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RESEARCH ARTICLE

ENDOVASCULAR TREATMENT OF NATIVE COARCTATION OF THE AORTA IN ADULTS: MOROCCAN EXPERIENCE.

Raiss Zakaria, Qat.A[1], Zoulati Mohammed[2], El Boussaadani.B, Sefiani.Y[2] and Bensaid.Y[2].
1. Department of Cardiology, CHU Ibn Sina Mohammed V University, Rabat, Morocco.
2. Division of Vascular Surgery,Ibn Sina Hospital,Rabat, Morocco.

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Abstract

Coarctation of the aorta is a congenital heart disease characterized by a local narrowing of the aortic lumen, most often located at the level of the aortic isthmus.It is rarely diagnosed in adulthood, which in this case it is discovered through etiological assessment of arterial hypertension. Endovascular treatment has become an alternative therapy to surgery.

Material and methods: Our work includes a retrospective serie of 5 cases of coarctation of the aorta (CoA) treated by endovascular approach, casesthat had been compiled in the vascular surgery department of Ibn Sina Hospital in Rabat, over a period of time between January 2010 and April 2015. The follow-up was based on the measurement of blood pressure and a radiological follow-up byComputed Tomography Angiography (CTA).

Result: The mean age of the patients was 22 years old. Arterial hypertension with a pressure gradient between arm and leg was the usual clinical presentation. Clinical diagnosis was confirmed by CT-angiography. The coarctation of the aorta (CoA) was located at the thoracic level in 3 patients and at the abdominal level in 2 others. Two patients were treated by balloon angioplasty alone while the othersangioplasting + stenting: covered stents (stent grafts) in 2 patients, and a bare metal stent in 1 patient. The results during a long-term follow-up showed a normalization of blood pressure under low dose combination therapy in 4 patients, while in a single patientnutritional-hygienic measures. Also the radiological follow-up showed a decrease in the trans-stenotic pressure gradient and the absence of restenosis.

Conclusion: CoA is a congenital malformation that is not uncommon, and diagnosis is clinical. The debate about therapeutic choice is open; however the endovascular approach remains the least invasive one.

Introduction:-

Coarctation of the aorta (CoA) is a narrowing most often located at the level of the aortic isthmus, rarely at the abdominal level. It accounts for 9% of congenital heart defects [1]. Hypertension with asymmetry between upper and lower limbs is the main clinical sign.The first surgical repair was carried out by Crafoord in 1944, and

Corresponding Author:-Raiss Zakaria.
Address:-Department of Cardiology, CHU Ibn Sina Mohammed V University, Rabat, Morocco.

since1982 balloon angioplasty has offered a truealternative therapy to native coarctations, especially inadolescentsandadults.

Material and methods:-

Our work includes a retrospective serie of 5 cases of coarctation of the aorta (CoA) treated by endovascular approach, cases that had been compiled in the vascular surgery department of Ibn Sina Hospital in Rabat, over a period of time between January 2010 and April 2015.Inclusion criteria were patients with coarctation of the aorta, in its isolated and native form.

The mean age of the patients was 22 ± 5 years (extreme limits between 17 and 27 years). The sex ratio was in favor of male sex (4/5). One patient was smoking in our series. A history of haemorrhagic stroke and Takayasu's disease was found in one patient.

The chief complaint was a resistant hypertension to medication in all patients, and a notion of abdominal pain reported by two patients.Coarctation of the aorta was suspected in the absence or diminished femoral pulses and blood pressure asymmetry in both upper and lower limbs in all our patients. Cardiac auscultation noted a systolic murmur in the aortic in one of our patients and an abdominal bruit in two patients.

The ECG showed an aspect of left ventricular hypertrophy with secondary repolarization changes in a single patient. The chest x-ray showed a cardiomegaly in one patient and a mediastinal widening in another.Echography showed a trans-stenotic pressure gradient increase (> 20 mm Hg) in all our patients.
A CT-angiography scan was performed in all our patients, which confirmed the diagnosis. It revealed a circumferential stenosis of the descending thoracic aorta at 39 mm away from the origin of the left subclavian artery in patient 1.

Patient 2 had a short and tight stenosis at the aortic isthmus at 15 mm away from the origin of the left subclavian artery, with a 7 mm extension.

Patient 3 presented acoarctationat the aortic isthmus. Chest CT-angiography in patient 4 noted the presence of a dilatation (ectasia) in the ascending aorta dilatation with no image of dissection. Abdominal CT-angiography showed focal stenosis of the infrarenal aorta extended on 14 mm, associated with bilateral renal artery stenosis more predominant on the left one,with renal asymmetry and infrarenal abdominal aortic aneurysm measuring 34 mm and extending 97 mm to the level of bifurcation, without evidence of fissure nor rupture. Finally in the 5th patient we found a stenosis of the focal infrarenal abdominal aorta associated with bilateral renal artery stenosis more important on the right.

The first three patients underwent balloon angioplasty of the thoracic aorta with an implantation of a coveredstentin two patients who had a very tight stenosis and a bare metal stent in one patient because of the proximity of the lesion to the subclavian artery's origin.The 4th patient underwent a balloon angioplasty of the abdominal aortic stenosis alone and a stent implantation at the level of the right renal artery.The last patient had a dilatation of both the aortic stenosis and the left renal artery by balloon angioplasty alone.Aortography was performed at the end of the procedure to check the correct positioning of the stent and the good permeabilizationof the stenosis.

Results:-

Immediate and long-term results (a mean follow-up of 4 years) noted a normalization of blood pressure under low-dose combination therapy in 4 patients, while under nutritional-hygienic measures alone in a single patient, as well as the perception of lower limb pulses in all our patients. The systolic pressure gradient decreased from 40 +/- 10 mmHg to 5 +/- 4 mmHg and the coarctationof the aorta site diameter increased from 7 +/- 3 mm to 18 +/- 4 mm. CT-angiography was performed 3 months after the procedure and then did not show restenosis, aneurysm formation norany other complications.All of our patients left the hospital after two days of hospitalization and none of the patients reported a complication after the procedure.

Discussion:-

Surgery is the classical treatment of coarctation of the aorta, it is performed by left posterolateral thoracotomy. However, it was in 1979 that Sos T and al [2] reported for the first time the success of balloon dilatation of the coarctationof the aorta in postpartum babies. In 1982, Lock and al [3] showed in turn the success of balloon angioplasty on experimental models. Since that date, many teams have published their experiments on native coarctation and re-coarctation.

Since 1991, it has been proposed to perform; especially in adolescentsand adults, whether in native or recoarctationforms;a balloon angioplasty combined with stenting, the purpose of which is to prevent elastic recoil after dilatation, to avoid over dilatation of the stenosis, to minimize the extension of the intimal or media tear, therefore the risk of dissection, and finally to offer a homogeneous layered neointimal proliferation.It is essential to note that endovascular treatment is a minimally invasive procedure that avoids performing thoracotomy, laparotomy nor arterial clamping, and that it decreases the length of the operating time and therefore a short stay in the intensive care unit (ICU).

In the series of Tyagiand al [4], 35 adolescents and adults, with a mean age of 14 to 37 years old,presenting native Coarctation of the aorta (80% had a discrete isolated CoA, while 20% had it associated with tubular hypoplasia of the aortic isthmus) underwent balloon angioplasty between June 1985 and December 1990.Immediate results showed a decrease in the systolic pressure gradient from 78.5 ± 23.9 to 15.7 ± 11.6 mmHg, with no significant complication reported. During the follow-up, 26 patients did an angiography 9 to 15 months after the angioplasty, with good results.On the other hand, 7.7% of the patients developed a recoarctation and 11.5% an aneurysm. The clinical follow-up between 3 to 67 months, showed that 37.5% of the patients recovered from systemic hypertension, 59.4% improved and only one patient continued to take the same dose of antihypertensive drug.

In his study, F.Godart [5] mentioned that stent placement has become a real therapeutic alternative to surgery for the treatment of CoA in adolescents and adults over the last decade. The most serious complication reported in this study is the rupture of the aorta that occurred in 1.6% of the 565 procedures in multiple study centers. Other complications that are much rarer are represented by aneurysm, stent migration, cerebrovascular accident and paradoxical hypertension.

In 2004, in a retrospective study, Walhoot and al [7] compared the surgical treatment of CoAversus balloon angioplasty in 46 patients, and found an immediate similar success regarding pressure gradients and recoarctation rate. No aneurysms were observed in both groups. They concluded that both techniques lead to low rates of re-intervention.

In the series of Enrique M and al [8], at the University Hospital of Valladolid in Spain, between January 1998 and December 2007, out of the 11 adult patients treated for CoA, 5 patients (group A) were treated with angioplasting and stenting, while the 6 remaning patients (group B) underwent open surgery. The postoperative complication rate was 27.7% (hemothorax in group A versus pneumothorax and hemothorax in group B) without mortality. Thetransstenotic pressure gradientdecreased to 24.5 ± 4.3mmHg in group A versus 33 ± 3.2mmHg in group B. In addition, no case of restenosis was reported in both groups. The duration in ICU stay was 2.3 days (1 day for group A versus 3 days for group B). This serie concluded that short- and medium-term results in endovascular therapy allow for a shorter ICU stay and a less frequent use of antihypertensive drugs afterwards.

The immediate and long-term results of our series were very satisfactory despite the few cases to whom an endovascular treatment was provided.In our context, and given the morbi-mortality of surgery, the use of endovascular treatment in CoA is particularly recommended in adolescents and adults. In return, we need more studies with long-term follow-up in order to evaluate the results of angioplasty.

Conclusion:-

Coarctation of the aorta is a congenital malformation that is not uncommon, often revealed and corrected in the newborn or child, rarely in adulthood. It is diagnosed clinically, although the anatomical diagnosis is essentially based on CT-angiography. The debate about therapeutic choice is open; however the endovascular approach remains the least invasive one.Although for a better assessment, we need more studies with long-term follow-up in order to evaluate the results of angioplasty.

Figures

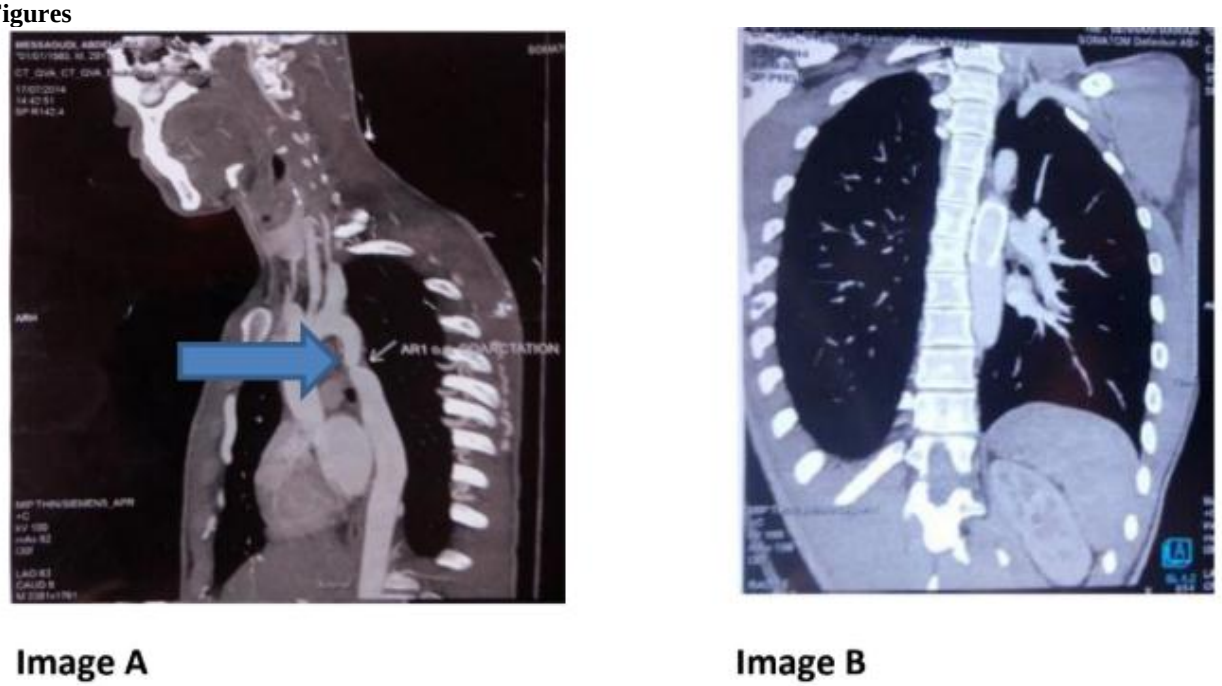

Figure 1:-Image A**:** CT-angiography showing coarctation of the thoracic descending aorta (arrow).Image B**:** CT-angiography follow-up 3 months after the intervention showing aproper post dilated thoracic aorta with a stent placed.

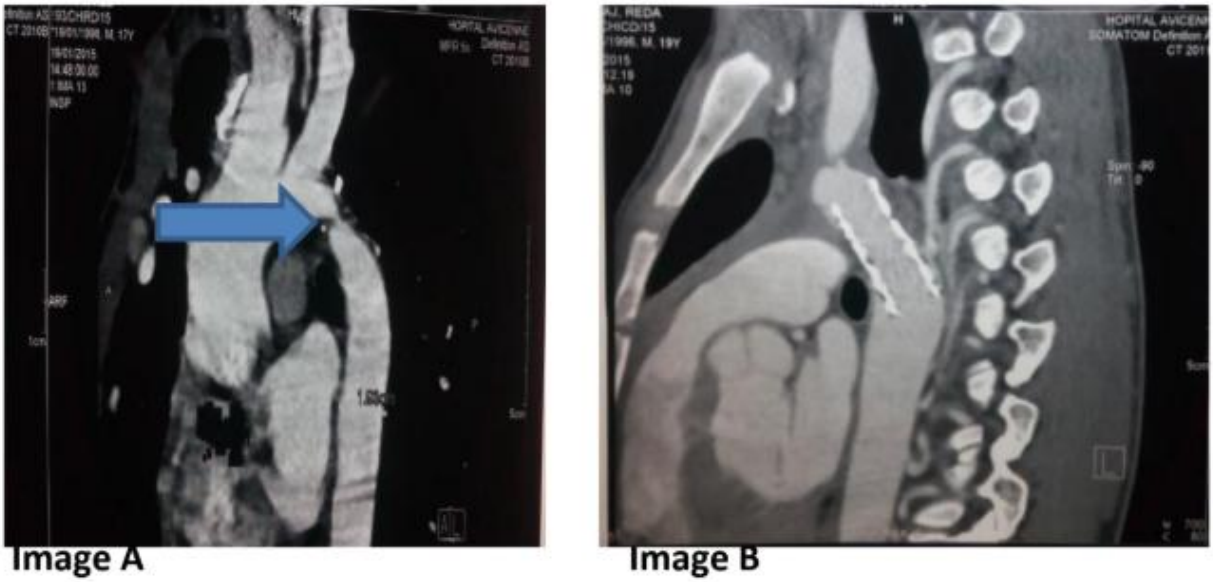

Figure 2:-Image A**:** CT-angiography showing coarctation of the aortic isthmus (arrow).Image B**:** CT-angiography follow-up 1 month after the intervention showing a proper post dilated thoracic aorta with a stent placed.

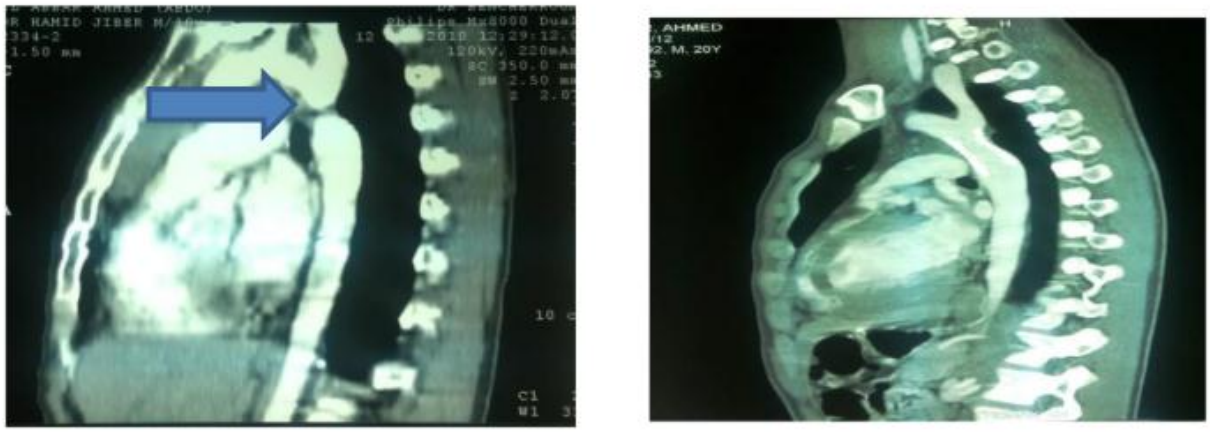

Image A Image B

Figure 3: Image A:CT-angiography showing coarctation of the thoracic aorta (arrow).Image B:CT-angiography follow-up 1 month after the intervention showing an proper post dilated thoracic aorta with a stent placed.

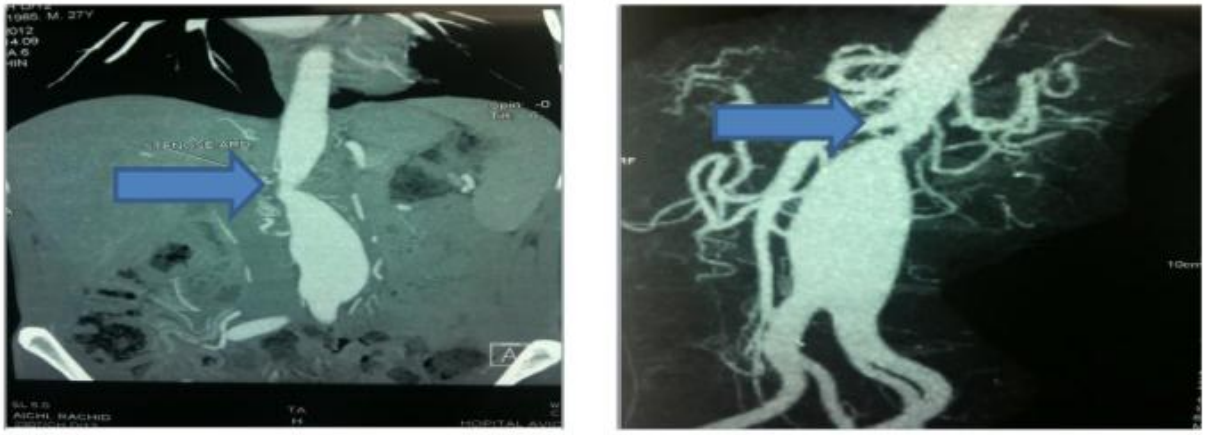

Figure 4:-Abdominal CT-angiography showing a stenosis of the abdominal aorta associated with a stenosis of the renal arteries (arrows) and an aneurysm of the abdominal aorta extended to the bifurcation.

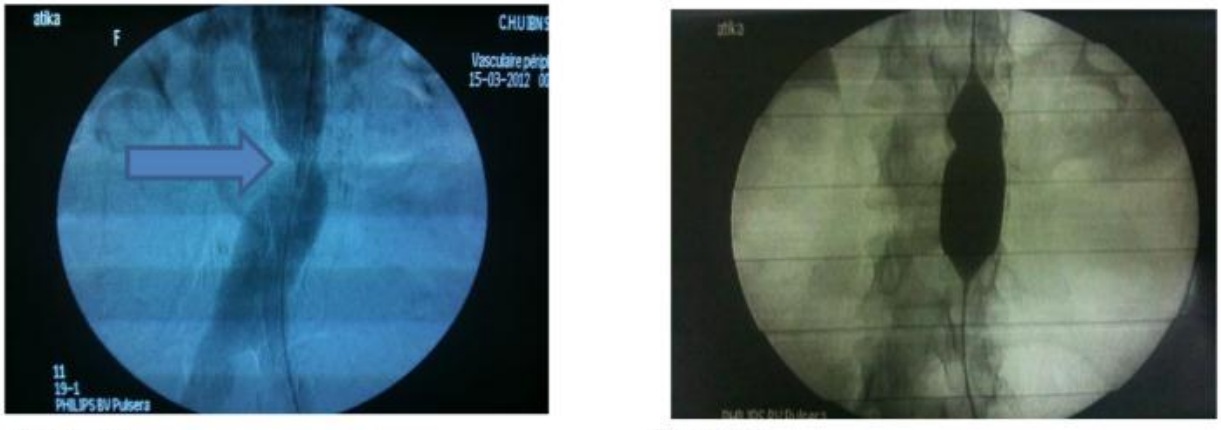

Image A Image B

Figure 5:-Image A:Pre-dilatation angiogram showing a stenosis of the abdominal aorta (arrow).Image B:Endovascular angioplasty with balloon imprint.

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