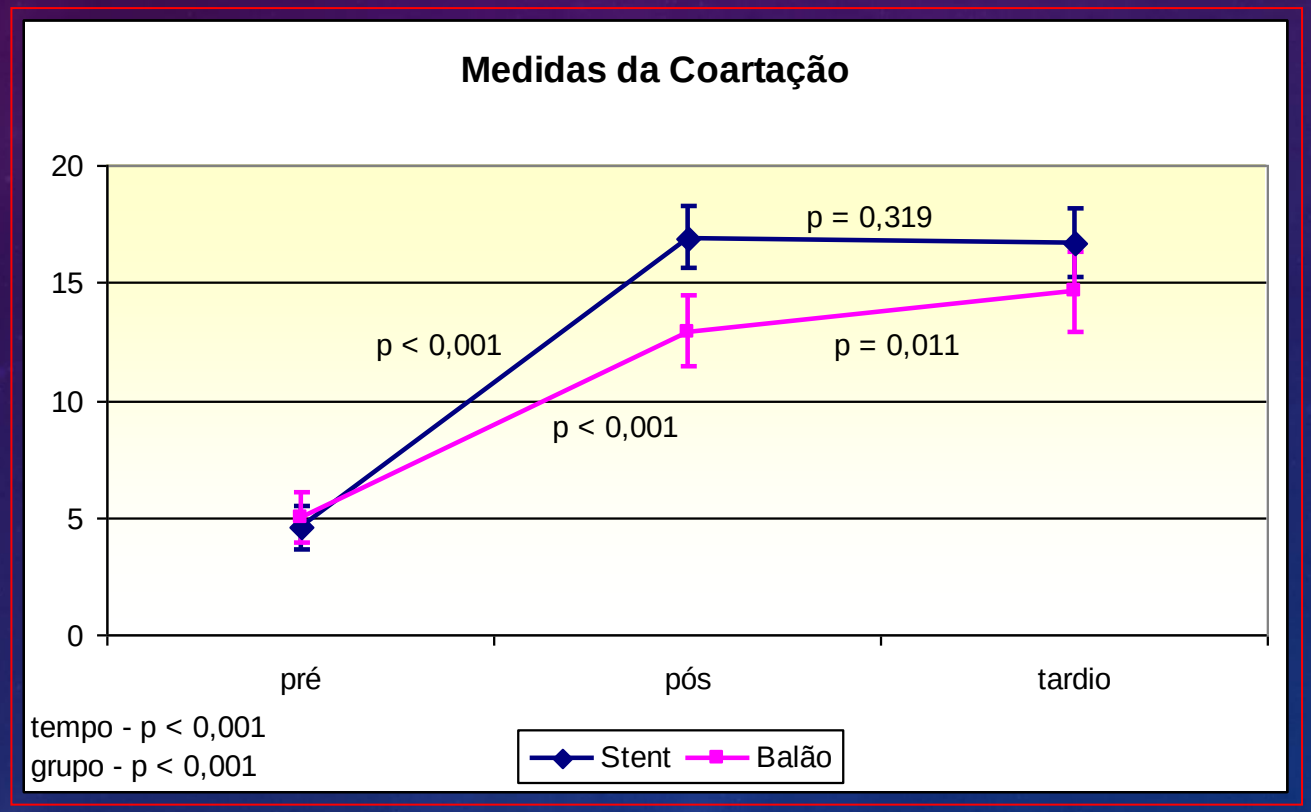
PACIENTES > 25 KG



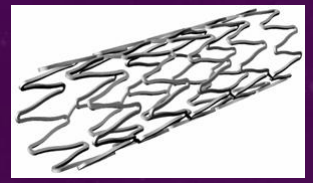
Análise dos resultados imediatos e tardios do tratamento percutâneo da CoA em adolescentes e adultos: comparação entre balões e stents. CAC Pedra 2004; Tese doutorado FM USP



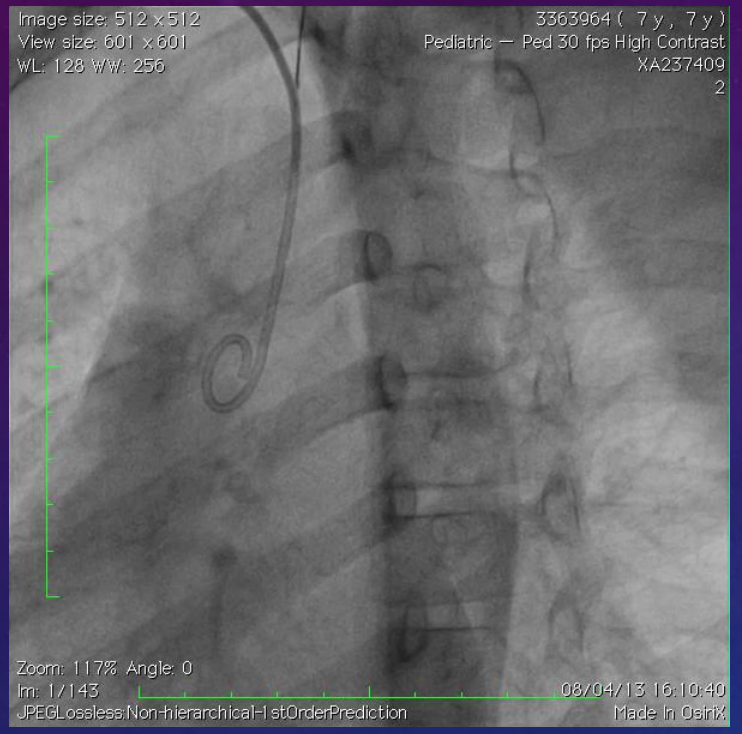
PACIENTES > 25 KG

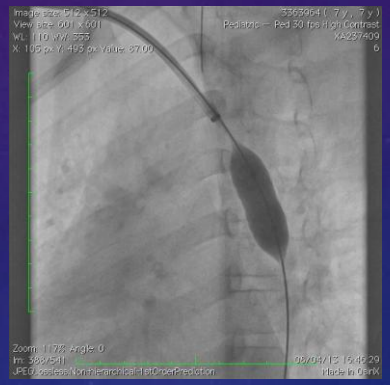


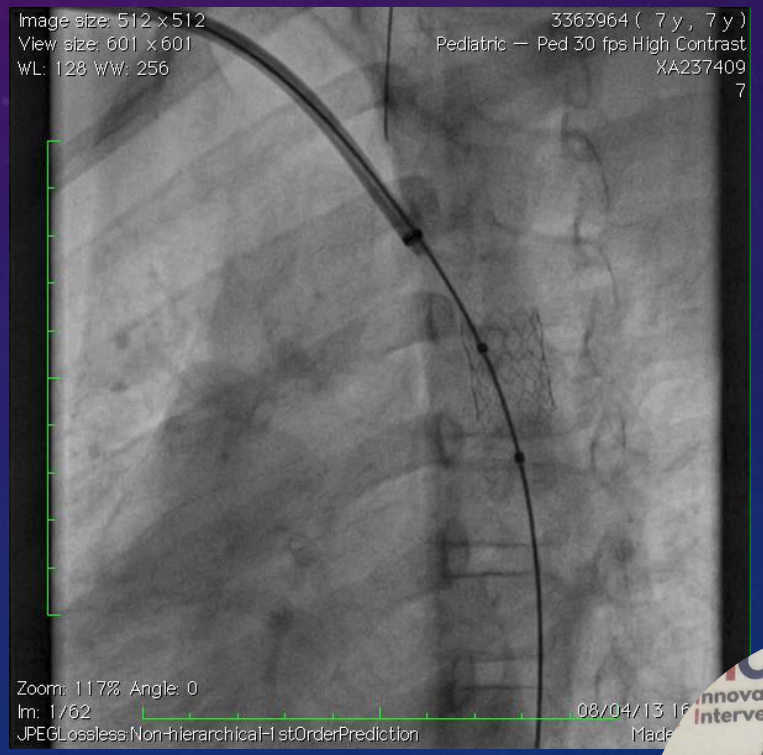
Análise dos resultados imediatos e tardios do tratamento percutâneo da CoA em adolescentes e adultos: comparação entre balões e stents. CAC Pedra 2004; Tese doutorado FM USP



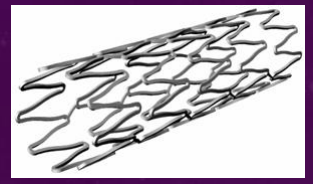
PACIENTES > 25 KG





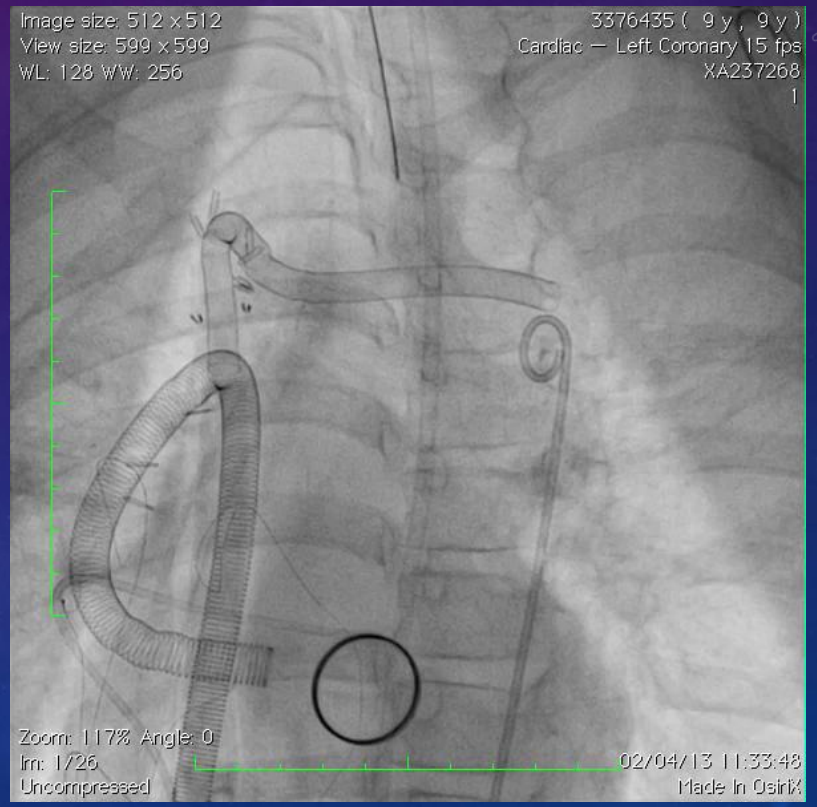


Pte 26 Kg
7 anos

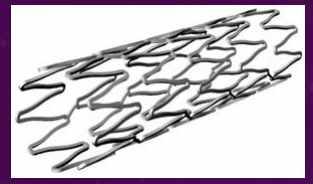


PACIENTES > 25 KG

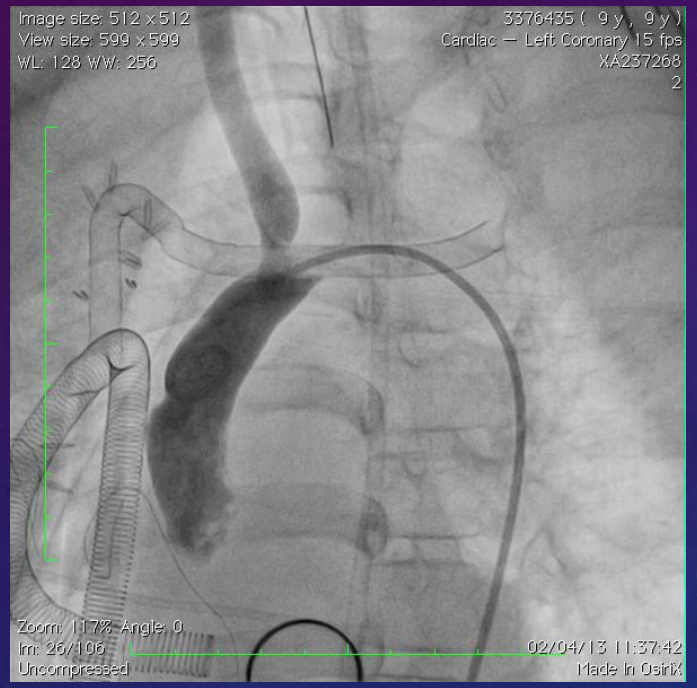
- Mas.....

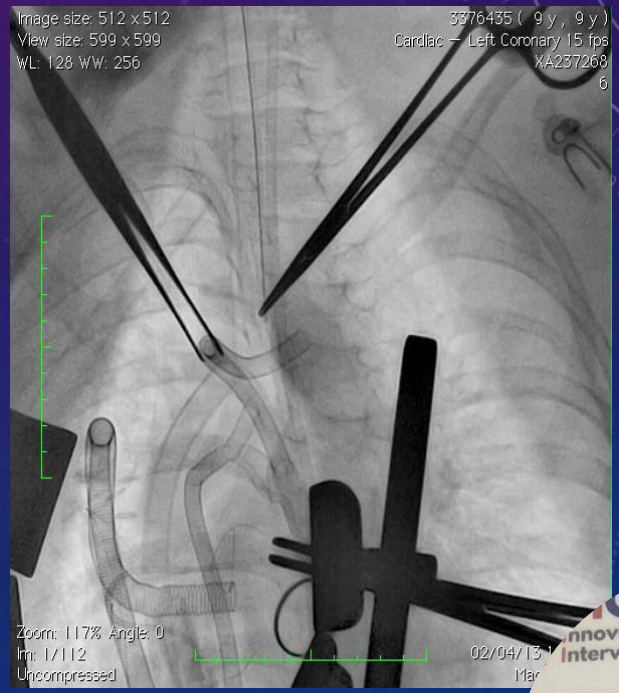


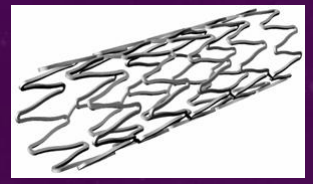
INCOR·HC
FUNDAÇÃO ZERBINI
CIÊNCIA E HUMANISMO



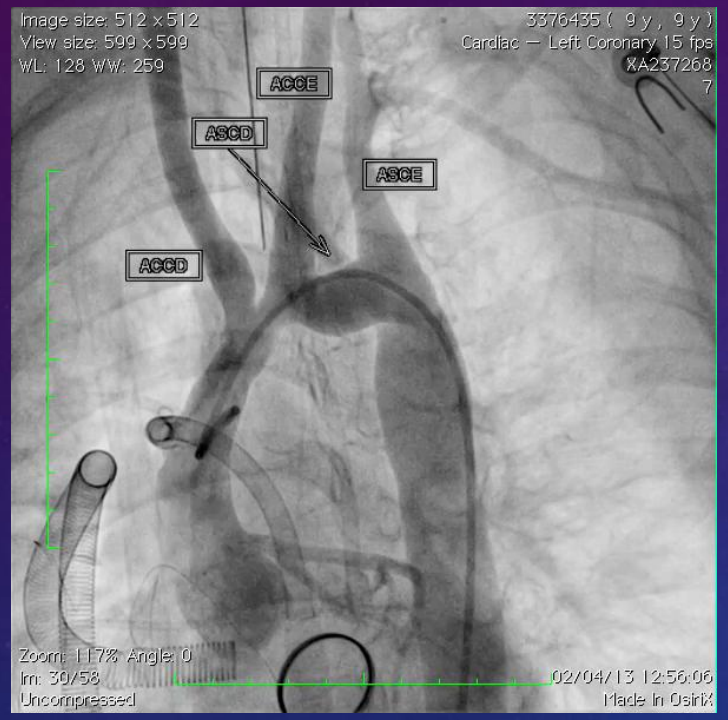
PACIENTES > 25 KG

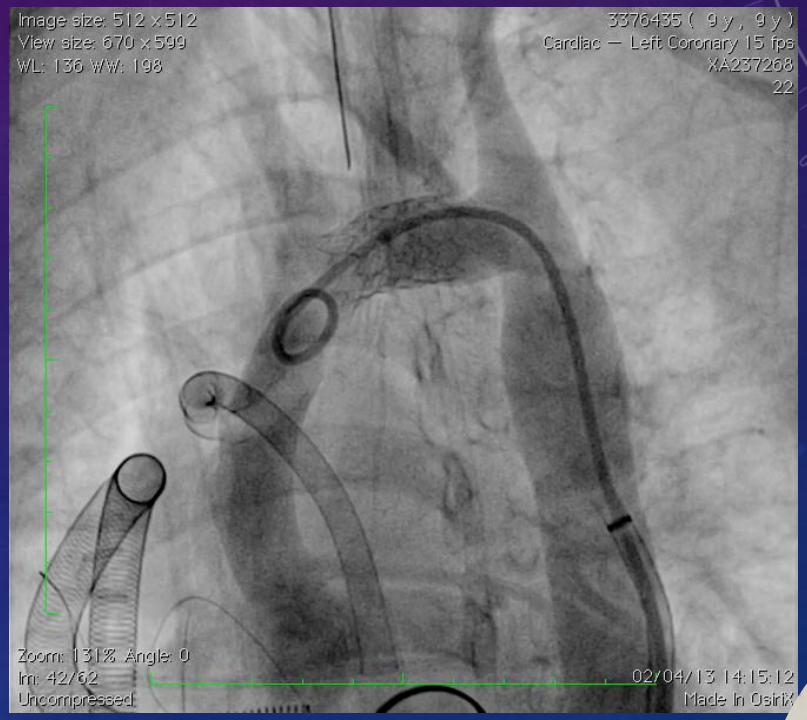


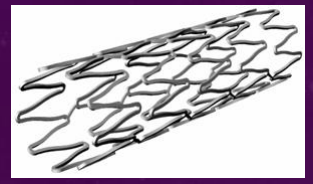




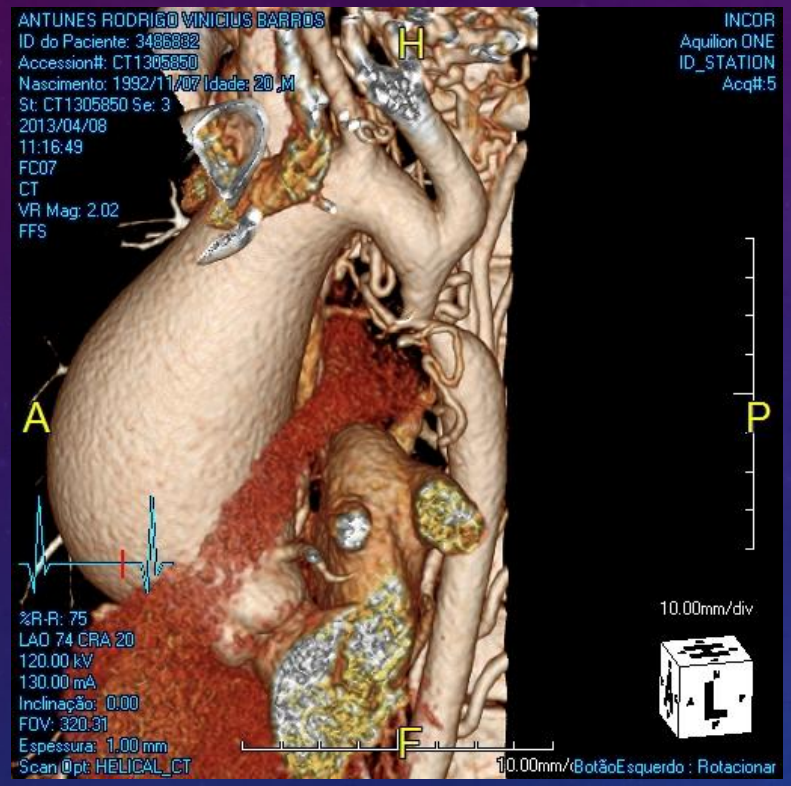
PACIENTES > 25 KG

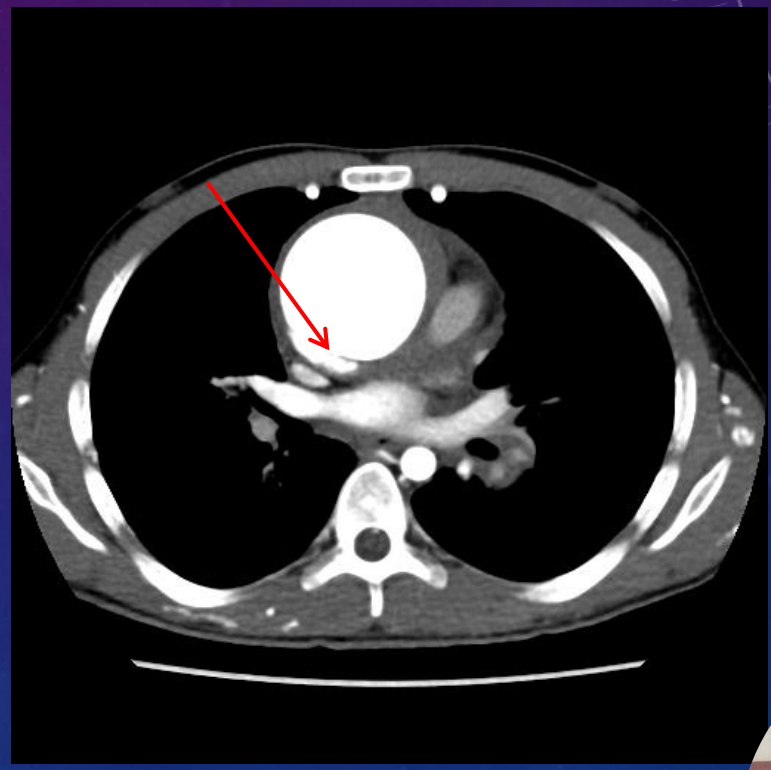






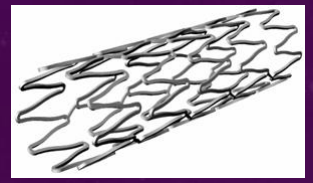
PACIENTES > 25 KG



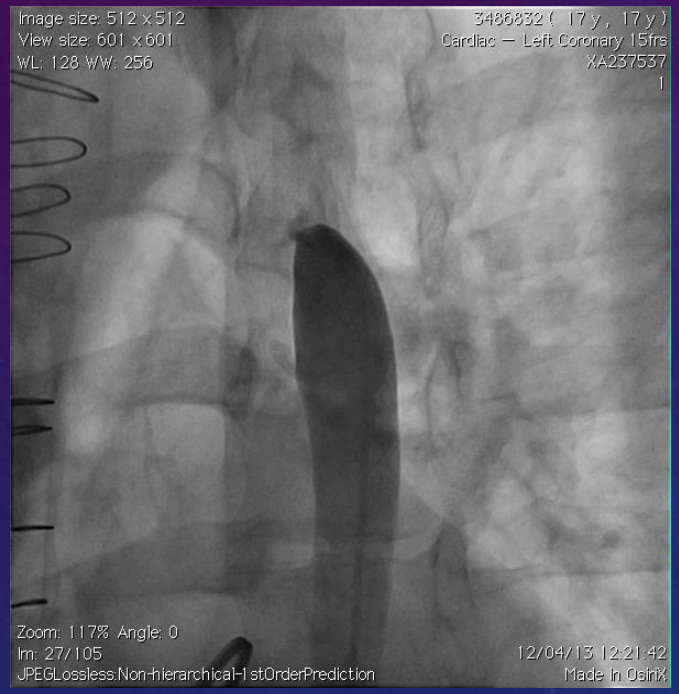


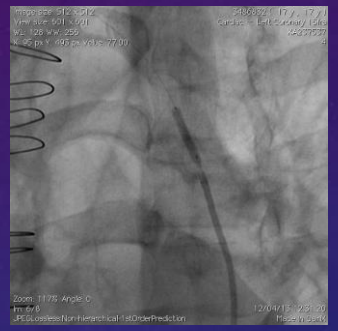
17 anos

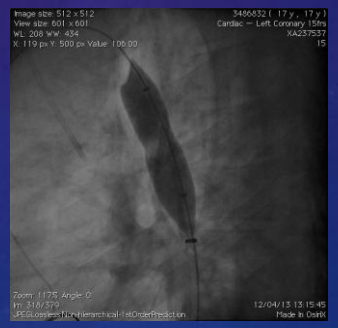
Dx Valvula Ao Bicuspide IAo importante + CoAo

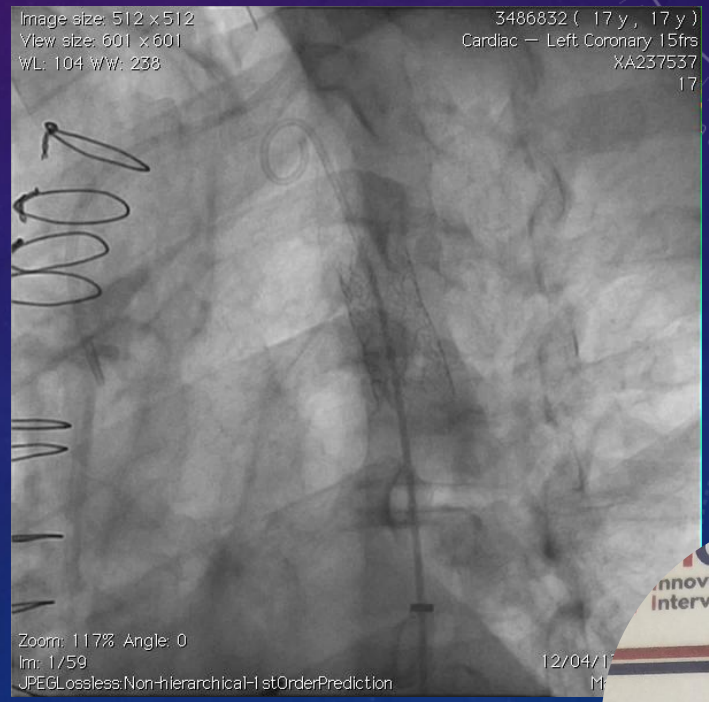


PACIENTES > 25 KG



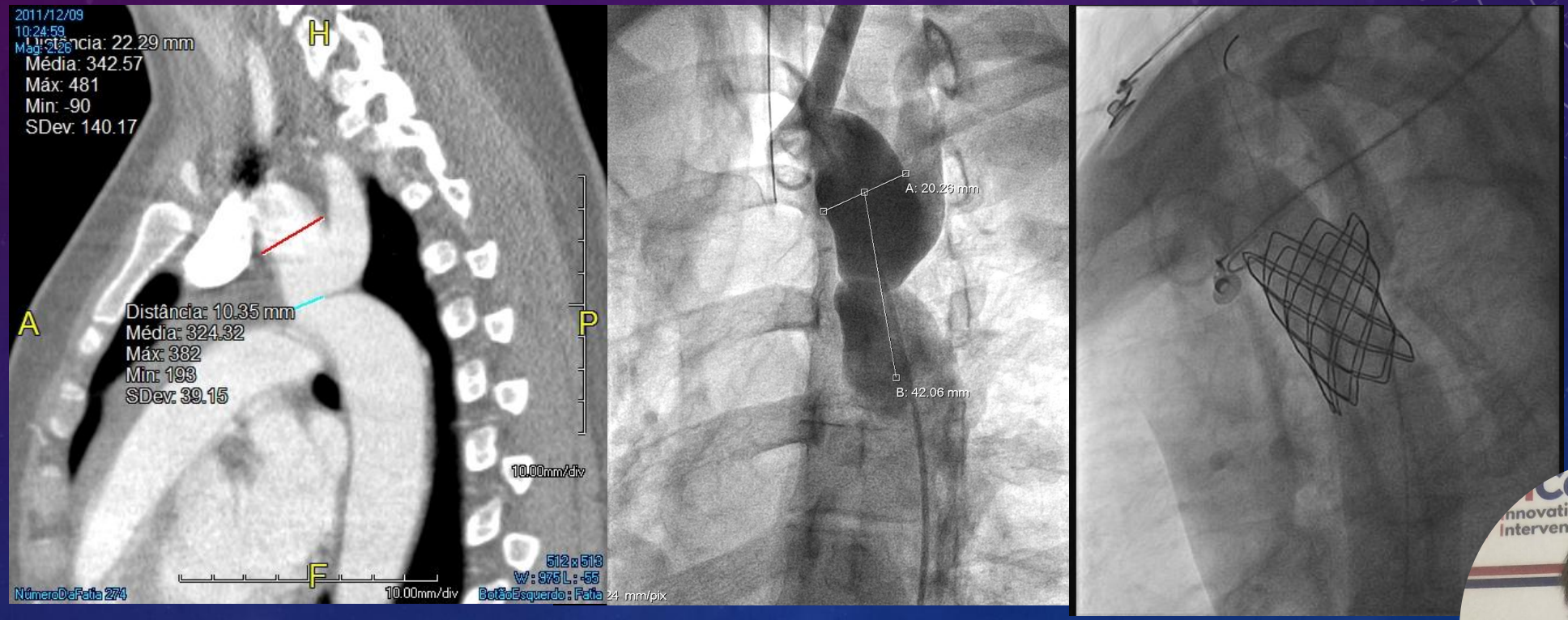






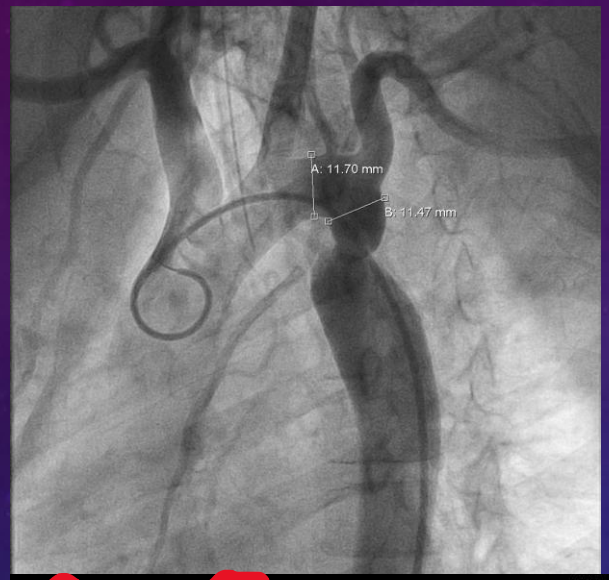
4 Dias Após CX

MEDIÇÕES



Arco Gotico + Subclavia justaCoAo

SEGUIMENTO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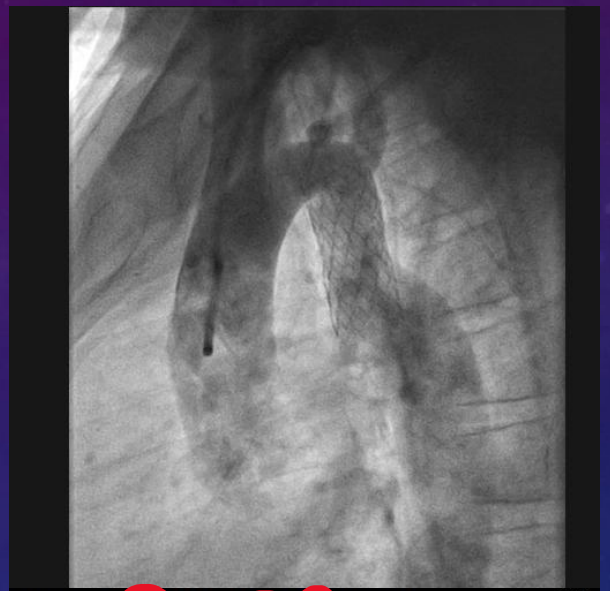
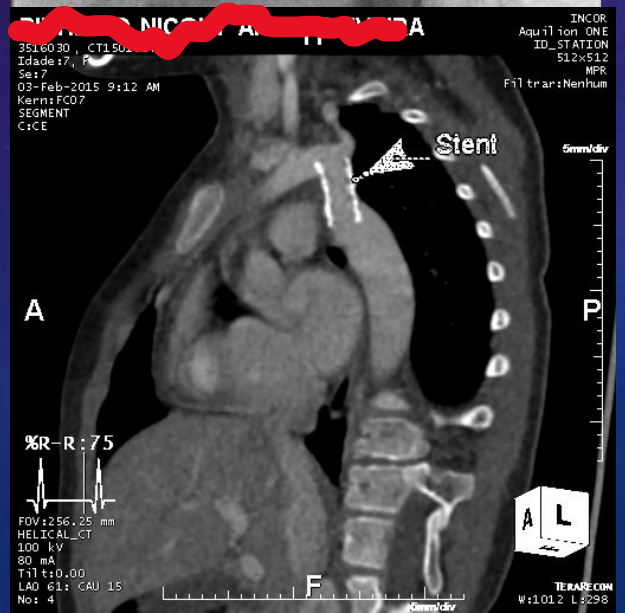
B: 11.47 mm




INCOR
Aquilion ONE
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Filtrar:Nenhum
03-Feb-2015 9:12 AM
Kern:FC07
SEGMENT
C:CE
Stent
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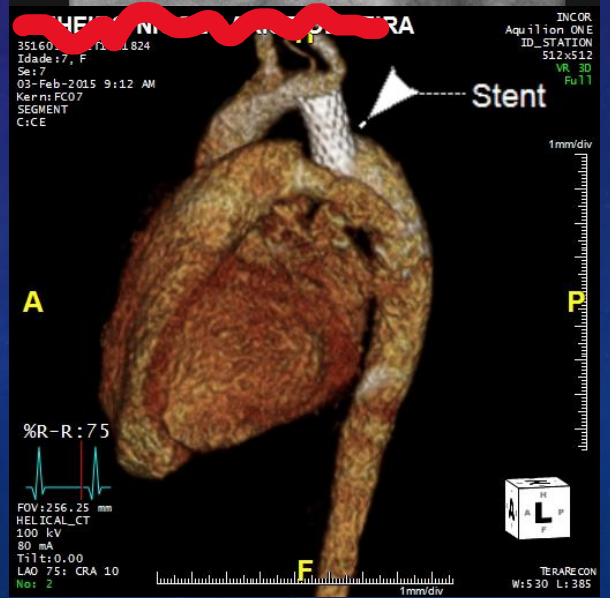
TERARECON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03-Feb-2015 9:12 AM
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C:CE
Stent
1mm/div
A
P
%R-R:75
FOV:256.25 mm
HELICAL_CT
100 kV
80 mA
Tilt:0.00
LAO 75: CRA 10
F
TERARECON

Escolha do Tratamento da CoAo (InCor)

< 1 ano :

- Cirurgia (escolha)
- Percutâneo
  - Crianças graves , ReCoa,Hibridos

< 25 Kg:

- Nativa: Angioplastia com Balão/Hibrido (stent)
- Re CoAo: Angioplastia com balão /Hibrido (stent)
  - CX:
    - hipoplasia do Arco
    - Coarctação segmentar
    - Cardiopatia associada

> 25 Kg:

- Angioplastia com stent (Escolha)
- Cx: hipolasia do arco , segmentar

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