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## Case Report

# *Arterial and Venous Tortuosity Syndrome: A Case Report*

**Reza Abbaszade[1], MD; Sara Khaheshi[1*], MD; Hassan Tatari[2], MD; Yaser Toloueitabar[2], MD**

## ABSTRACT

Arterial tortuosity syndrome (ATS) is a rare, autosomal, and recessive disorder. The genetic defect in this disease is caused by loss-of-function mutations in the *SLC2A10* gene, which encodes *facilitative glucose GLUT 10*. ATS is characterized by the widespread elongation and tortuosity of the aorta and the mid-sized arteries and focal stenosis in segments of the pulmonary arteries and/or the aorta combined with findings of a generalized connective tissue disorder. About 12% of all affected individuals are admitted to the neonatal intensive care unit because of primary presentation with infant respiratory distress syndrome. Most affected patients are identified in early childhood with cardiac murmurs or cyanosis. Here, we describe a 6-year-old boy with repeat hospitalizations due to respiratory symptoms and a history of unilateral hernioplasty. Physical examinations showed an increased range of motion in the joints and a decreased lower limb pulse, raising the suspicion of aortic coarctation. Frontal chest radiography, echocardiography, and computed tomography angiography demonstrated elongation and tortuosity in most of the patient's arteries and veins. ***(Iranian Heart Journal 2023; 24(4): 85-89)***

**KEYWORDS:** Pediatric, Vessel morphology, Heart, Arterial tortuosity syndrome (ATS), Connective tissue disorder

[1] Rajaie Cardiovascular Medical and Research Center, Iran University of Medical Sciences, Tehran, IR Iran.

*** Corresponding Author:** Sara Khaheshi, MD; Rajaie Cardiovascular Medical and Research Center, Iran University of Medical Sciences, Tehran, IR Iran.
**Email:** skhaheshi@gmail.com **Tel:** +989023452218

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Arterial tortuosity syndrome (ATS) is a very rare, autosomal, and recessive connective tissue disorder. ATS is characterized by blood vessel abnormalities, particularly abnormal twists and turns of the arteries that carry blood from the heart to the rest of the body. [1] Patients with this vessel abnormality have widespread elongation and tortuosity of the aorta and the mid-sized arteries and focal stenosis of segments of the pulmonary arteries and/or the aorta combined with findings of a generalized connective tissue disorder. [18] This syndrome may cause early mortality during infancy to limited manifestations in adulthood. [2] About 12% of all affected individuals are admitted to the neonatal intensive care unit because of primary presentation with infant respiratory distress syndrome. Most affected patients are identified in early childhood with cardiac murmurs or cyanosis. Subsequently, manifestations of a generalized connective tissue disorder are often observed. In general, the manifestations of connective tissue disorder include joint hypermobility/pain, cutis laxa, inguinal hernia, and diaphragmatic/sliding hernia. [3]

In ATS, cardiovascular involvement is the major source of morbidity and mortality due to the congenital widespread tortuosity of the large and mid-sized arteries, which plays a crucial role in increasing the risk of aneurysm formation at any age and dissection at the aortic root and throughout the arterial tree. [4] Hypertension and ventricular hypertrophy have been reported in individuals and may require aggressive management. [5]

**Case Presentation**

A 6-year-old boy, firstborn from relative parents, was born full-term via an uncomplicated vaginal delivery (birth weight = 3200 g). The patient required unilateral hernioplasty at 1 month for congenital inguinal hernia without any surgical complications. Until the age of 4 years, he was hospitalized several times due to tachypnea and non-purulent coughs diagnosed with pneumonia and respiratory tract sensitivity (treatment with antibiotics and sprays).

During the physical examination, the pulse of the lower limb was palpably weaker than that of the upper limb. Additionally, the range of motion of the joints was increased. The blood pressure of all 4 limbs was normal according to the patient's age, and a soft murmur was heard at the second intercostal space on the right side. Electrocardiography revealed an indeterminate axis, a pure R wave in the precordial $V_1$ derivation, and a decreased R wave amplitude in the precordial $V_6$ derivation.

Frontal chest radiography demonstrated elongation and tortuosity in the aortic arch and the proximal descending aorta and looping in the right pulmonary artery (Fig. 1). Echocardiography demonstrated mild mitral regurgitation, moderate right atrial and ventricular enlargement, mild to moderate tricuspid regurgitation (the peak pressure gradient = 45 mm Hg), and a patent foramen ovale (size = 3 mm) with a left-to-right shunt. In addition, the aortic arch was tortuous, and long segmental aortic coarctation was seen; however, the gradient was not determined. Based on the echocardiogram, a computed tomographic (CT) angiogram was requested. The CT angiography showed that the left-sided aortic arch had normal branches, the aortic arch was elongated (the arch size = 11.9 mm), and the ascending aorta was 17.5 mm in length. A CT scan demonstrated diffuse significant vascular tortuosity in the pulmonary artery, compatible with vascular tortuosity syndrome. The inferior vena cava and intrahepatic veins were also involved (Fig. 2).

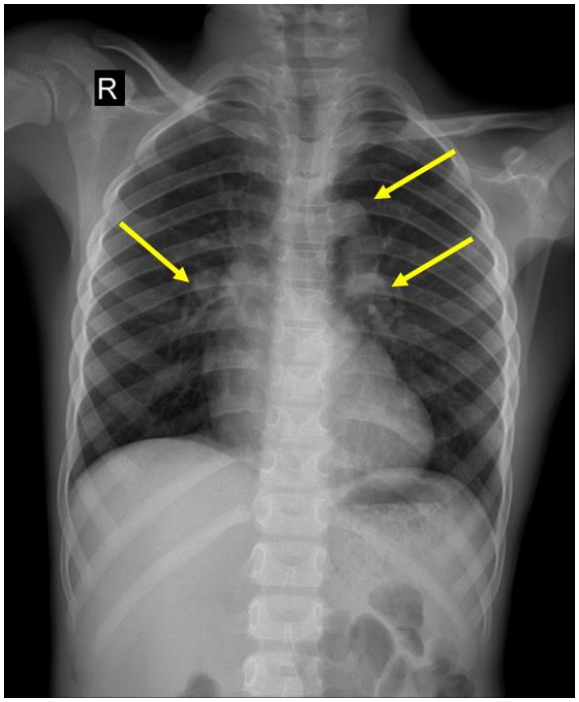


**Figure 1:** The patient's frontal chest radiograph shows elongation and tortuosity in the aortic arch and the proximal descending aorta and looping in the right pulmonary artery.

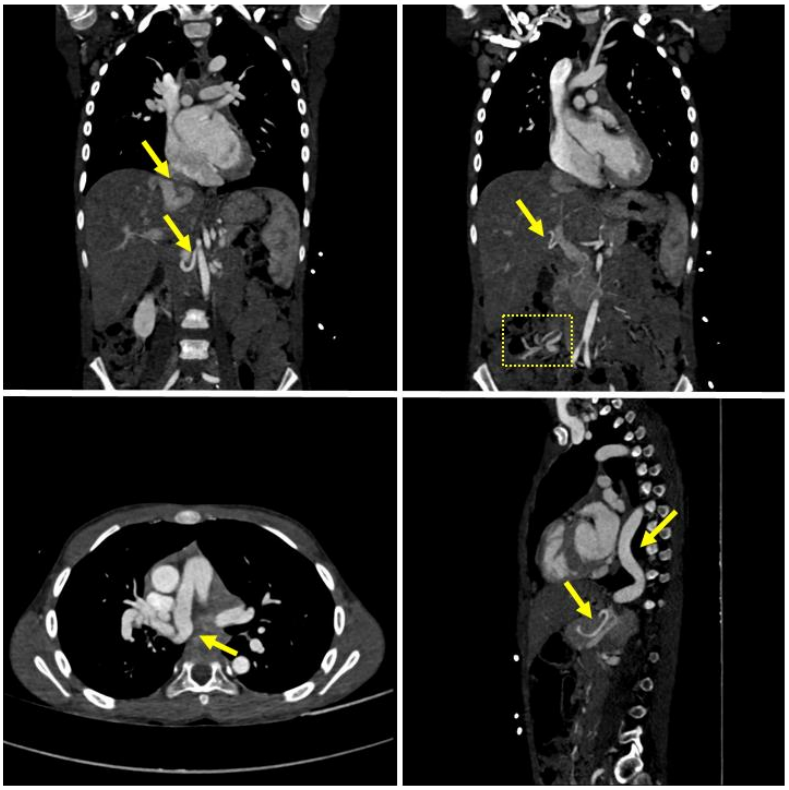

**Figure 2:** The patient's computed tomography scan shows elongation and tortuosity in the aortic, visceral, and hepatic vessels.

## DISCUSSION

While ATS typically appears during the early years of life, depending on complications in infancy and the involvement of several systems affected by this recessively inherited disorder, prenatal and antenatal cases of ATS have also been reported. [15,16]

ATS can occur alongside other connective tissue disorders, such as Marfan syndrome, even with nonspecific symptoms. [19] In this regard, genetic studies have yet to be performed. Nonetheless, the findings of CT scan, echocardiography, and physical examinations, in addition to connective tissue disorders such as hernia, joint hypermobility, and arterial tortuosity syndrome, can constitute reasonable indications for ATS disorder rather than Marfan syndrome. The significant issue regarding our patient was that besides the involvement of the aorta and the pulmonary arteries, the hepatic and renal arteries were also affected. Additionally, the veins were tortuous. Venous tortuosity may affect blood flow and venous wall remodeling, causing sluggish blood flow and thrombosis. [10,11] To prevent clot formation and embolization in our patient, we started antiplatelet therapy with aspirin. In another reported case, persistent pulmonary hypertension association with venous tortuosity was seen. [12] Some cases of ATS presenting with epilepsy or migraine headaches have also been reported, indicating that this group of patients might need meticulous cerebral vascular evaluations. [13]

Many syndromes have clinical similarities to ATS and should be differentiated from Marfan syndrome. Research shows that tortuosity in the vertebral arteries and the aorta is increased in Marfan syndrome compared with the level of tortuosity correlated with the severity of aortic involvement. [17] Our patient had no Marfanoid features but exhibited joint hypermobility and vascular changes often affecting the aortic root in the form of dilation or aneurysm formation. [14]

A coordinated approach by a team of specialists, including clinical geneticists, orthopedists, cardiologists, neurologists, cardiothoracic surgeons, and ophthalmologists, is beneficial to individuals with ATS. With regard to our patient, we believe that meticulous teamwork, follow-up, and physical examinations would have expedited the diagnosis. The follow-up of this group of patients should include serial imaging (eg, echocardiography) to delineate any changes in vessel morphology and indicate the progression/regression of expression of his syndrome.

**Conflict of Interest:** The authors declare no conflicts of interest.

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