CONTROVERSES ET ACTUALITÉS EN CHIRURGIE VASCULAIRE

CONTROVERSIES & UPDATES IN VASCULAR SURGERY

JANUARY 25-27 2018

MARRIOTT RIVE GAUCHE & CONFERENCE CENTER

PARIS, FRANCE WWW.CACVS.ORG

Endovascular treatment of aortic coarctation:for wich patients and with wich endoprosthesis?

M.N.Bouayed,M.Bouzidi et al

Disclosure

Speaker name:

M.N.Bouayed.....

I do not have any potential conflict of interest

Introduction

- 7% average of all cardiac malformations

- Mostly male is affected(2/3)
- Prevalence: 1 in 5000 new born.
- Treatment of aortic coarctation : endovascular or open surgery

*Valksmann G,Richard A:La Presse médicale;tome 40 > n87/8 > juillet–août 2011 doi: 10.1016/j.lpm.2011.02.031

Monitoring during follow-up

- AngioCT scan is systematic during follow-up

- Very long-term follow-up: treated patient is never fully healed. The long-term CV complications are frequent because ACo is not isolated but is very often an element of a broad disease of arterial system

95% of cases: Isthmus location

- Often located in the isthmus, sometimes extended and sometimes associated with an aortic arch hypoplasia
- Upstream ductus arteriosum,sometimes patent,and sometimes associated with other malformations
- Downstream the occluded ductus arteriosum, often short and isolated

*Valksmann G,Richard A:La Presse médicale;tome 40 > n87/8 > juillet–août 2011 doi: 10.1016/j.lpm.2011.02.031

Associated cardiac diseases

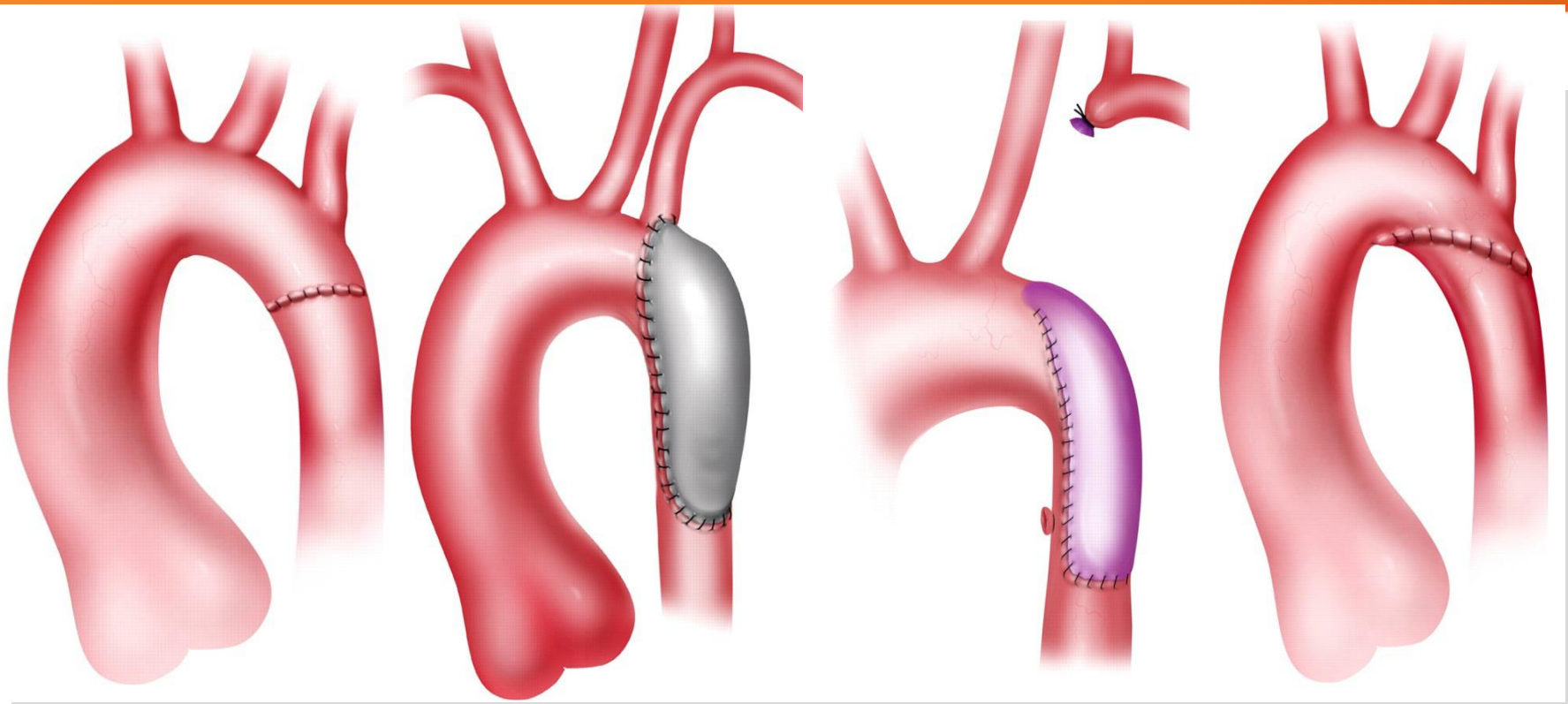
- Bicuspid aortic valve(50-85%)
- Coronary artery disease
- Ascending aorta dystrophic aneurysm
- Mitral disease

Long-term prognosis after treatment*

- The long-term survival rate of patients operated in adulthood is lower than that of the normal population
- **More the systolic pressure is high in post op, greater the probability of death**
- **Related deaths:**

-to the early onset of coronary lesions
-endocarditis
-to reoperation for restenosis or valvular disease
-sudden death
- aortic or cerebral aneurysms rupture
-dissections rarely

★Toro-Salazar OH et al.Long term follow-up of patients after coarctation of the aorta repair.Am J Cardio,2002;89:541-547
*Vriend JW, Mulder BJ (2005) Late complications in patients after repair of aortic coarctation: implication for management. Int J Cardiol 101:399–406



Surgical treatment

Crafoord	Vossschulte.	Waldhausen	End to end anastomosis

Garcia A M et al. Radiology 2008;248:44-60

Complications of Surgical Treatment

Early complications	Late Complications
Residual ACo and Hypertension paraplegia Hemorrhage Mortality < 1%	-Aneuvrysm and false aneuvrysm:9% -Recoarctation:10-20%

Guilmet et coll, Bauer et coll, Bouchard et coll, Cohen et coll, Olga et coll, Gibbs et coll, Bobby et coll.

Von Kodolitsch Y, Aydin MA, Koschyk DH, et al.— Predictors of aneurysmal formation after surgical correction of aortic coarctation. J Am Coll Cardiol, 2002, 20, 617-624

ENDOVASCULAR TREATMENT*

True therapeutic alternative to surgery in the treatment of adolescents and adults ACo

-Technical Succes rate :90 %
-Early improvement of hypertension in 90% of cases but it persists in more than 1/3 of cases
-In the medium term, 50-75% of patients do not take medication or have a BP well controlled by a minimum of drug

** D.R Turner et al: Endoscular management of coarctation of the aorta SEMINARS IN INTERVENTIONAL RADIOLOGY / VOLUME 24, NUMBER February 2007*
*Chen SS, Donald AE, Storry C, Halcox JP, Bonhoffer P, Deanfield JE (2008) Impact of aortic stenting on peripheral vascular function and daytime systolic blood pressure in adult coarctation.Heart 94:919–924

Complications of endovascular treatment

MORTALITY: < 0.7% (Gibbs et coll, n= 970 procédures)

Balloon angioplasty	Endografts
-Aortic Rupture -Aneurysm -Recoarctation(15%)★	Less complications when covered stent is used -Aortic rupture : less than 2 % mostly if no covered stent -aneuvrysm:5% if no covered stent -recoarctation : infrequent,occurs if using only balloon No complications or even reintervention when using stent◆

★ *Turner D.R et al:Endoscular management of coarctation of the aorta SEMINARS IN INTERVENTIONAL RADIOLOGY/VOLUME 24, NUMBER 2 2007*

◆Jennifer S. Nelson et al;Endovascular treatment of aortic coarctation in adult with isthmic hypoplasia.*J Endovasc Ther 2008;15:552–557*

Author/y	n patients	Age	Technic	Late Follow up
Fawzi et al 2004	49	22 y	balloon	Normal BP :63% Redilatation:8% Aneurism:8%
Holzer et al 2010	302 pt X	15 y	stenting	success77% at long term
Forbes JACC 2011	57 pt X	06-12 y		Good results vs open surgery
Sassolas 2012	18 pt	26 y	stenting	Excellent results
Mesmann et al 2012	15 pt	13-53 y	Stenting	Excellent results
Turner et al 2007	422pt X	Adolescent Adult	-balloon -Covered stent -Bare stent	Good results in 300 pt 71.09%
Kiche et al 2015	52	Adult	Self-expandable uncovered nitinol stent	Good results
Our série 2017	37	27 y	Covered stent	Excellent results

Percutaneous treatment of adult isthmic aortic coarctation: acute and long-term clinical and imaging outcome with a self-expandable uncovered nitinol stent. Kische S, D'Ancona G, Stoeckicht Y, Ortak J, Elsässer A, Ince H - Circ Cardiovasc Interv - January 1, 2015; 8 (1);

- « Adult coarctation of the aorta treatment by means of a self-expandable uncovered stent is safe and durable. The peculiar stent design maintains adequate localized radial strength over time with minimal trauma on the adjacent aortic wall and negligible device-related complications. Blood pressure control optimization is immediate and persistent even at long-term follow-up. »

Jennifer S.Nelson J ENDOVASC THER 2007;14:264–269

Endovascular Treatment of Aortic Coarctation in an Adult With Isthmic Hypoplasia

- « Potential advantages of self-expanding stents, such as a smaller delivery system and increased flexibility
- dilation parameters and lower radial force, limit their ability to treat particularly elastic lesions
- Our experience from this patient supports the position that self-expanding stents should be avoided when treating isthmic hypoplasia. »

Open, Hybrid, and Endovascular Treatment for Aortic Coarctation and Postrepair Aneurysm in Adolescents and Adults

Eric E. Roselli, MD, Athar Qureshi, MD, Jahanzaib Idrees,

Ann Thorac Surg 2012;94:751–8)

« Covered stents or stent grafts are preferred in patients with aneurysm or pseudoaneurysm . Depending on surgeon's or interventionalist's preference, very tight coarctations may be safely treated with covered stents to protect against rupture or perforation. If a self-expanding stent graft is used to protect against rupture but is lacking in sufficient radial force to fully expand the stenotic segment, an additional balloon expandable stent may be placed within it to prevent recoil »

Intermediate Outcomes in the Prospective, Multicenter Coarctation of the Aorta Stent Trial (COAST). Meadows J, Minahan M, McElhinney DB, McEnaney K, Ringel R, - Circulation - May 12, 2015; 131 (19); 1656-64

- « The Coarctation of the Aorta Stent Trial (COAST) was designed to assess the safety and efficacy of the Cheatham Platinum stent when used in children and adults with native or recurrent coarctation. Acute outcomes have been reported. We report here follow-up to 2 years.
- Follow up to 2 years: stent is safe »

COAST-ing Toward Covered Stents for Aortic Coarctation
Not All Plain Sailing!*
Damien P. Kenny
JACC: CARDIOVASCULAR INTERVENTIONS VOL. 9, NO. 5, 2016

« **COAST II** :158 patients were either included as a treatment cohort (53%) or a prevention cohort (47%), and enrolled prospective

- There was 100% technical success, suggesting no issues with stent delivery
- Excellent reduction in coarctation gradients were demonstrated »

Comparison of surgical repair and percutaneous stent implantation for native coarctation of the aorta in patients ≥ 15 years of age☆
Xianglin Yeaw

International Journal of Cardiology 203 (2016) 629–631

« Other recognised complications of transcatheter procedure such as stent fracture/migration and aortic dissection/rupture did not occur in this study. We believe that the BIB-mounted CP stents used in this study minimise those afore- mentioned complications. »

Endovascular Management of Coarctation of the Aorta
D.R. Turner, M.R.C.P., F.R.C.R., B.Sc.,1 and P.A. Gaines, F.R.C.P., F.R.C.R.1
Semin Intervent Radiol 2007;24:153–166.

« Balloon-mounted stents such as Palmaz (Cordis, Miami Lakes, FL) or Cheatham Platinum (NuMed, Hopkinton, NY) devices are most often used because of their radial strength and accuracy of positioning. However, self-expanding devices have also been used, and they generally offer the advantage of greater flexibility and conformability.

Use of a balloon- in-balloon delivery system may reduce the risk of migration during deployment »

CP BIB Covered Stent

- Benefits

Flexibility

Rounded ends : less risk of tearing

- Covered stent can prevent longer-term aneurysm formation
- Even though aneurysm formation rate is generally low (0% to 4%)

Hypertension

Whatever the stent used, arterial hypertension incidence, sometimes unmasked by ambulatory blood pressure monitorization or after exercise, is much higher than those in healthy population*

**Is hypertension the fate of aortic coarctation patients treated with Cheatham Platinum (CP) stent?*
Baykan A, Demiraldi AG, Tasci O, Pamukcu O, Sunkak S, Uzum K, Sezer S, Narin N - J Interv Cardiol - November 21, 2017;

PROSPECTIVE STUDY

Our series : 37 patients,adolescents and adults with Isthmus Aortic Coarctation

January 2014-October 2O17

Baseline Patients Characteristics

37 patients	
Mean Age,year	27(12-51)
Sexe M	23(62%)
HTA	100(100%)
Intermittent claudication	20(54%)
Femoral pulses absent or weak	20(54)
Diabetic	1(0,2%)
Stroke	2(0.5%)
History of Endocarditis	1(0.2%)
Preductal	6(16.2%)
Juxta et postductal	31(83.7%)

Mean diameter:2.9 mm(2.03-4.08)
Mean lenght:3.5 cm (1-5)

Cardiovascular diseases associated Series n=37	n=,%
Bicuspid aortic valve	**15 (40)**
Aortic valve insufficiency	5(13.5) (01 operated)
Mitral insufficiency	5(13.5)
Ischemic cardiac disease	2(5.4)

Patent Ductus Arteriosum	**2(5.4)**
Aberrant right sub-clavian artery	2(5.4)
Prior coarctation open repair(end to end)	2(5.4)

Operative details(1)

37 patients	n,%	
General anesthesia	37(100)	
Femoral artery access	36(97.3)	
External iliac artery	1(2.7)	
Angiography:humeral approch	37(100)	
Self-expanding covered stent graft Valiant	4(10.8)	
Balloon expandable covered stent Advanta V12	6(16.2)	
Balloon expandable covered stent CP BIB	27(72.9)	

Mean procedure duration: 45 mn

Operative details(2)

37 patients	n,%	
Technical success	37(100)	
LSA coverage	0(0)	
Operative complications	0(0)	
Day in intensif care unit	0(0)	
Ilio-fémoral artery injury	0(0)	
Early local complications(hematoma)	4(10.8)	
Stroke,Paraplegia,Renal failure,Cardiac complication	0(0)	
Quality of life:good	37(100)	

30 mm/Hg	00 mm/Hg
70 mm/Hg	00 mm/Hg
32 mm/Hg	00 mm/Hg
30 mm/Hg	00 mm/Hg
70 mm/Hg	10 mm/Hg
40 mm/Hg	00 mm/Hg
40 mm/Hg	00 mm/Hg
40 mm/Hg	00 mm/Hg
50 mm/Hg	00 mm/Hg
35 mm/Hg	00 mm/Hg
32 mm/Hg	00 mm/Hg
30 mm/Hg	00 mm/Hg
70 mm/Hg	00 mm/Hg
60 mm/Hg	00 mm/Hg
50 mm/Hg	10 mm/Hg
50 mm/Hg	00 mm/Hg
60 mm/Hg	00 mm/Hg
45 mm/Hg	00 mm/Hg

Pressure gradient

60 mm/Hg	10 mm/Hg
60 mm/Hg	15 mm/Hg(Valiant)
65 mm/Hg	00 mm/Hg
40 mm/Hg	00 mm/Hg
60 mm/Hg	15 mm/Hg(Valiant)
30 mm/Hg	00 mm/Hg
80 mm/Hg	10 mm/Hg
35 mm/Hg	15 mm/Hg
70 mm/Hg	00 mm/Hg
50 mm/Hg	00 mm/Hg
50 mm/Hg	10 mm/Hg
40 mm/Hg	00 mm/Hg
50 mm/Hg	10 mm/Hg
50 mm/Hg	00 mm/Hg
50 mm/Hg	00 mm/Hg
80 mm/Hg	00 mm/Hg
30 mm/Hg	00 mm/Hg
50 mm/Hg	00 mm/Hg
40 mm/Hg	00 mm/Hg

Pressure gradient

Series,n=37:Immediate follow-up		
	Pre-intervention	Post-intervention
Mean SBP transcoarctation gradient	53 mm hg(+/- 27)	2.02 mm hg(0-15)

Late Follow up:mean 27 months(3-45)

Series 37 patients		
	Pre-operative	Late Follow up
Mean SBP coarctation gradient	53 mmhg(+/-27)	2.2 mmhg(0-15)
	n,%	n,%
Femoral pulses	17(46)	37(100)
Normal Blood pressure	0(100)	5(13.5)
Hypertension well controlled with 1 medicament	0(100)	17(46)
Hypertension well controlled with 2 medicaments	20(54)	15(40.5)

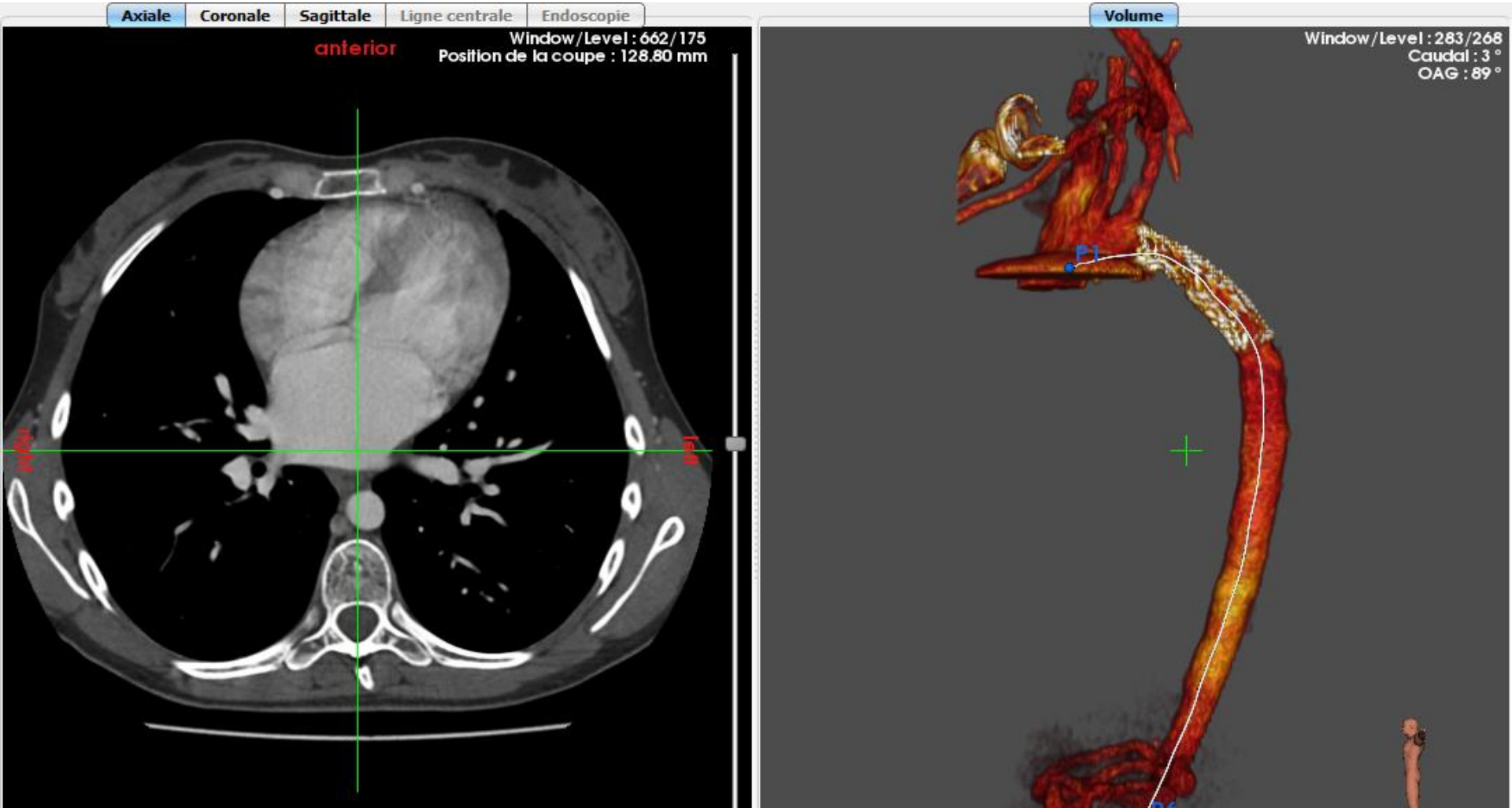
Pre-operative Gradient mm hg	**20 - 60**	**above 60**
Patients n	24	13

Post-operative Gradient post-op mm hg	**00**	**10**	**15**
Patients n	28	06(**1 Valiant**)	03(**2 Valiant**)

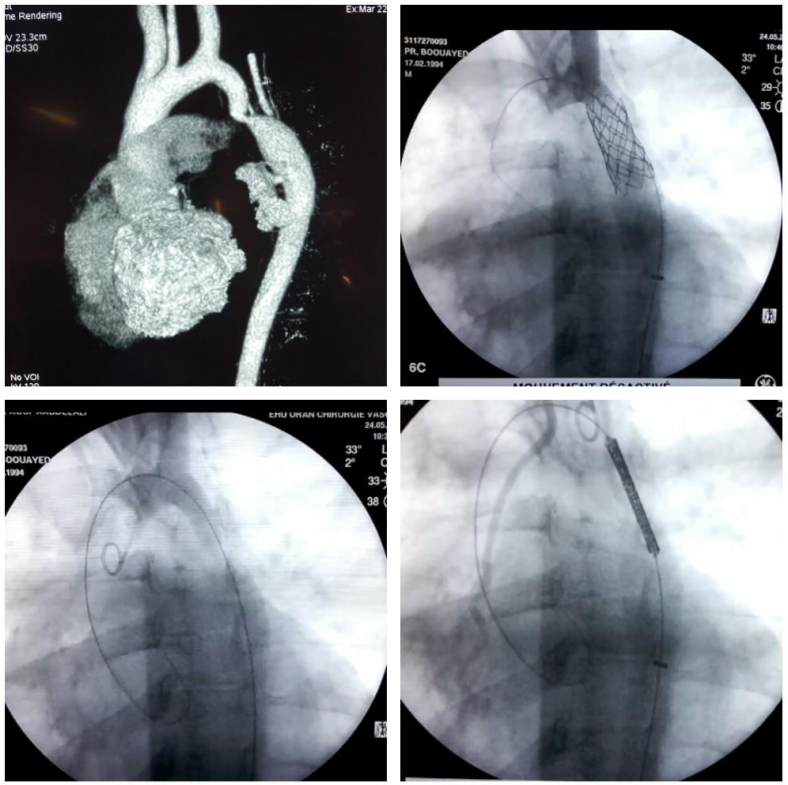
Angio CT scan 1,6,12,24 months

Series:37 patients	n(%)
Migration	0(0)
Fracture	0(0)
Recoarctation	0(0)
Descending aortic Aneurism	0(0)
Dissection	0(0)

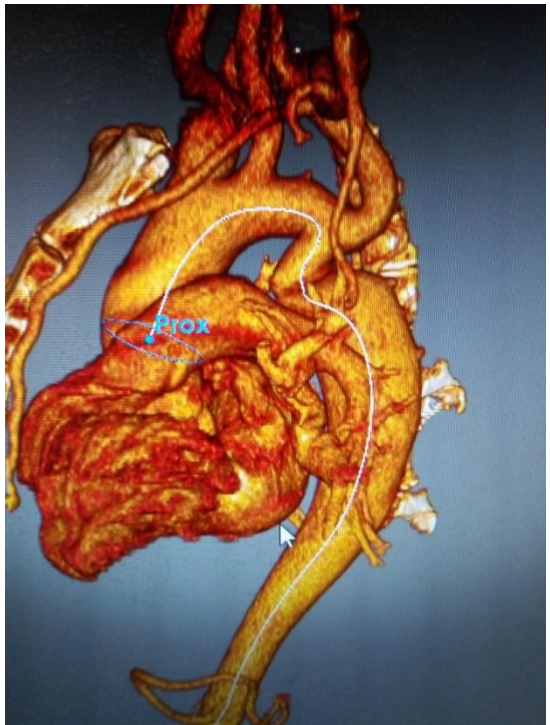
CT SCAN AT 12 MONTHS:ENDOGRAFT VALIANT

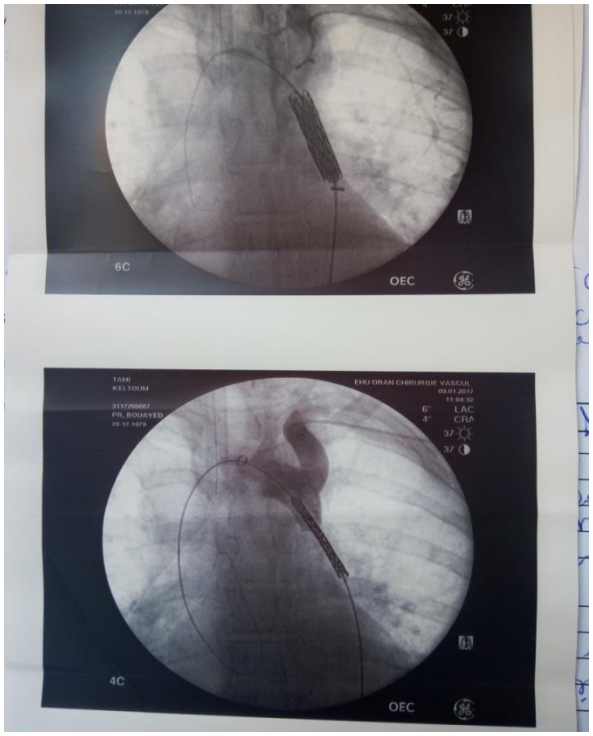


Case 1:CP covered stent

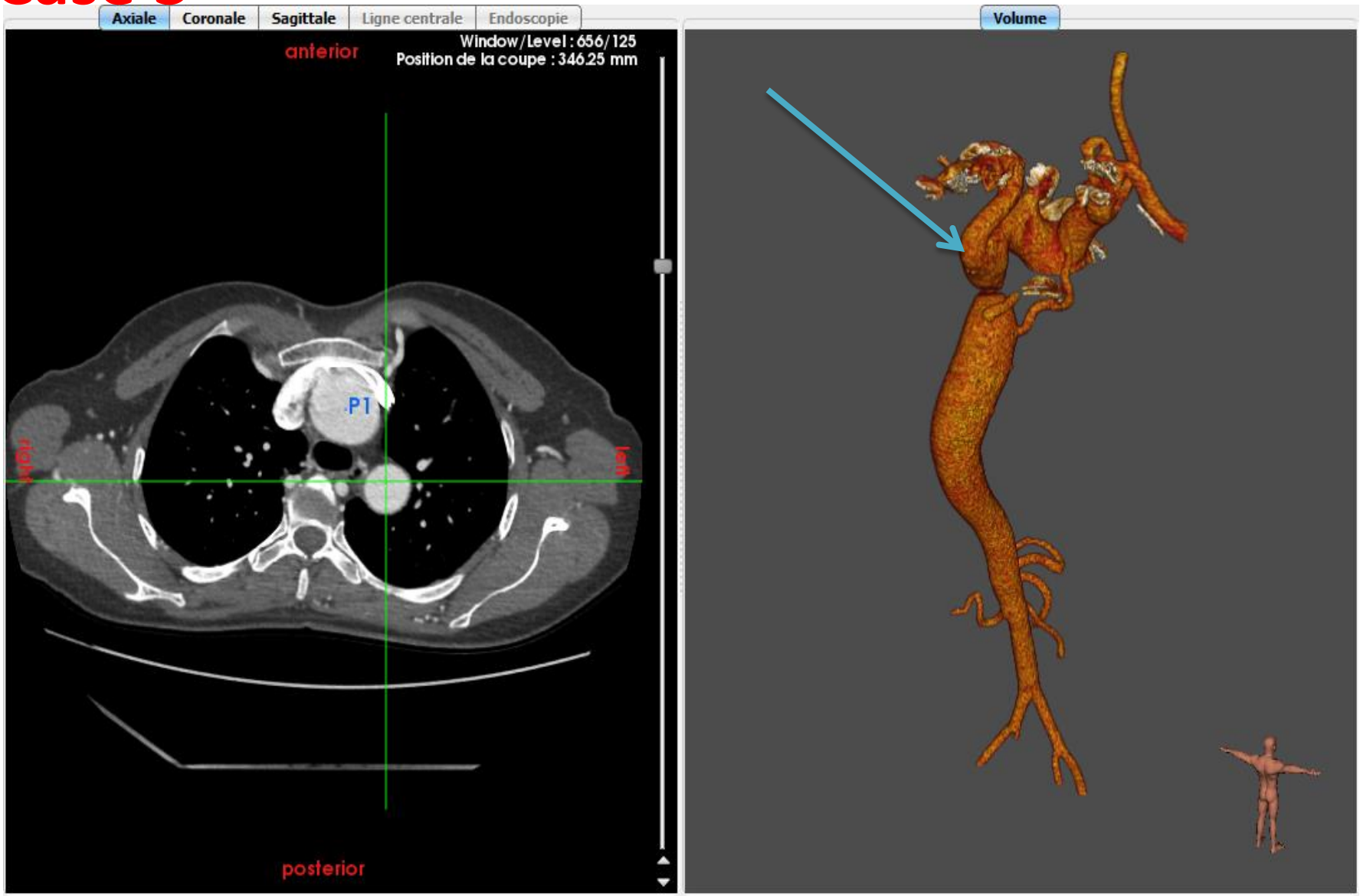


Case 2:CP covered stent

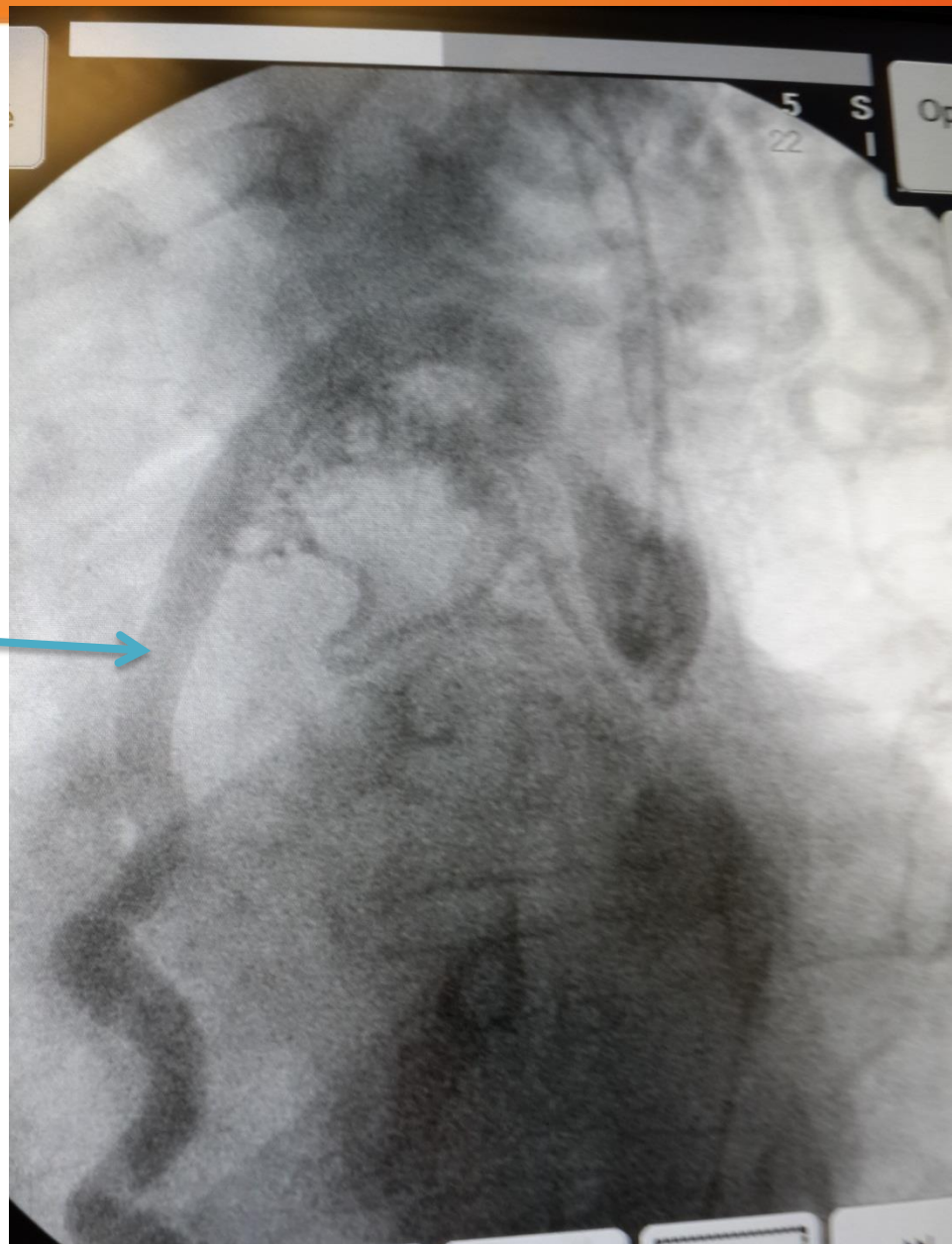




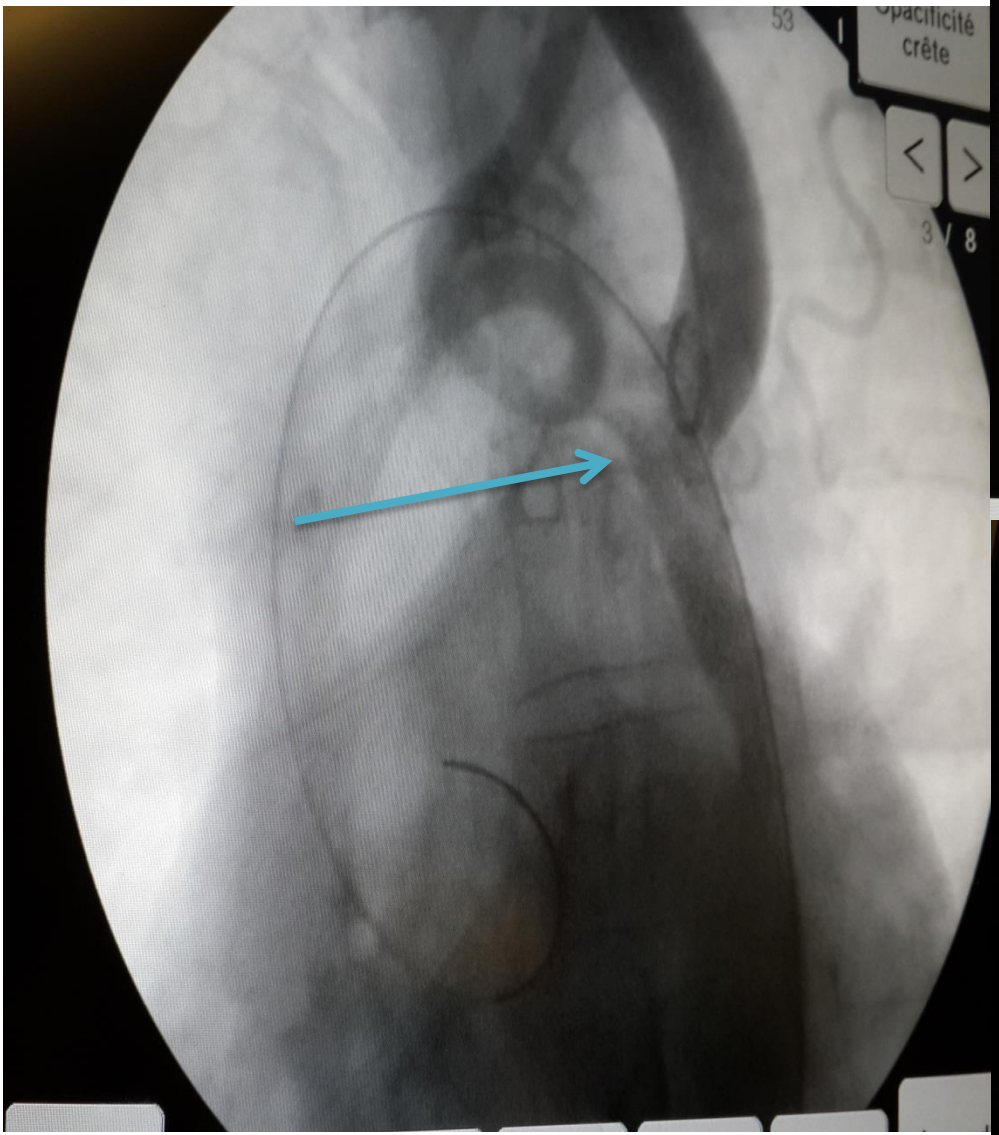
Case 3

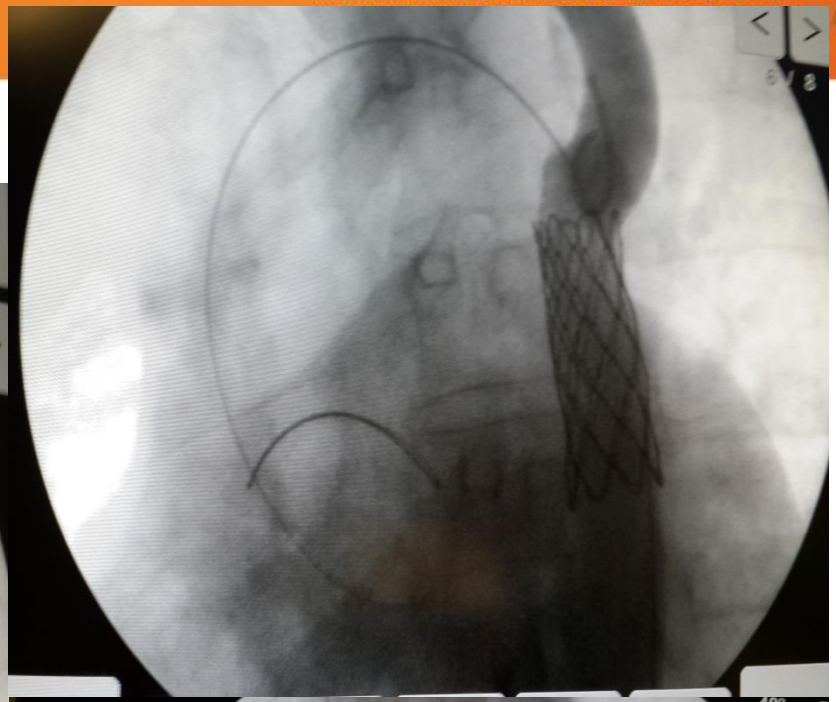

Axiale
Coronale
Sagittale
Ligne centrale
Endoscopie
anterior
Window/Level : 656/125
Position de la coupe : 346.25 mm
P1
right
left
posterior
Volume

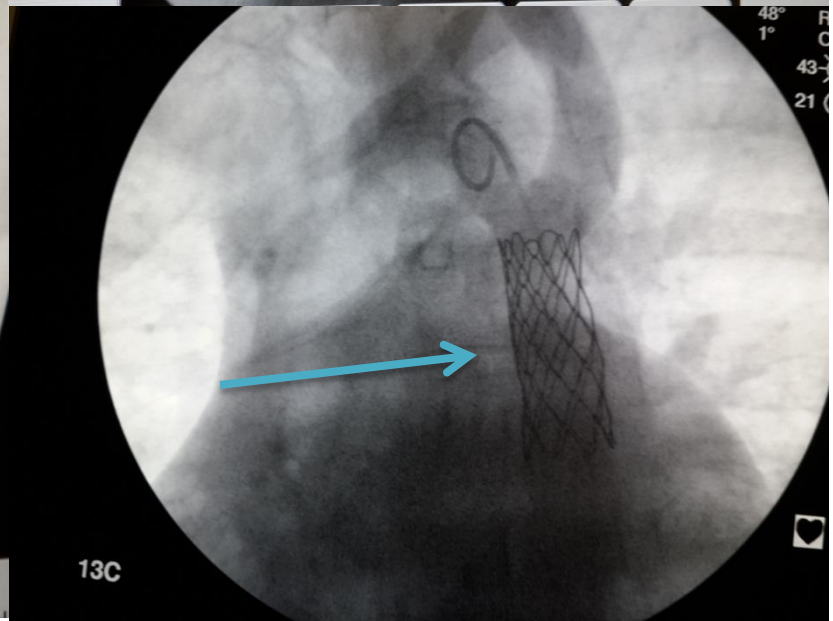
CASE 3
ANGIOGRAPHY



CASE 3:CP COVERED STENT

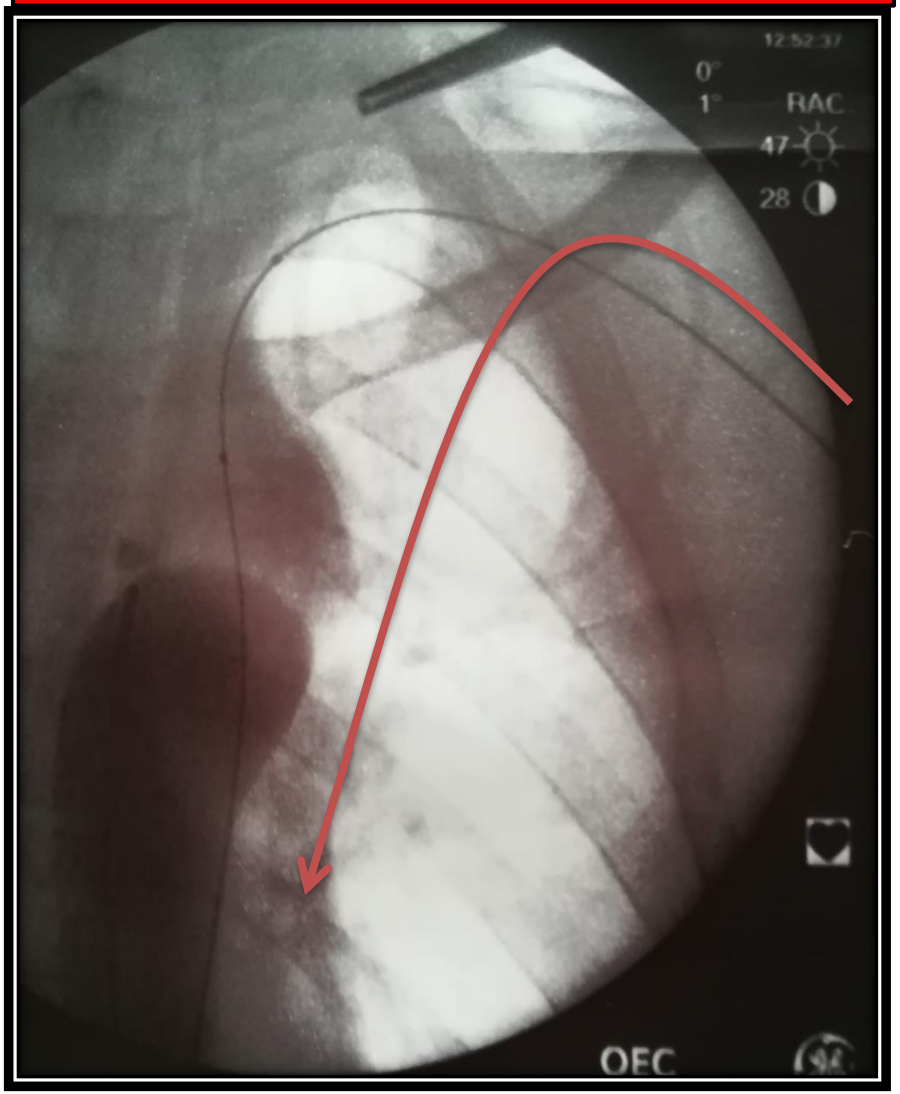




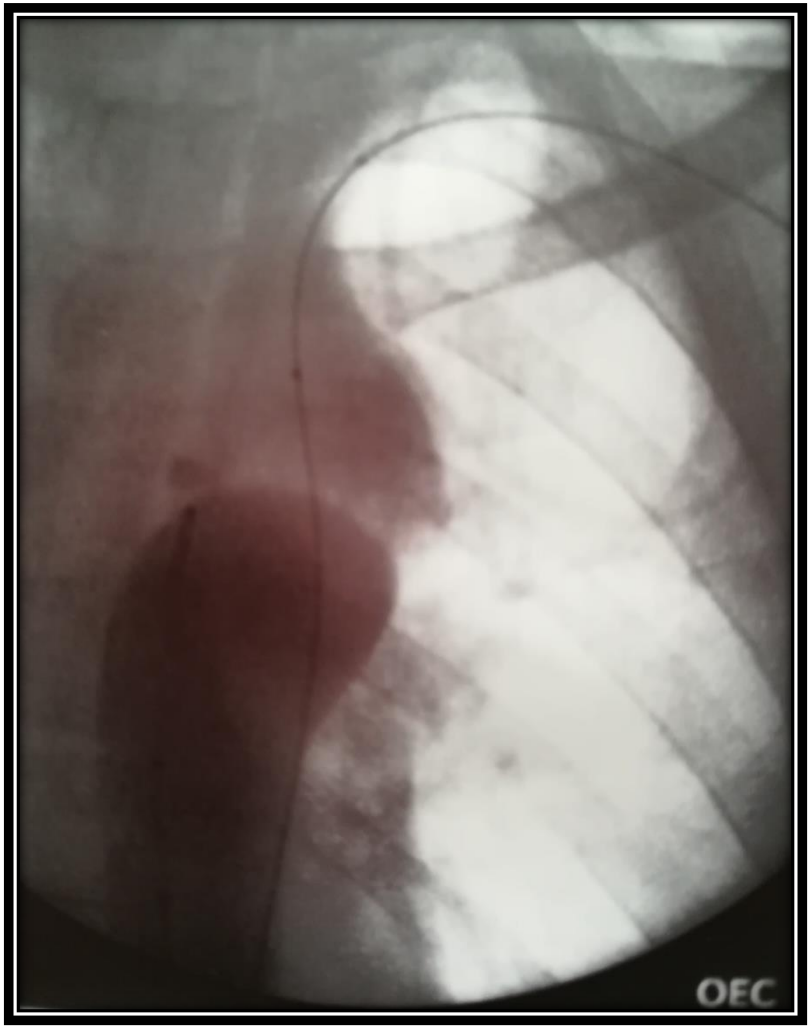


Case 3:post-operative CT SCAN

Case 4:Very tight stenosis

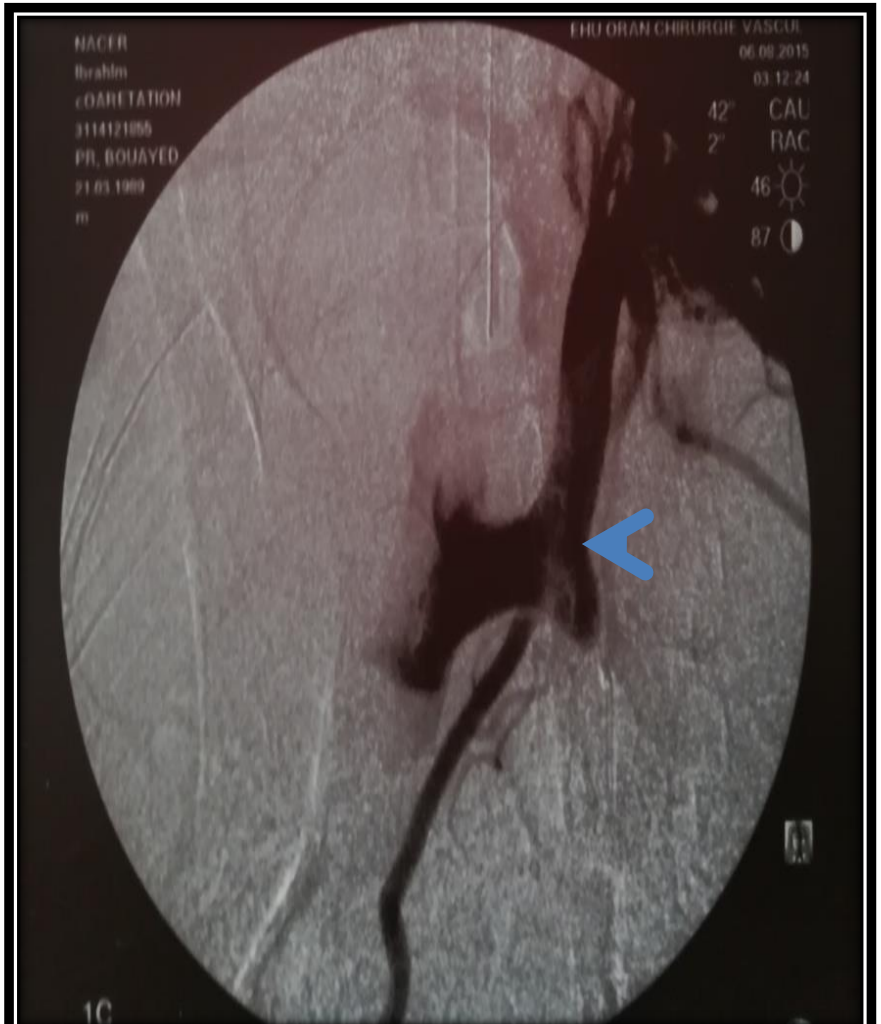


Pre-dilatation through humeral approch



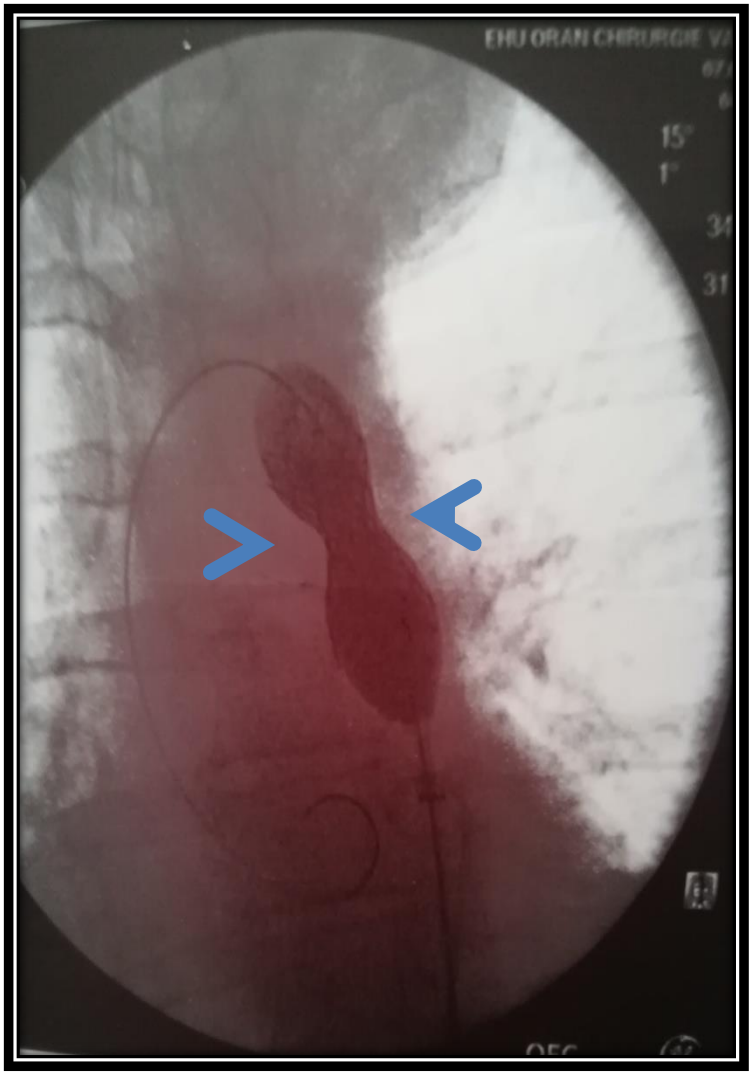
Case 5

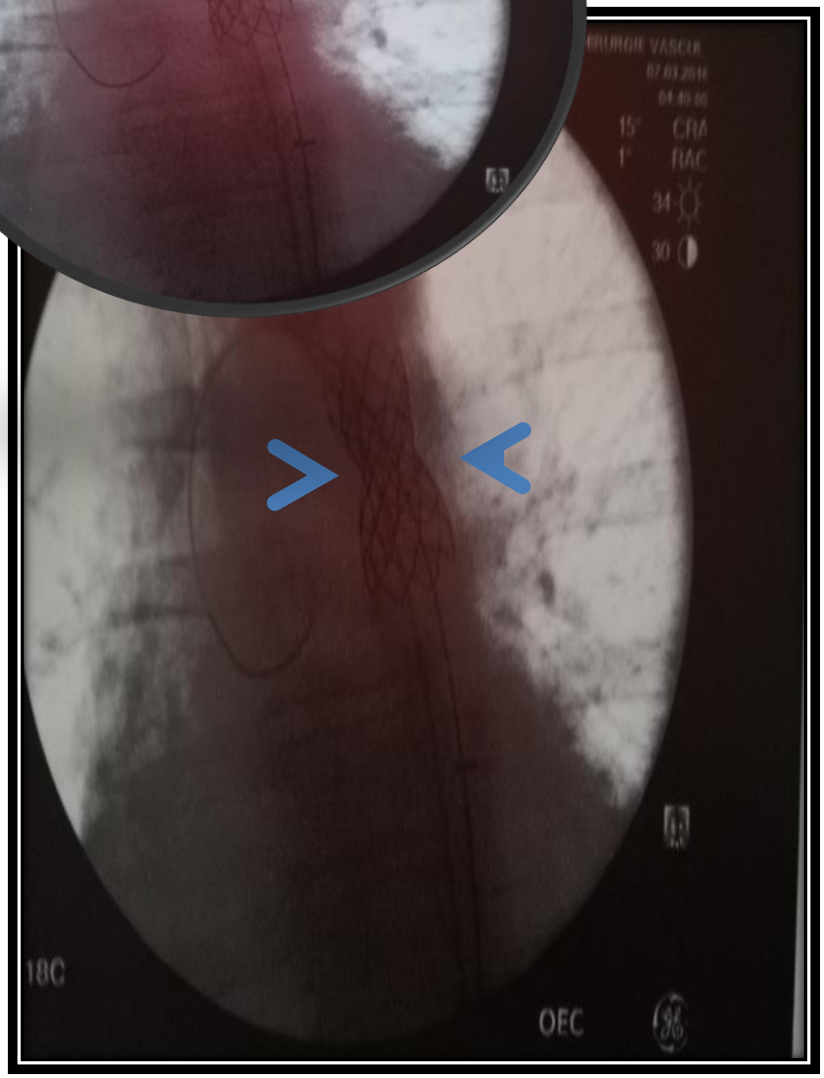
Very tight stenosis



Pre-dilatation

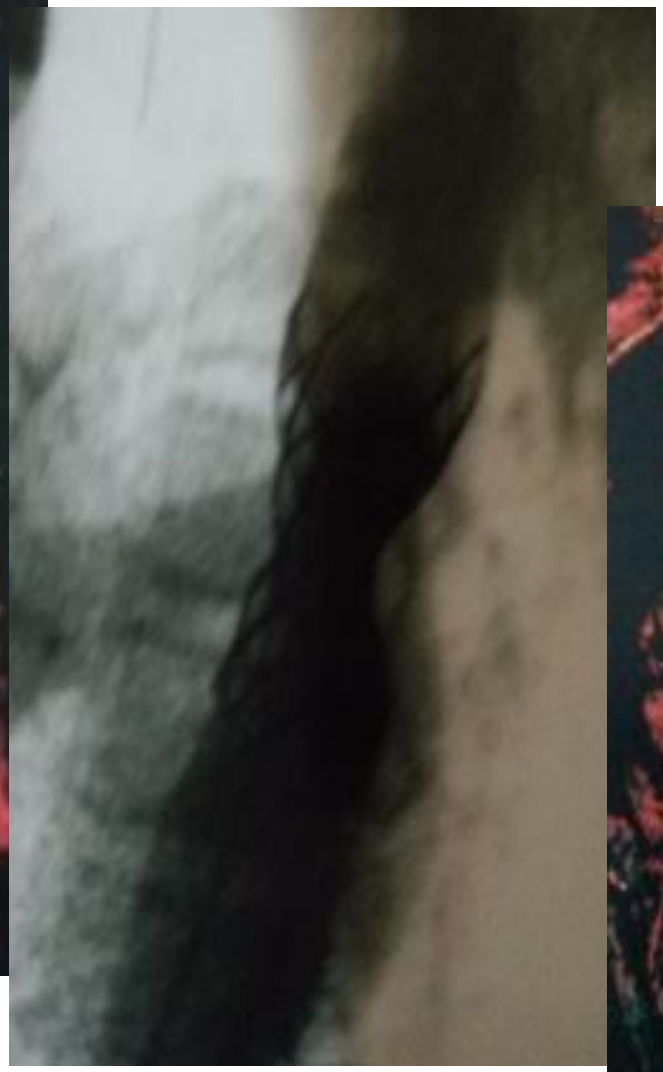
Case 5



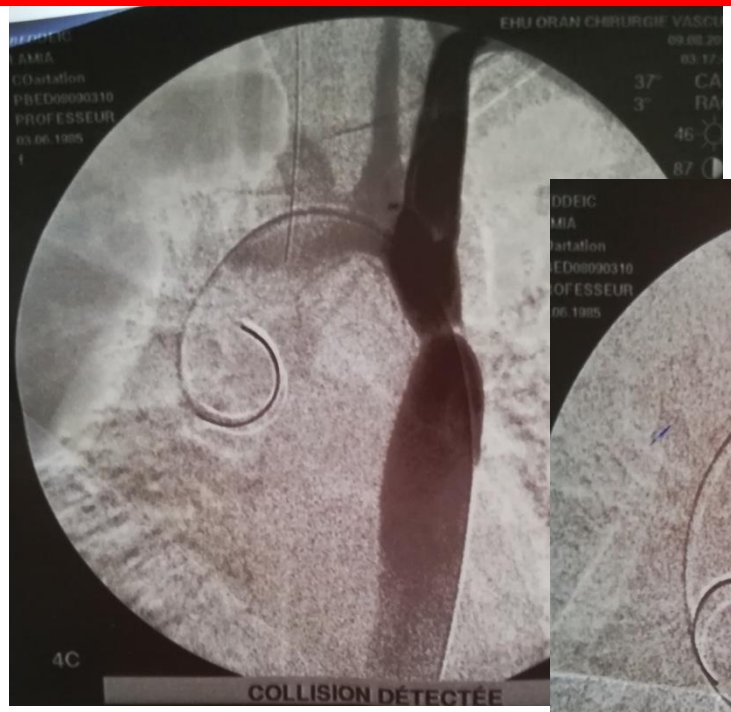


Case 6

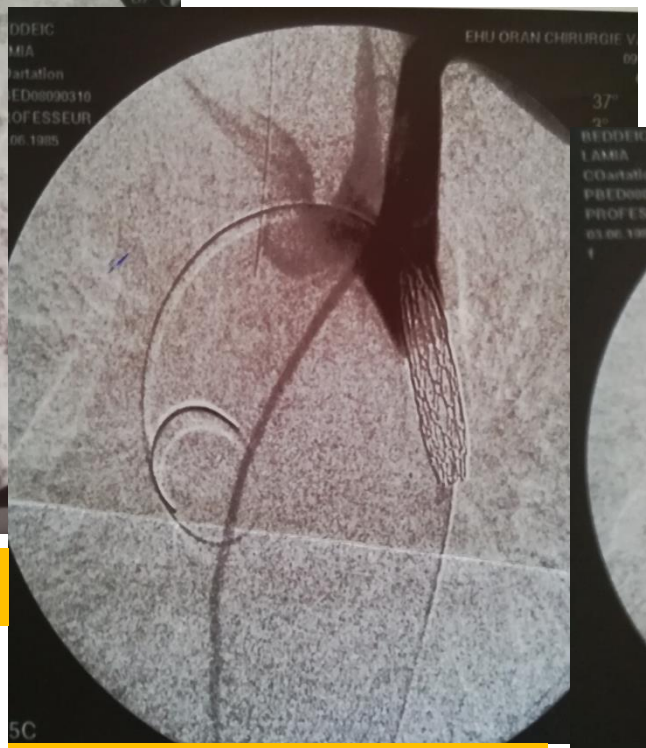
CT scan at 12 months



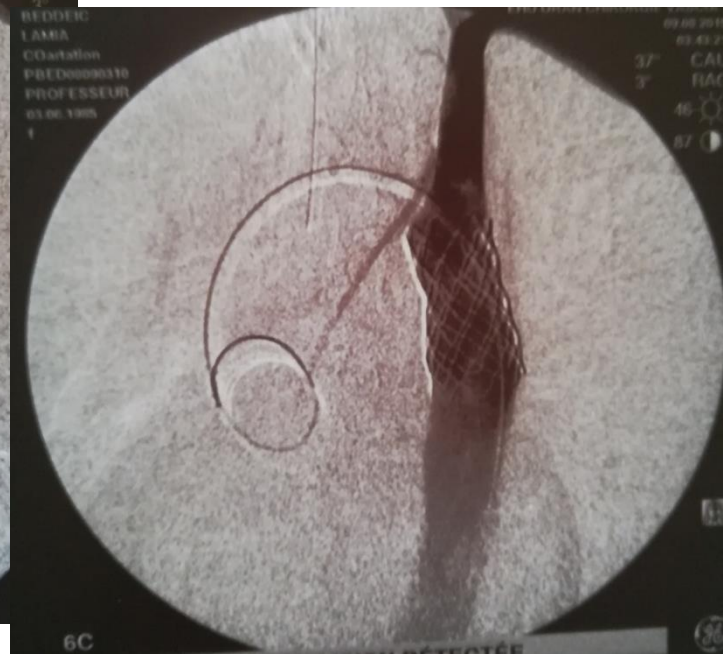
Case 7:CP Covered Stent



Aortic coarctation

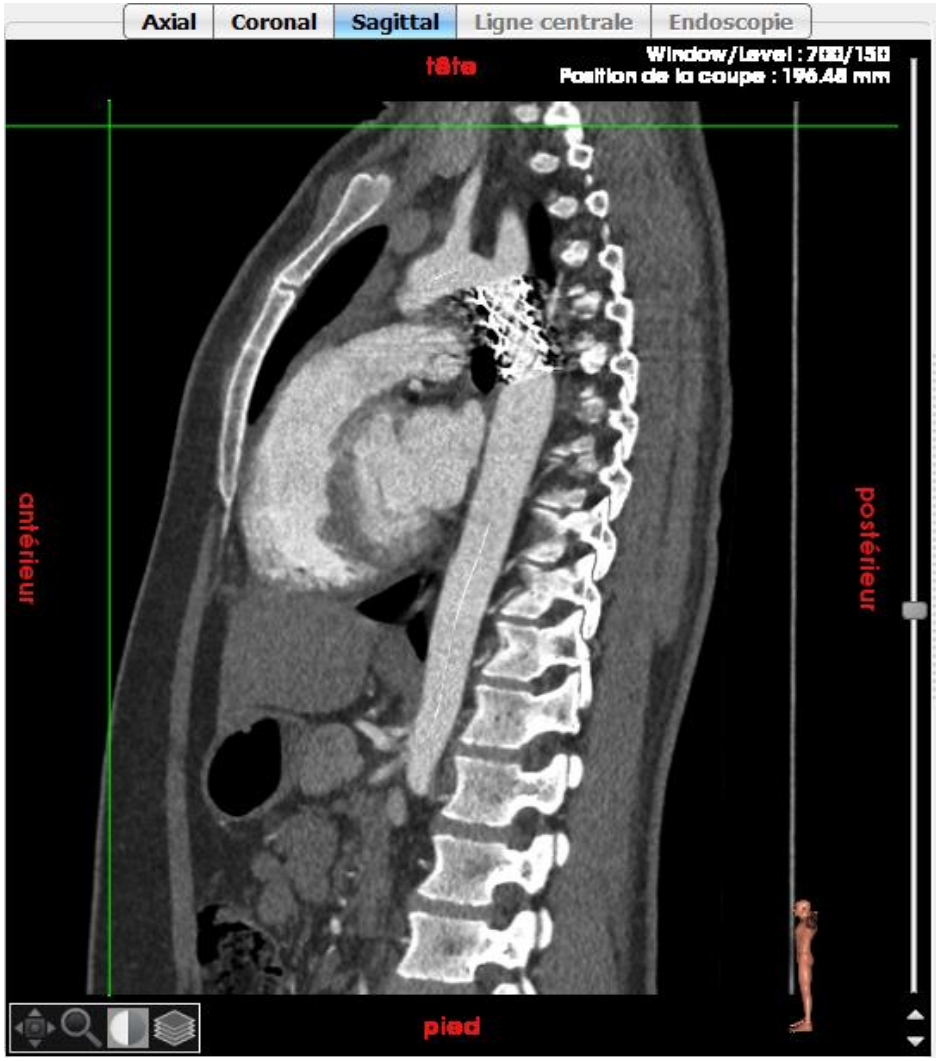


Stent releasing

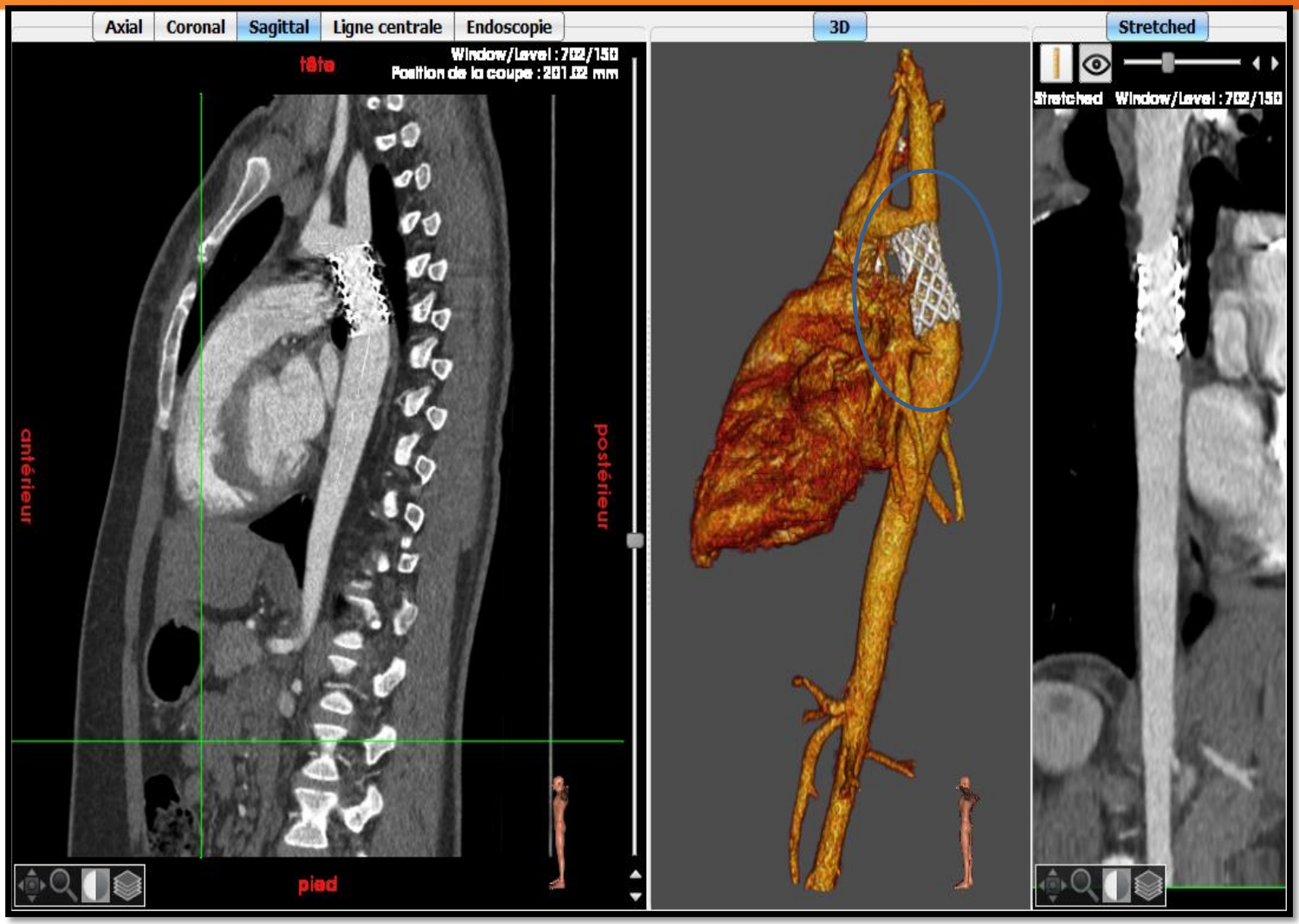


Final result

Case 7:CT Scan at 12 months



Case 7:CT Scan at 24 months



CONCLUSION

In adolescents and adults, treatment of aortic coarctation and recoarctation is currently performed usually by balloon-expandable covered stents that is safe and efficient

M.C.Q

Which endovascular technique seems the safest and most effective for the treatment of an isthmic aortic coarctation in adults:

1. Angioplasty with balloon
2. Angioplasty with a covered self-expanding stent
3. Angioplasty with balloon-expandable covered stent
4. Angioplasty with a balloon-expandable bare stent