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Case Report

Aortic coarctation in an asymptomatic patient with arterial hypertension initially evaluated by Doppler ultrasound in the emergency room: A case report ☆

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ABSTRACT

Aortic coarctation is a severe pathology that can be underdiagnosed in pediatric patients. We present 1 case of a patient diagnosed with aortic coarctation in the emergency department, referred by his treating physician when detecting high blood pressure figures. This study focuses on the diagnostic approach and Doppler ultrasound findings.

Introduction

Coarctation of the aorta refers to a narrowing of the aortic artery that obstructs to flow distal to the origin of the left subclavian artery, at the origin of the arteriosus ligament [1]. The vascular malformation responsible for coarctation is a defect in the middle layer of the vessel, leading to hypertrophy of the vessel that bulges inward and results in a concentric narrowing of the wall, which may extend throughout the circumference of the aorta. Patients with coarctation of the aorta are at risk for hypertension, aortic complications, and abnormal left ventricular function.

Aortic coarctation is a relatively common anomaly in pediatric patients, rarely seen in adults, it is the eighth cardiac malformation in order of frequency. It accounts for approximately 5%-8% of congenital heart malformations. The prevalence is estimated at 3-4 per 10,000 live births. In terms of incidence, it is higher in men with a ratio of 2:1. The prognosis of coarctation of the aorta without treatment is poor. A total of 75%-80% of untreated patients die from an aortic dissection, heart failure, or intracranial hemorrhage at a mean age of 35 years [2].

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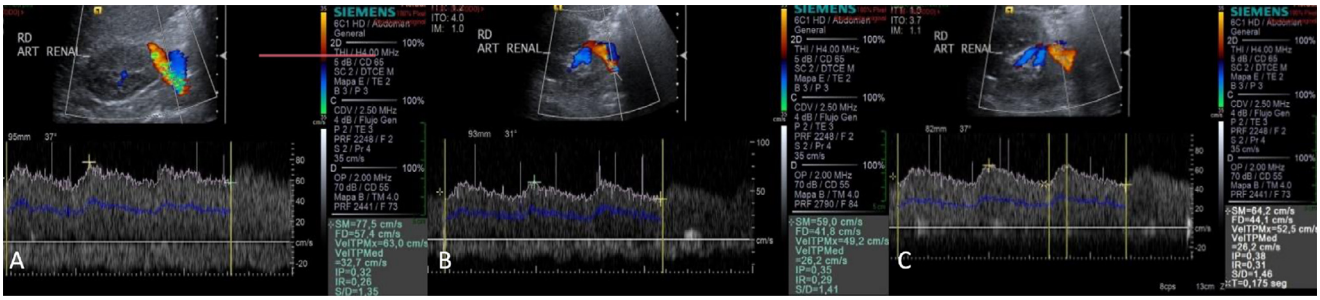

Fig. 1 – *Doppler ultrasound in spectral mode*. Where the right renal artery is assessed in the proximal (A), middle (B), and distal (C) thirds. An increase in the systolic acceleration time and loss of the systolic peak with convex morphology is observed, data concerning Tardus Parvus.

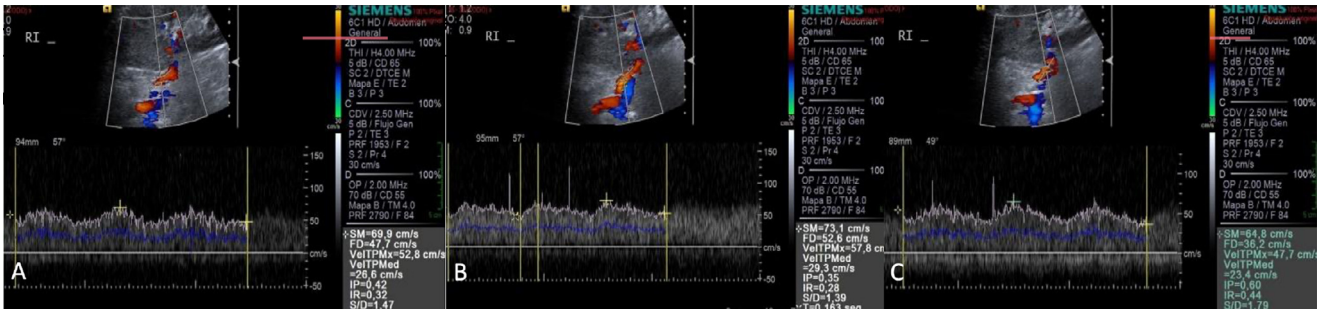

Fig. 2 – *Doppler ultrasound in spectral mode*. Where the left renal artery is assessed in the proximal (A), middle (B), and distal (C) thirds. An increase in the systolic acceleration time and loss of the systolic peak with convex morphology is observed, data concerning Tardus Parvus.

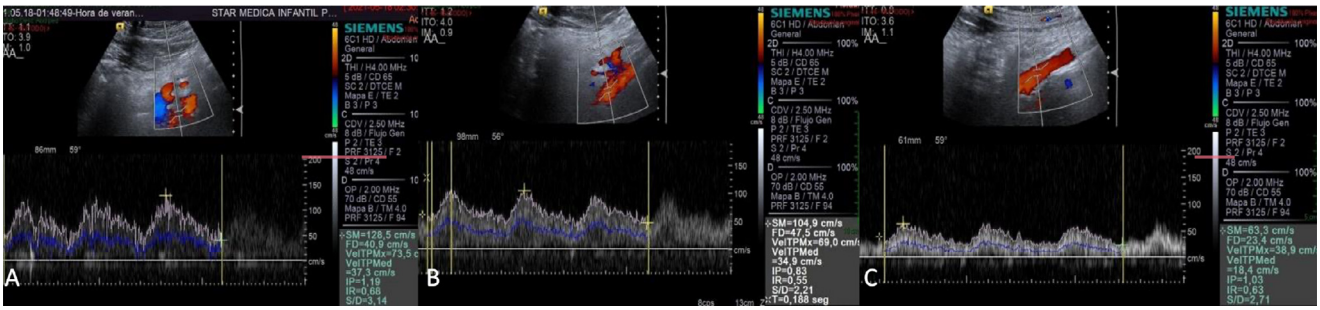

Fig. 3 – *Doppler ultrasound in spectral mode*. Where the proximal (A), middle (B), and distal (C) abdominal aortic artery are assessed. An increase in the systolic acceleration time and loss of the systolic peak with convex morphology is observed, data concerning Tardus Parvus, as well as loss of the triphasic spectrum and decrease in resistance indices.

Case report

A 14-year-old male patient was admitted to the emergency department with an increase in blood pressure of 190/100, asymptomatic. Renal Doppler ultrasound is indicated due to suspicion of arterial hypertension of renal origin.

Doppler ultrasound is performed with the assessment of renal and aortic flows, determining tardus parvus in all the assessed trajectories (Figs. 1-3), generalized decrease in resistance indices, and loss of triphasic morphology of the abdominal aorta, CT angiography with protocol is suggested for the thoracic aorta.

CT angiography was performed with a protocol for the thoracic aorta (Fig. 4), diagnosing aortic coarctation.

He was taken to the hemodynamics room where an aortic stent was placed (Fig. 5), he went to intensive care for 2 days with satisfactory evolution and was later admitted to the

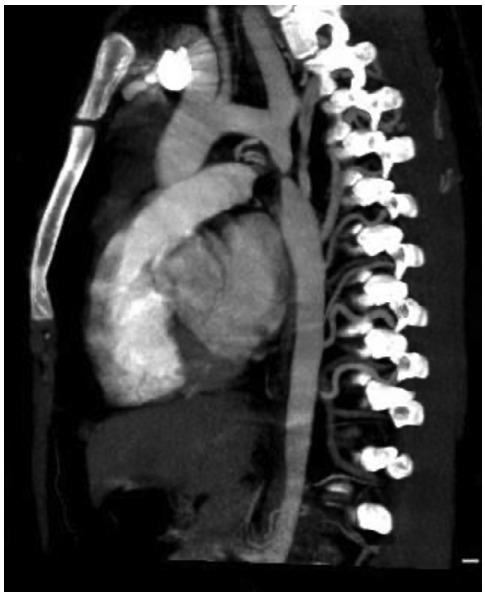

Fig. 4 – *Chest CT angiography with sagittal reconstruction*. Critical (punctate) coarctation of the aorta with prominent collateral circulation is observed, the site of coarctation 26 mm from the left subclavian artery. Dilation of the vertebral collaterals, mammary and intercostal arteries.

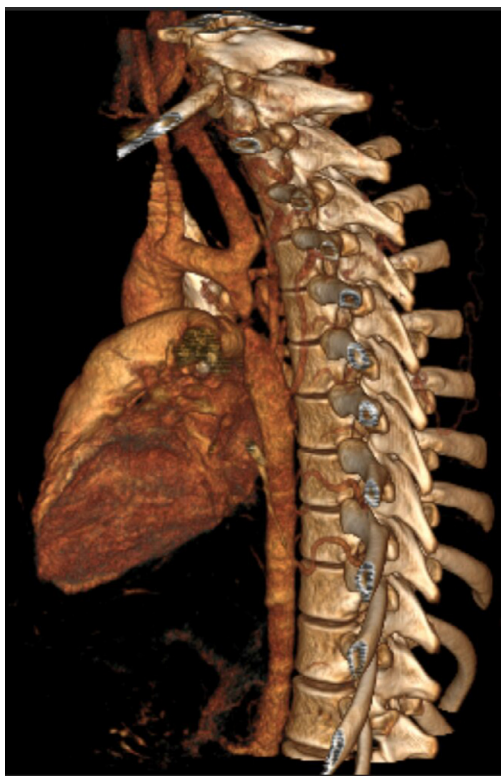

Fig. 5 – 3D reconstruction of the aorta.

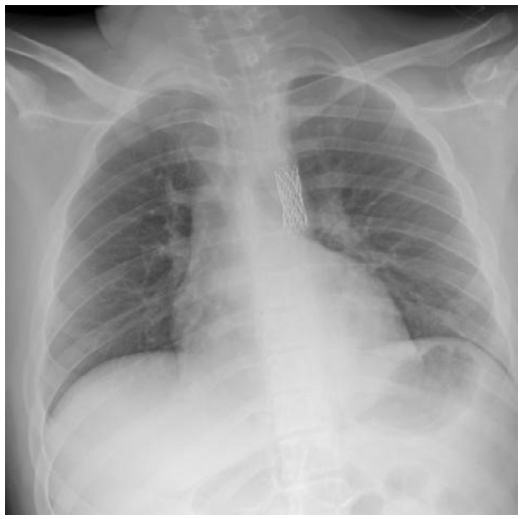

Fig. 6 – *Portable chest x-ray*. The presence of a projected aortic stent is identified in the topography of the descending segment.

floor, with blood pressure management within normal limits. A chest X-ray was performed showing the aortic stent (Fig. 6)

Discussion

Patients may generally be asymptomatic, although they may present with high blood pressure, headache, epistaxis, muscle spasms in the lower limbs, claudication when exercising the lower limbs, cold feet, and neurological changes. Women are at increased risk of aortic dissection during pregnancy.

Upon inspection, the arterial beat can be seen in the suprasternal fossa, upper extremities more developed than the lower ones, collateral circulation in the thorax, dilation of vessels that can be palpated in the intercostal spaces, armpits, or interscapular region [3].

The pathognomonic clinical manifestation is the discrepancy of pulses and systolic blood pressure between the upper and lower limbs. Pulses are diminished below the coarctation, systolic blood pressure is increased in the upper extremities, and a pressure gradient between upper and lower extremities is observed, generally greater than 20 mm Hg. A systolic ejection murmur can be heard on auscultation at the left upper sternal border and base with radiation to the left interscapular area.

The diagnosis is made both by clinical evaluation and cabinets. The electrocardiogram in neonates and infants with moderate coarctation of the aorta may be normal; it may be abnormal if associated with heart defects. In older patients, it presents data of left ventricular hypertrophy. Regarding radiography in newborn patients, there may be an increase in the dimensions of the cardiac silhouette and data of pulmonary vascular congestion. In infants and school children, it may be normal, although it may denote a prominent aortic arch, and a "3″ shaped indentation proximal to the descending aorta may be observed in the region of stenosis. Irregular, scalloped

notches can be seen on the lower surface of the posterior ribs. This finding is unusual in children younger than 5 years and is seen more frequently in patients with a significant gradient across the long-standing coarctation [3].

Doppler echocardiography is the fundamental diagnostic method for the detection of coarctation of the aorta. We can show an acceleration of flow in the coarctation zone that allows evaluating the severity of the obstruction by employing the pressure difference between the aorta proximal and distal to the coarctation. Depending on the severity, diastolic prolongation of the flow wave in the abdominal aorta may appear. Doppler ultrasound of the abdominal aorta can show changes in systolic peaks, and delayed systolic acceleration can be seen in the renal arteries. To obtain anatomical information on the location and dimension of the coarctation, computerized axial tomography, magnetic resonance imaging, and arteriography are used to show collateral circulation.

Coarctation of the aorta can be resolved surgically or through interventional procedures, including subclavian artery patch aortoplasty, patch aortoplasty, coarctation bypass, combined 2-stage bicuspid valve surgery, among others. Surgical repair has approximately doubled the 30-year survival of patients with coarctation of the aorta, with 72%-98% of these individuals reaching adulthood [4,5].

Conclusions

Aortic coarctation is a relatively common anomaly in pediatric patients and the initial approach will generally be with chest x-ray and ultrasound, which is why it is essential to be familiar with the main imaging findings, emphasizing Doppler since it is a method that in hands experienced can give an accurate diagnosis.

Patient consent

I declare to have informed written consent of the patient's legal representative, for the submission and publication of the article.

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