

CoA Stenting Alexandria Experience

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- Coarctation of the aorta is the eighth most common form of congenital heart disease & accounts for 5-8% of all Congenital Heart Diseases & affects roughly 1 in 1,000 liveborns.

Anderson RH et al, Br Heart J 1983; 50:176-81.

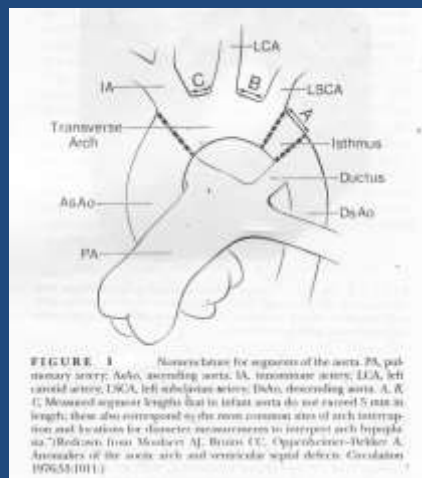
Definition of CoA

Coarctation of aorta is a discrete shelf or curtain of stenosis in the isthmus usually at its junction with descending aorta and arterial duct just beyond the origin of LSCA, although involvement of the origin of LSCA is not uncommon. Sometimes coarctation of aorta is associated with isthmus and/or transverse arch (usually distal) hypoplasia .

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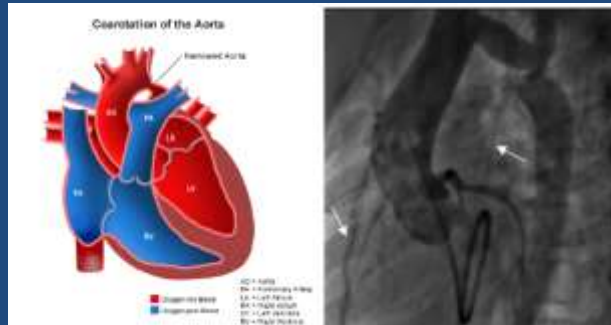
3



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4



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5

Types (Classification)

Isolated or simple coarctation with or without PDA with or without arch hypoplasia.

Complex coarctation which is associated with intracardiac lesions.

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6

- **Native CoA**
- **Re CoA** which is recurrence of CoA post surgery or post balloon angioplasty or post both.

Clinical Presentations (above 5-6 years)

Child, adolescent, and adult

- systolic/continuous murmur conducted to back (collateral murmurs over scapula rarely)
- weak or absent femoral pulses (radio-femoral delay in older patients)
- upper limb hypertension
- exercise intolerance
- leg fatigue and claudication
- cold feet
- cardiac arrest (left ventricular hypertrophy and arrhythmia)
- hypertensive retinopathy
- intracranial bleed
- aortic dissection/rupture
- infective endocarditis

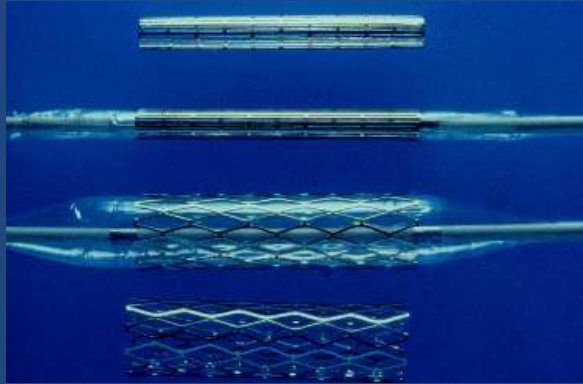
Transcatheter Techniques for Treatment of Coarctation of the Aorta

- The major stimuli behind the introduction of therapeutic cardiac catheterization for the treatment of coarctation were the risk of residual or recurrent coarctation and the rare but catastrophic spinal cord infarction following surgical treatment.

Currently available balloon expandable paediatric stents used in CoA

- Palmaz stents e.g Palmaz P 4014 & P 5014, P 308 and P 188, Palmaz Genesis XD
- Intrastents e.g Intrastent Max LD 18-26 stent
- **Cheatham –Platinum ; Bare and Covered.**
- Andrastents.
- Valeo stent

Palmaz stents – balloon expandable

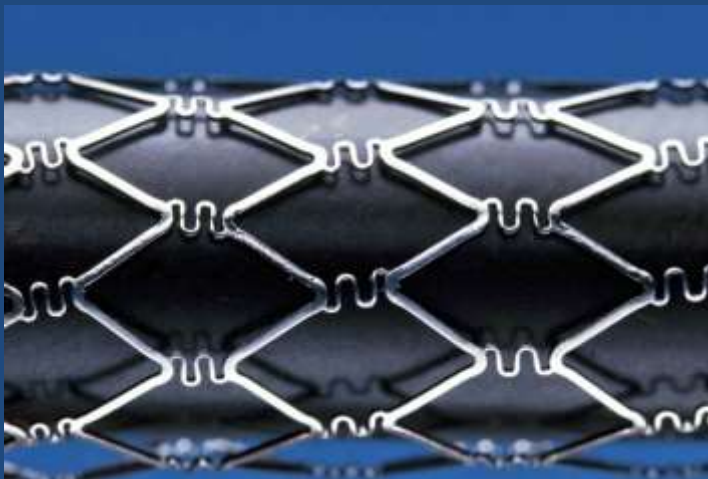


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11

Genesis balloon expandable stent

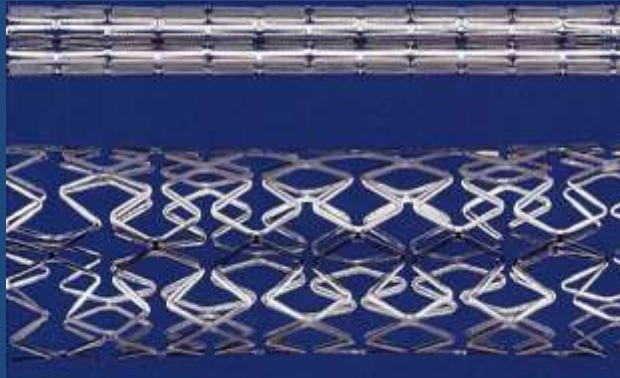


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12

Intrastent doublestrut balloon expandable stent

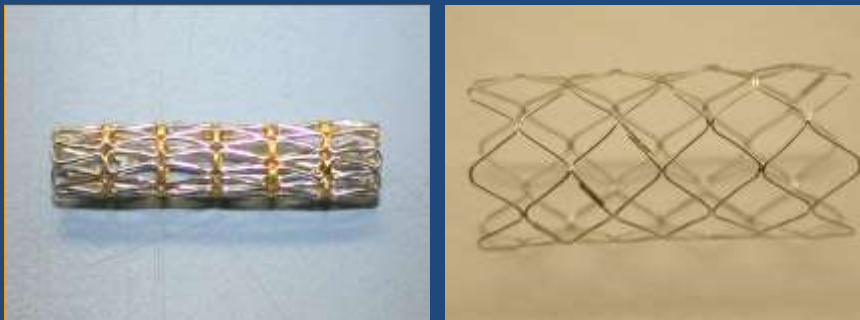


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13

Cheatham-Platinum Bare CP stent



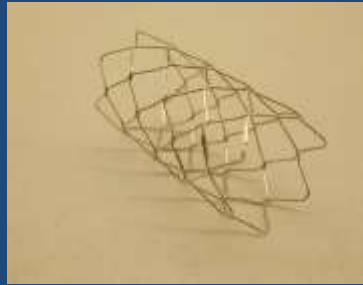
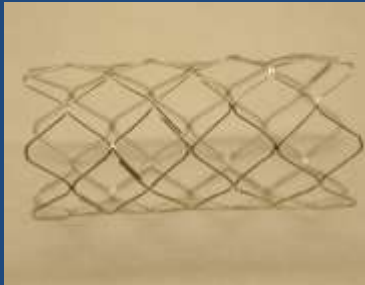
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14

Cheatham-Platinum (C-P) stent

- Made of 90% platinum/10% iridium wire
- 0.013" thick wire - gives the stent strength
- Each row of zigs is laser welded



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15

Cheatham-Platinum Covered CP stent



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16

The indications for redilating previously implanted stents include the following

- (a) A stenosis which initially prevents optimal stent expansion
- (b) Elective underexpansion at the time of implantation
- (c) Neointimal proliferation within the stent that significantly reduces lumen size
- (d) Growth that results in relative stenosis.
- (e) Residual hypertension in ReCoA.

Duke et al. Heart 2003;89:905-12

Technique of procedure done

1. Written informed consent was obtained from all the patients and/or their parents for the procedures.
2. All procedures were done under general anaesthesia or conscious sedation in 2 out of 9.
3. The procedure was done under (radiographic) fluoroscopic-guidance in the cardiac catheterization laboratory
4. Percutaneous entry was made into the right or left femoral artery.

- The pressure gradient between ascending aorta and descending aorta across the coarctation site and pullback gradients across it were measured.
- An arch aortogram in both posteroanterior and lateral views using a 5 French marker pigtail catheter was performed to visualize the coarctation area and the following measurements were taken; diameter of the distal transverse arch, isthmus, minimum diameter of the coarctation site, descending aorta diameter immediately post coarctation and at the level of diaphragm, length from LSCA to CoA

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19



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20

- Mullins long transeptal sheath (Cook Europe, Bjaeverskov, Denmark) was advanced over an Amplatz SuperStiff guidewire through the femoral artery across the coarctation site.
- The size of the long sheath was the size of sheath needed to introduce the balloon + 2 fr more in bare stent & 3 fr more in covered stent .
- The stent/balloon assembly was then advanced through the sheath to the desired site. After a final check angiogram, the sheath is withdrawn to uncover the stent, and RV pacing was not done as most of the cases were very tight CoA while the balloon was inflated using an inflator.

- In the nearly full grown adolescent the stent was inflated by balloon whose size allow full inflation (the diameter of the balloon was **equal to or 1 mm greater than the diameter of the aortic isthmus** , but not greater than the diameter of the descending aorta at the level of the diaphragm) as they will not need further expansion with growth in contrast to children and not fully grown adolescents where stents were electively underexpanded (**dilated to 70-80% of the diameter of the descending aorta at the diaphragm** or to a diameter similar to that of the transverse aortic arch).

- Balloon expandable Cheatham-Platinum CP stents (4 bare and 5 covered) in the 9 patients all were mounted on Z-med balloons (did not use BiB).
- After the stent was deployed, simultaneous pressure measurements were made using the angiographic catheter and the long delivery sheath, also pull back gradients were measured.
- A further arch aortogram was performed.
- Hemostasis was obtained by direct pressure .

- All the patients received an antiplatelet dose of aspirin (3–5 mg/kg/day) beginning on the day before the procedure and continuing for six months.
- Antibiotics (gentamycin and amoxicillin) were given one hour before stent implantation and continued for 48 hours afterwards.

- A heparin bolus of 100 units/kg was injected intravenously following establishment of arterial access to maintain an activated clotting time of above 250 seconds. If the procedure taking more than 90 mins ACT was repeated and another dose between 30-60 u/kg acc to ACT result is given.

- MRI has been shown to be diagnostic & well suited for both pre- & post-operative evaluation of aortic coarctation & very important for management decisions to establish the location & degree of stenosis , length of coarctation segment , associated aortic arch involvement (such as tubular arch hypoplasia), the collateral pathways (internal mammary & posterior mediastinal arteries) , relationship to aberrant subclavian artery , poststenotic dilatation , especially when echo window is not adequate as in adults.

Rezavi et al *Cardiol Young* 2003;12:461-46.

Severe near interruption CoA by CTA in 35 ys male

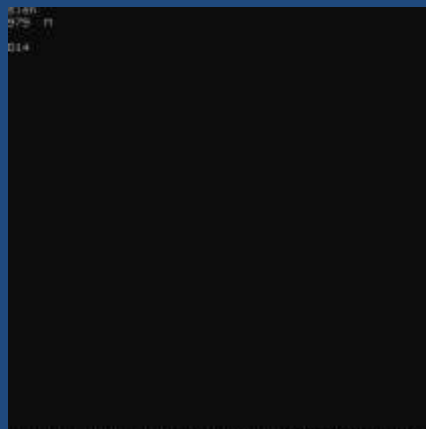
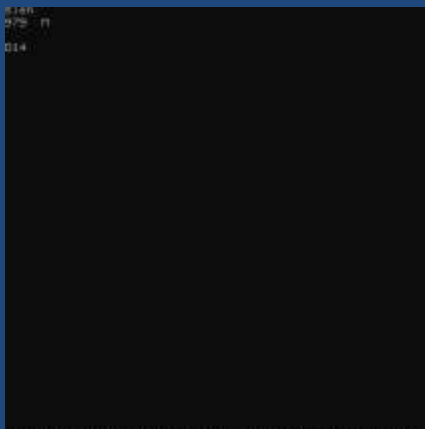


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27

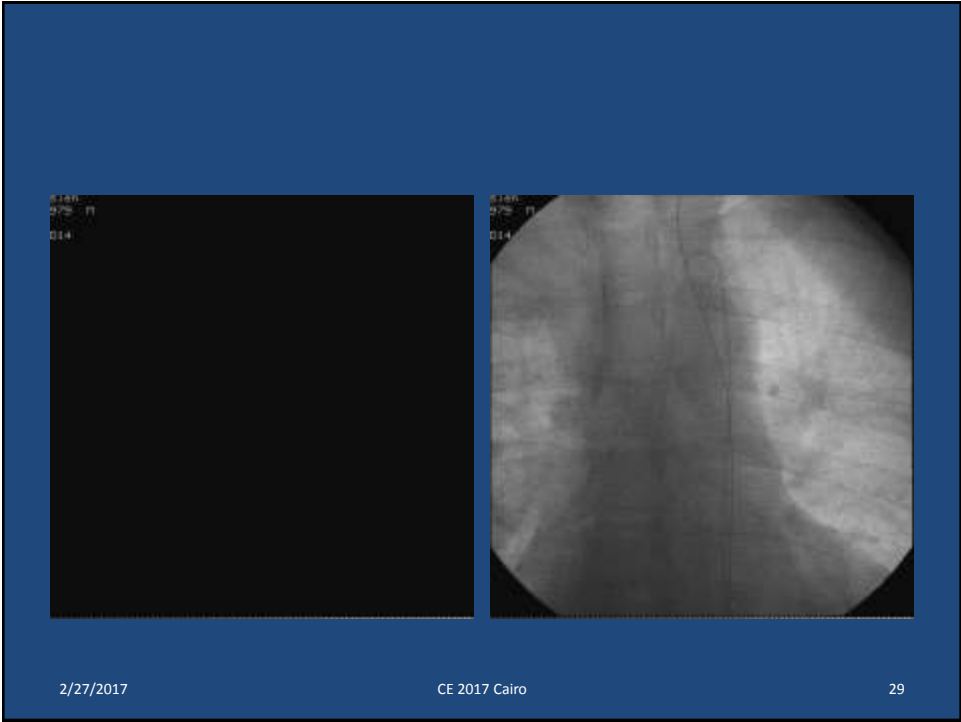
Catheter Rx



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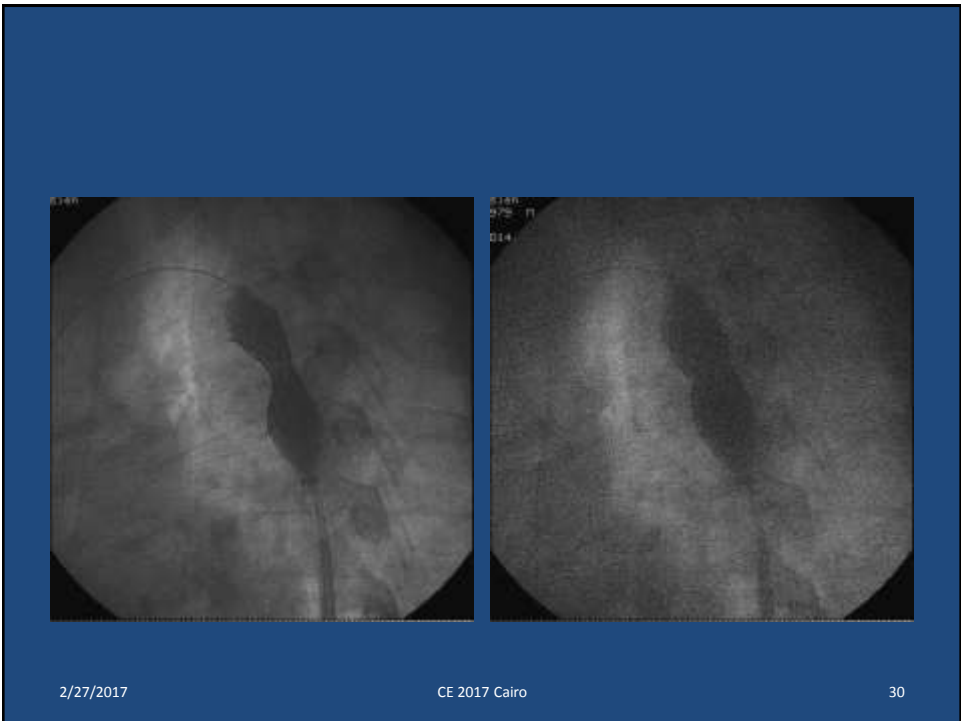
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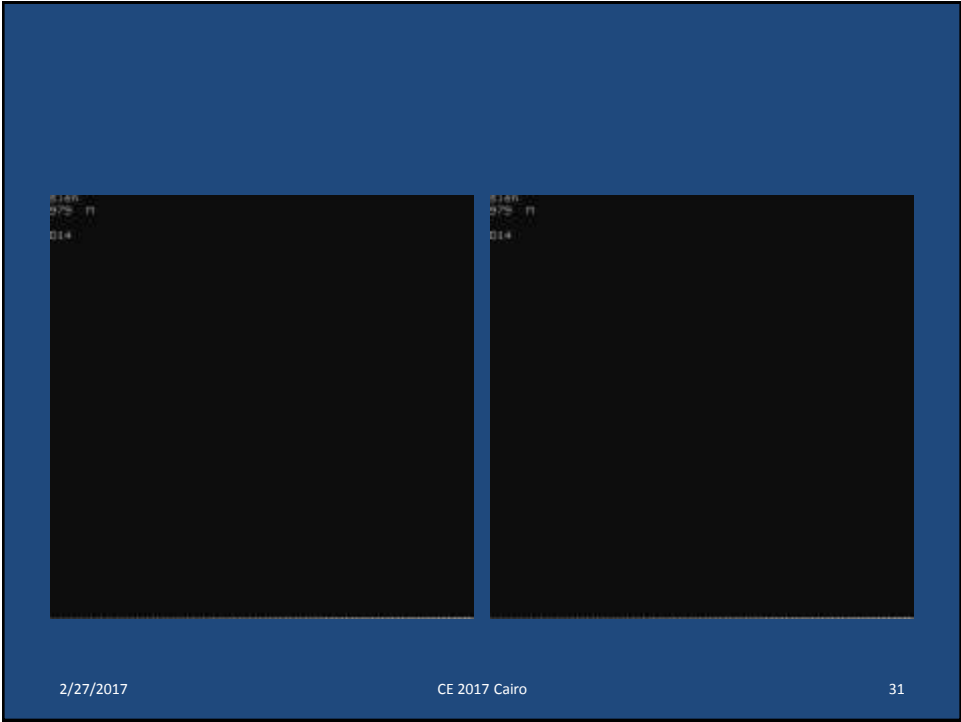
29



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30



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31

CXR post CoA stenting



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32

CTA of near interruption CoA in 23 years female



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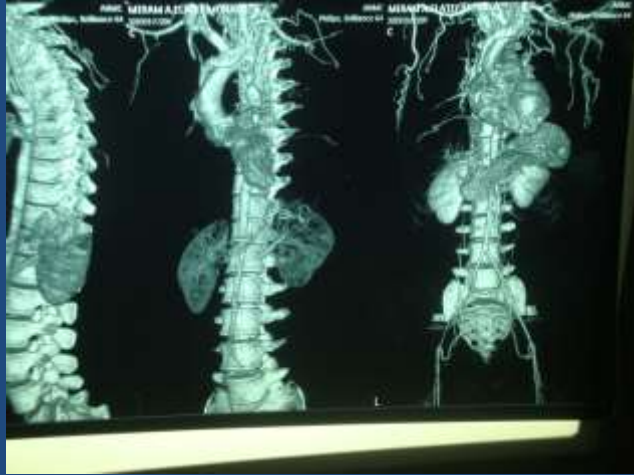
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34

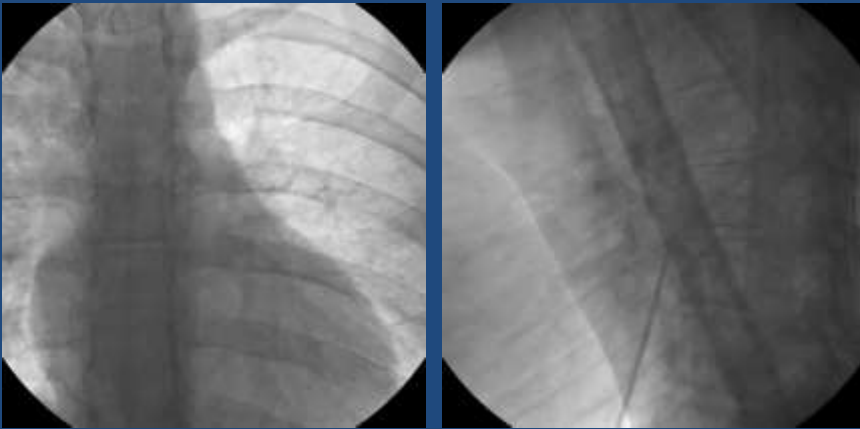


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35

Catheter Rx



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36



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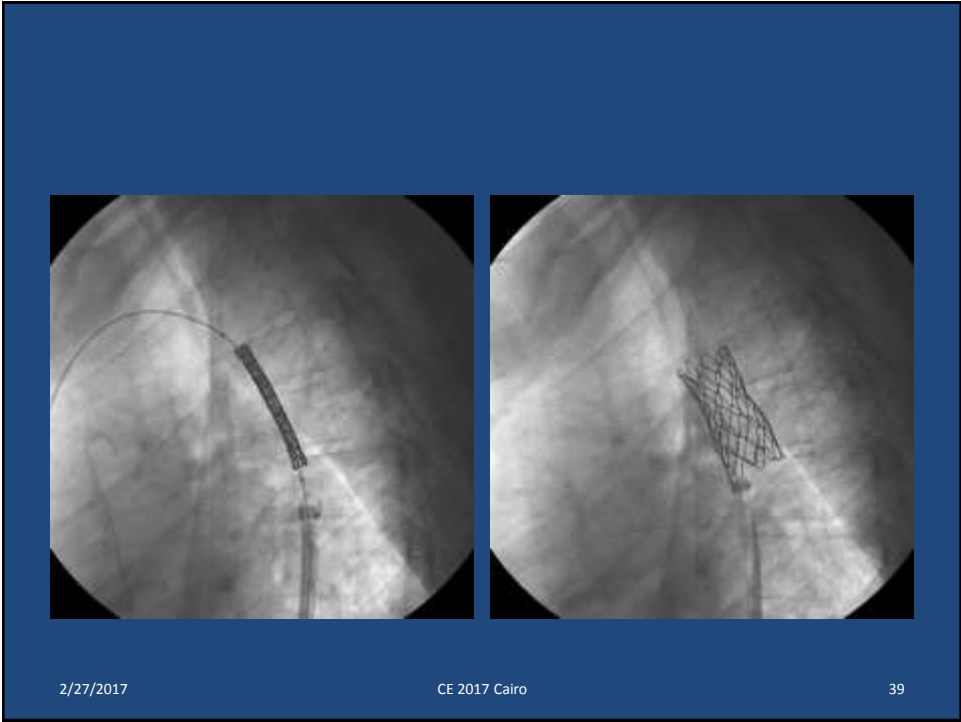
37



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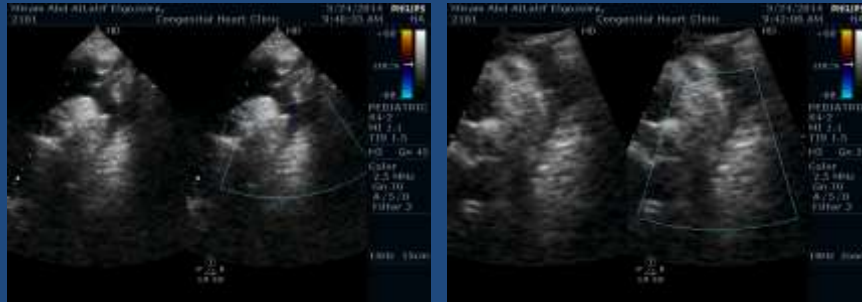
38



CXR post stenting



Echo post stenting



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41

CoA stent 13 years old girl

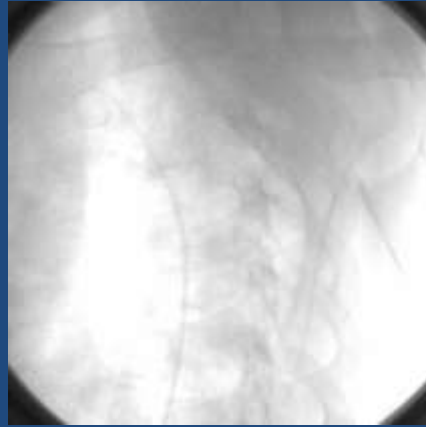
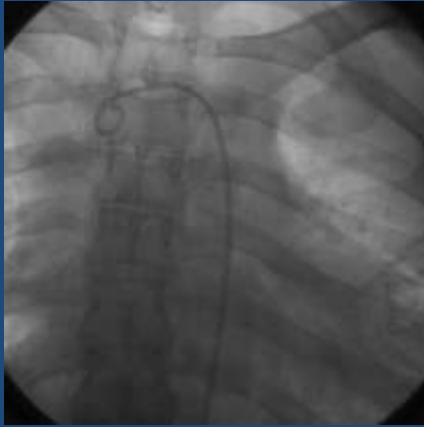


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42

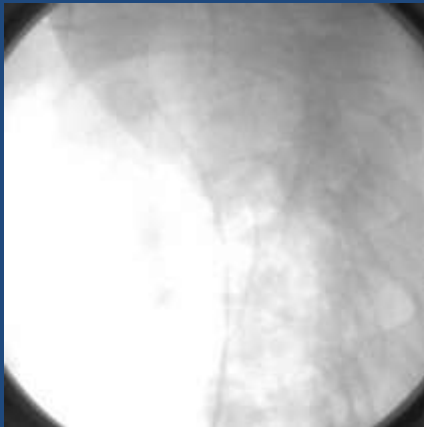
24 years old female with severe CoA with HTN



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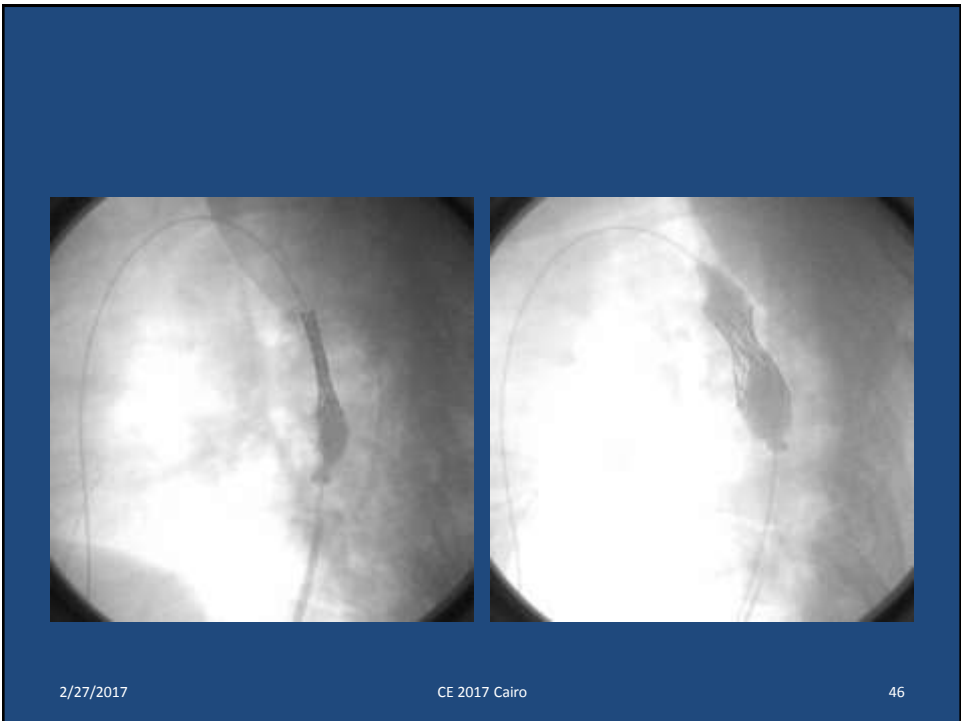
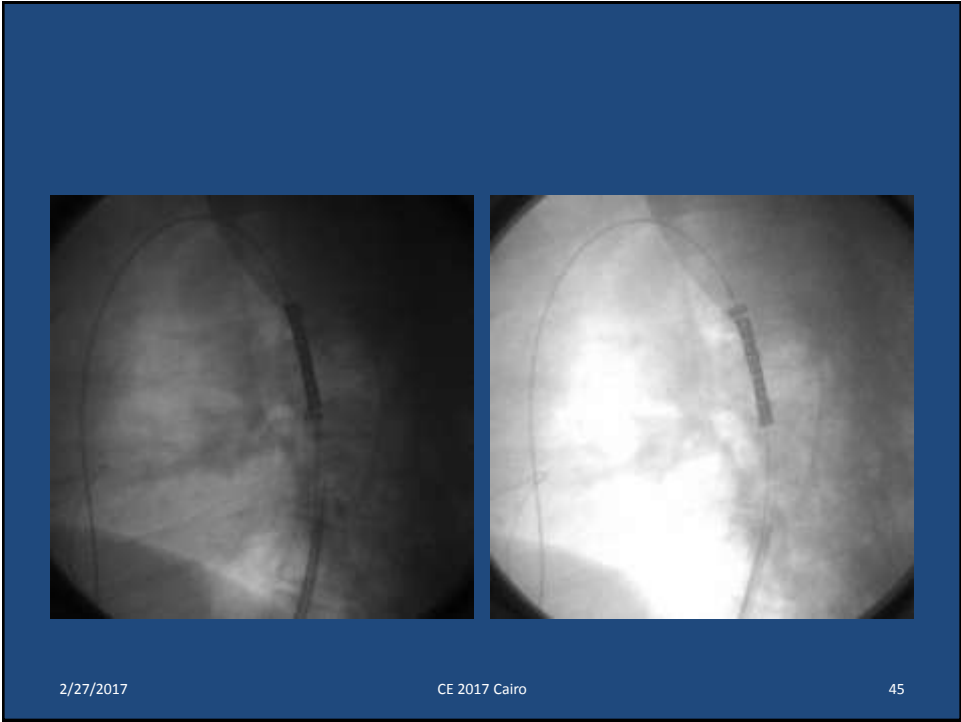
43

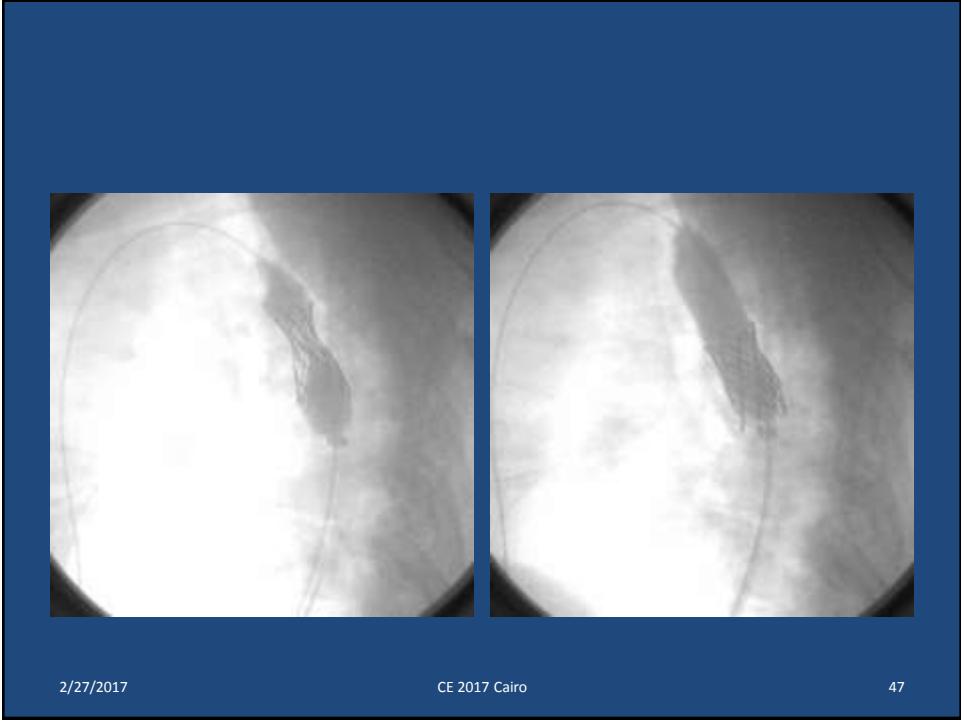


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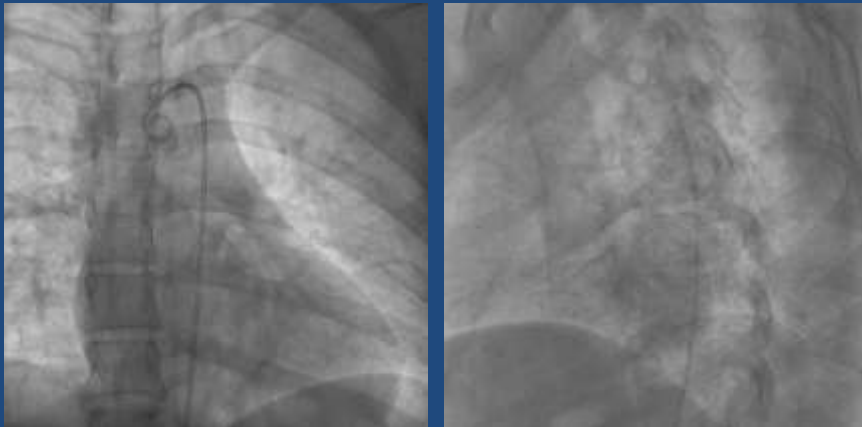
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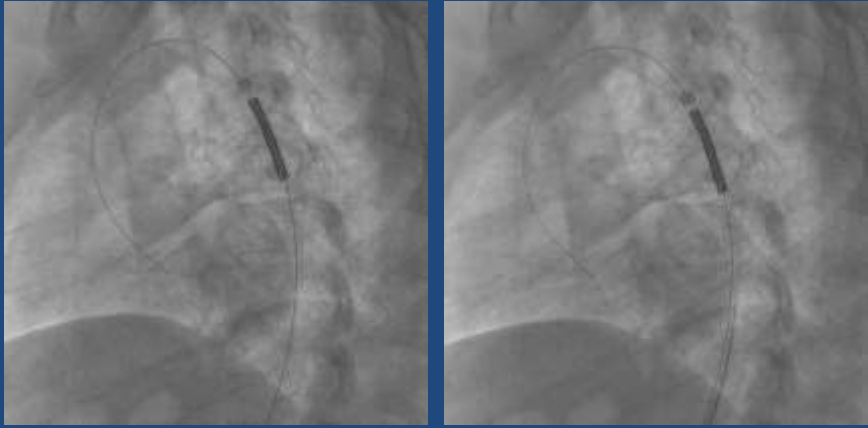






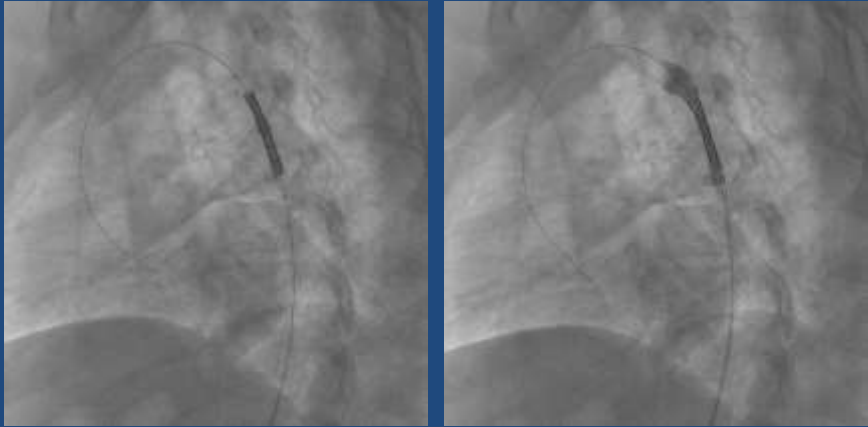
Severe CoA in 35 years old lady





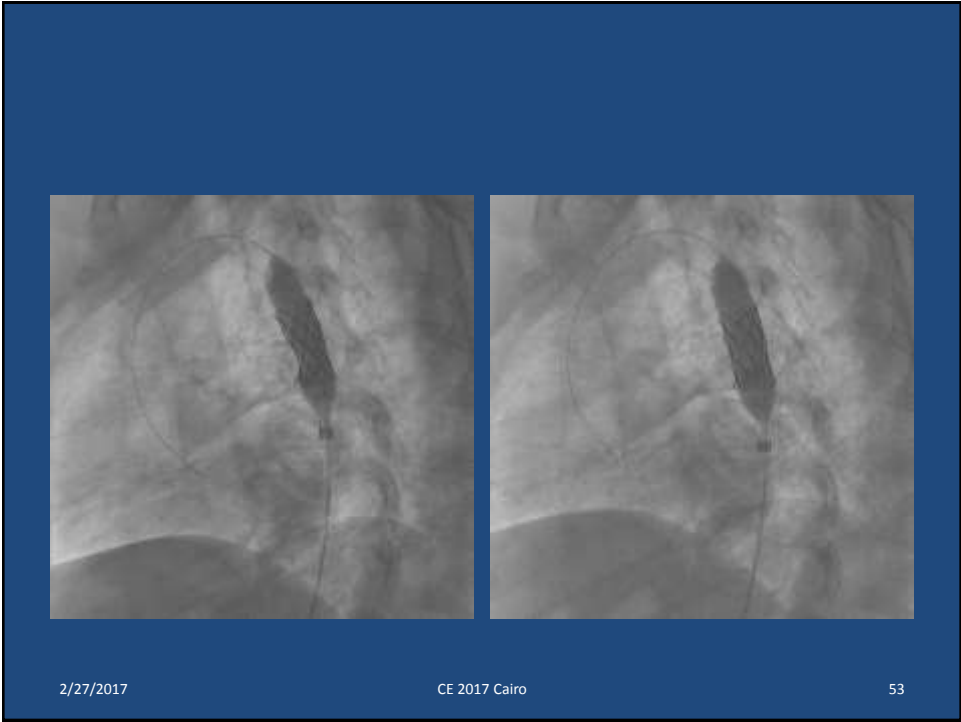
Two side-by-side chest X-rays showing a catheter in the thoracic cavity. The catheter is positioned in the upper part of the thorax, likely in the superior vena cava or a branch. The lungs and heart are visible in the background.

2/27/2017 CE 2017 Cairo 51



Two side-by-side chest X-rays showing a catheter in the thoracic cavity. The catheter is positioned in the upper part of the thorax, likely in the superior vena cava or a branch. The lungs and heart are visible in the background.

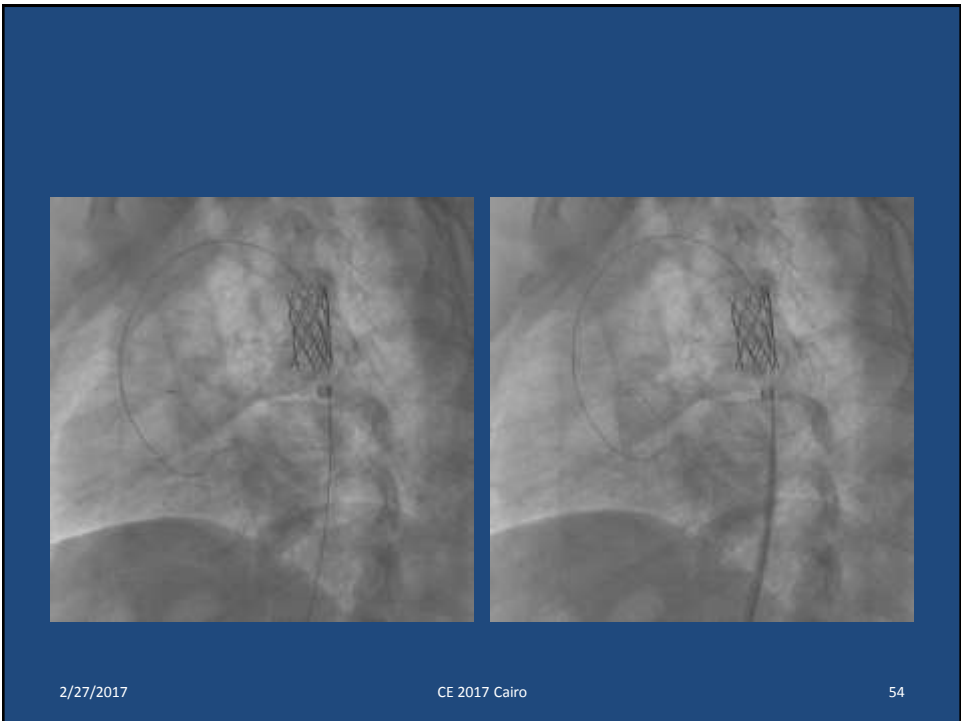
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2/27/2017

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53



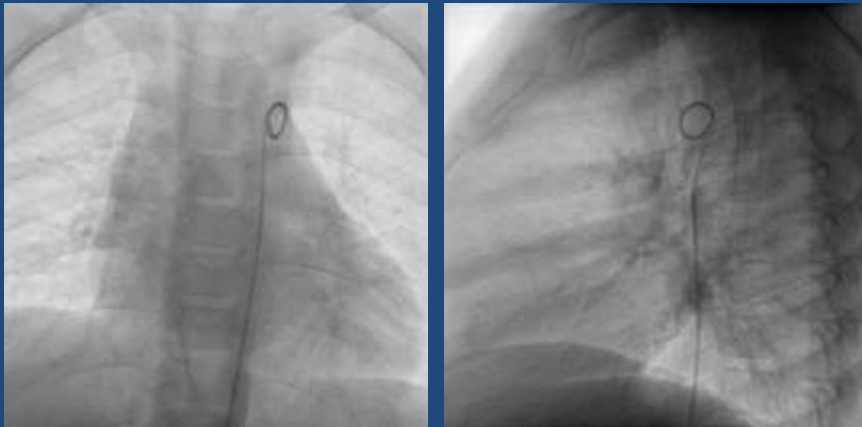
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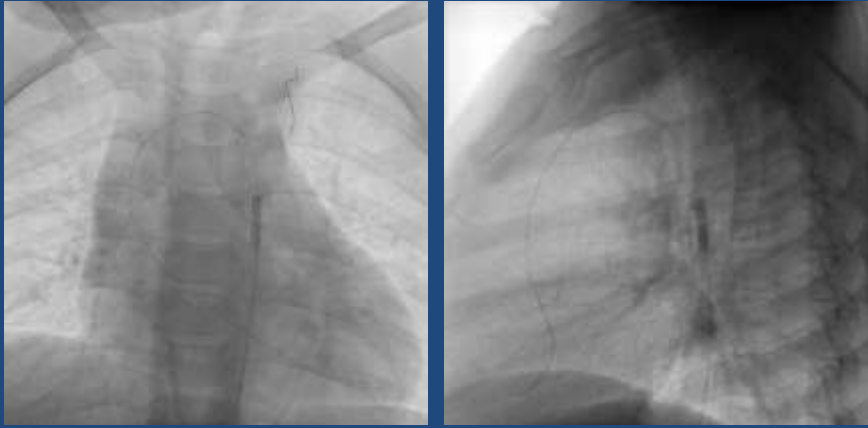
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54



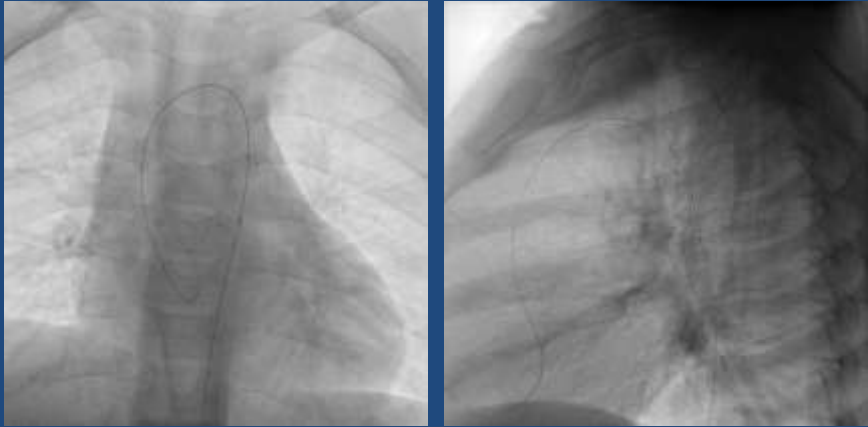
Subatretic CoA in 5 years old 18 kg boy





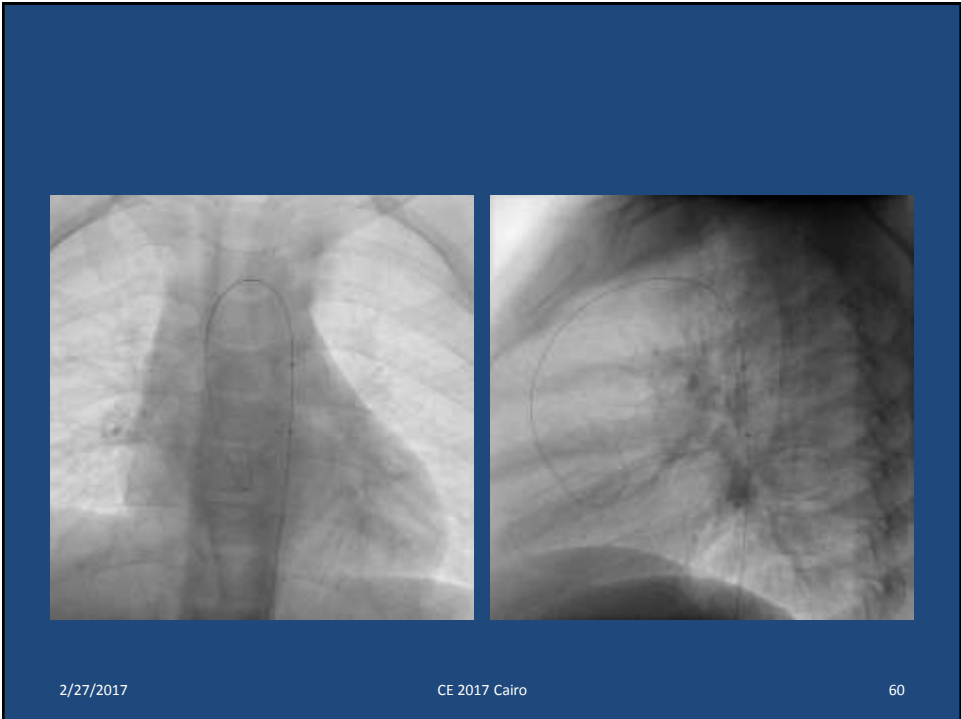
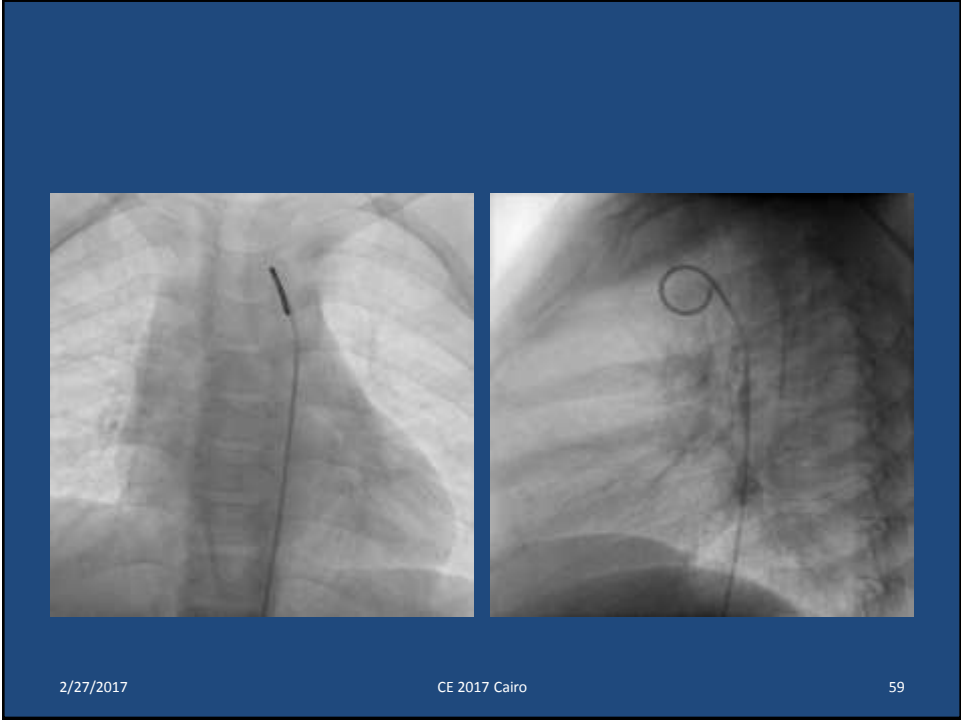
Two chest X-rays are displayed side-by-side. The left image is a standard posterior-anterior (PA) view, and the right image is an anterior-posterior (AP) view. Both images show a faint, vertically oriented oval outline superimposed on the mediastinal structures, likely representing a specific anatomical or pathological finding.

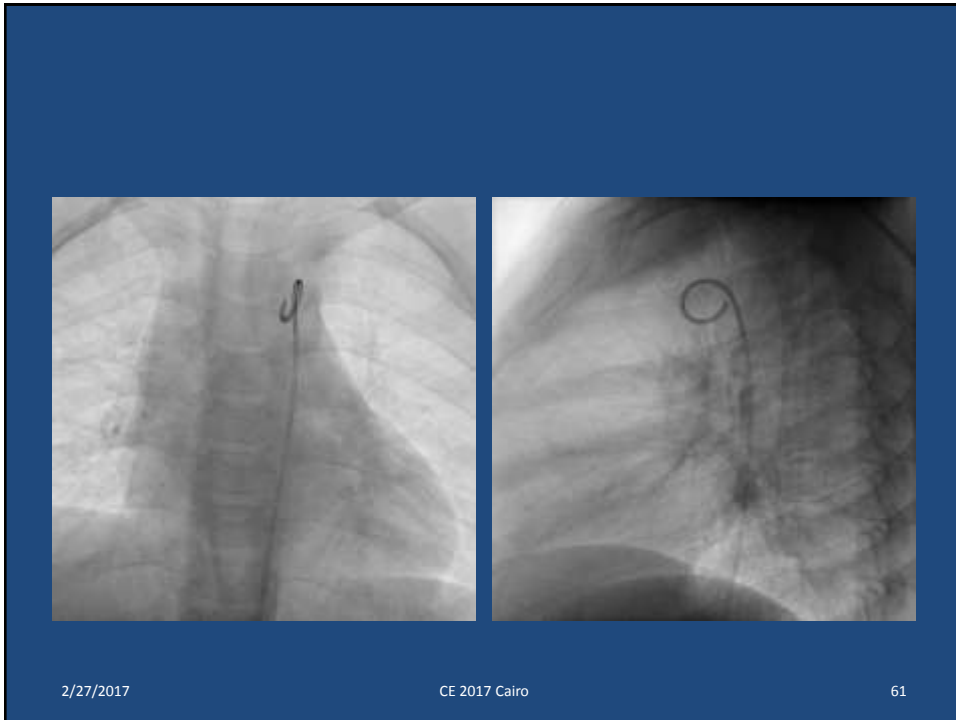
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Two chest X-rays are displayed side-by-side, similar to the previous slide. The left image is a PA view and the right is an AP view. The faint oval outline seen in the previous slide is now more prominent and clearly defined, indicating a more significant finding in the mediastinum.

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Demographic & clinical Data

- No of cases 9 between April 2013 & December 2016
- M:F =3/6
- Age : 13-45 years
- Wt : 35-89 Kg
- Procedure time: 85 to 135 mins
- AntiHTN medications pre-procedure 6 cases.
- F/U 2 to 38 months.
- Anti HTN medication stopped in 3 out of 6 & decreased to one drug in 2 out of 6.

- 3 out of 9 cases could not cross the CoA from below and needed left radial puncture & access and advanced from above and created a circuit 2 of them by snaring the wire into FA & one by advancing upwards a terumo wire along the one from above & tracking its course.
- 2 Cases needed pre dilation to advance the long sheath through the CoA site.
- One case needed redilating the stent immediately post deployment.

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63

- All stents used were CP stent.
- 5 cases were subatretic CoA or near interruption and needed covered stent
- 7 of 9 cases were above 20 years .
- All cases were Native CoA
- 2 out of 9 cases were 13 & 14 years and one of them needed redilation 1 year post stenting.

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64

Take Home Messages

1. Balloon-expandable stents should be considered a safe and very effective treatment modality with sustained good mid-term results in children older than 8 years and weighing more than 25-30 kg and adolescents with coarctation of the aorta.
2. The potential for redilatation of CP-stents in a wide range of diameters without significant shortening adds to the benefit of this device in growing children.

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65

3. The high accuracy of stent placement achieved by using RV pacing technique and the accurate angiographic measurements upon which decision of the size of balloon and length of the stent are chosen are cornerstones in minimizing complications as stent migration and aortic dissection. Avoidance of stent overdilation decreased the risk of aneurysm formation.

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66

4. CoA in adults is best treated by stenting .
5. Covered stents should be reserved to fully- or near-fully-grown patients as adolescents or adults with subatretic or severe CoAs.
6. Follow up post stenting in adults with poor acoustic echo window needs CXR & fluroscopy every 6 months & CTA every 1 year.

- In adult CoA MSCTA or MRA is mandatory pre decision making to make sure is it severe CoA or near atretic (interrupted) CoA or true interruption & interruption distance.
- Angiographic measurements in the cath lab are the most important imaging modality to decide type , size of balloon or stent whether in children or adults

Thank You