is very rare and therefore coronary angiography is not a first-choice examination, although "nonatherosclerotic" coronary diseases should be considered. Second, in most of the reported cases and/or clinical series in childhood,[3] the most frequent clinical presentations are heart failure or cardiogenic shock, rather than chest pain. Finally, in the vast majority of cases, there is full spontaneous recovery of cardiac function, prognosis is better, and, unlike the situation in adults, there are no sex-related differences. Indeed, in older ages, the pattern of complications differs greatly between men and women and the overall prognosis seems to be more severe in men, with worse hemodynamic deterioration and a higher rate of in-hospital mortality.[4,5]

In the last few decades, cardiac MRI has become more important in the diagnosis of TTC and plays an important role in the younger population. A large, prospective, multicenter study demonstrated that cardiac MRI performed at the initial clinical presentation provided significant functional and anatomical information for the diagnosis of TTC.[6] Indeed, our patient, considering her young age and the low risk of coronary artery disease, did not undergo coronary angiography and underwent cardiac MRI, which showed no gadolinium late-enhancement, as is usually observed in TTC.

In conclusion, our case highlights the possible relationship between asthma and TTC. To the best of our knowledge, this is the first reported case of TTC in a young girl following an acute asthma attack during orthopedic surgery and is one of the few reported pediatric patients with TTC who underwent cardiac MRI.

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Aortic root surgery after arterial switch operation

Cirugía de raíz aórtica tras switch *arterial*

To the Editor,

Although progressive dilation of the neoaortic root[1] is less common than complications involving the neopulmonary root following arterial switch operation (ASO) to repair transposition of the great arteries in the neonatal period, it, together with neoaortic valve regurgitation, is a serious complication. Because the pulmonary branches are located in front of the ascending aorta after ASO (Lecompte maneuver, figure 1A-C), it is difficult to access the aortic root, unlike the situation when there is a normal spatial relationship between the aorta and the pulmonary artery. We present a small series of patients who underwent aortic root surgery for neoaortic valve regurgitation and/or dilation of the ascending aorta after ASO and describe arterial cannulation, aortic root access, and valve-sparing techniques.

Six patients aged between 6 months and 21 years (median, 12 years) and weighing between 6 and 64 kg (median, 43 kg) with a history of ASO underwent surgery for neoaortic valve regurgitation (5 patients) and dilation of the ascending aorta (6 patients, all children) (table 1). Just 1 patient—the youngest in the series—had known risk factors for neoaortic root dilation.[2,3] The patient was a 6-month-old infant who had undergone palliative ASO (previous aortic-pulmonary root size discrepancy and ventricular septal defect). The operation was the first reintervention for 4 patients, the second reintervention for 1 (previous neopulmonary valve replacement), and the third for another (2 previous neoaortic valve replacements). Chest computed tomography (figure 1) was performed to determine the spatial relationship between the great vessels (including the origin and path of the coronary arteries) and to check for adhesions to the sternum. A Doppler femoral ultrasound was also performed to assess the diameter and patency of the artery and vein.

Cannulation was femoral in 2 patients and central in 4. The pulmonary artery bifurcation (Lecompte maneuver) was mobilized in 5 patients using an inverse approach to the neonatal switch maneuver consisting of dissecting the bifurcation and moving both pulmonary arteries anterior to the ascending aorta. In the other patient, it was only necessary to separate and mobilize the right pulmonary artery to access the neoaortic root.

Neoaortic valve replacement was required in 3 patients as the valve was considered to be irreparable at the time of the intervention. One of the patients received a single prosthetic valve while the other 2 underwent valved conduit placement and reimplantation of the coronary arteries (just the right artery in 1 case) using the Bentall technique. Replacement of the ascending aorta with the valve-sparing David procedure (figure 1) and reimplantation of the coronary arteries with the Yacoub technique and Schäfers aortic annuloplasty were each performed in 1 patient. In the second case, the circumflex artery arose in the right coronary artery and followed a retroaortic path (type D, posterior loop) and was therefore very close to the area of the annuloplasty. Associated procedures included replacement of the neopulmonary valve with a valved conduit in 1 patient (third intervention) and replacement of both pulmonary arteries, both fragile, with a corrugated hilum-to-hilum conduit (fourth intervention) in another.

The case of the youngest patient in this series, aged 6 months and weighing 6 kg, deserves special mention. The infant developed progressive neoaortic valve regurgitation due to neoaortic root dilation after an initially successful palliative ASO in the neonatal period to treat single-ventricle heart disease, aortic

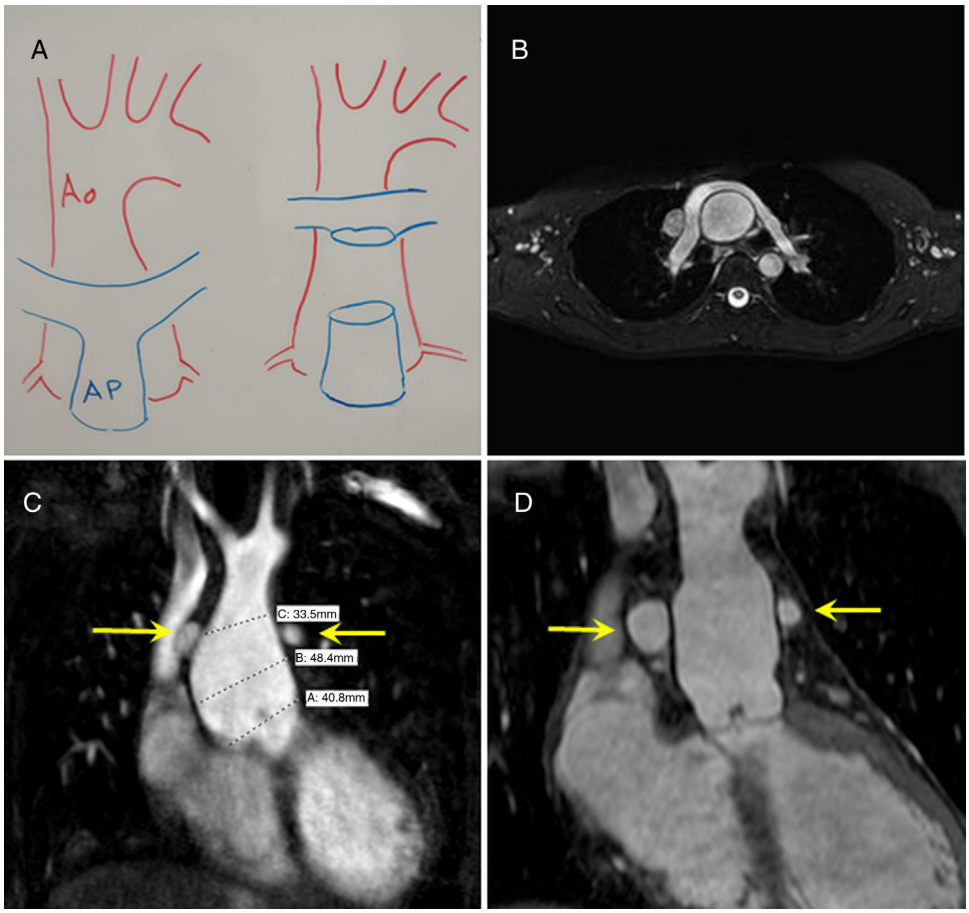

Figure 1. A, Diagram showing the pulmonary artery anterior to the aorta. B, Close-up preoperative axial section showing the Lecompte maneuver (pulmonary branches anterior to the aorta). C, Preoperative frontal view showing the pulmonary branches (arrows) and dilation of the aortic root. D, Postoperative frontal view showing the David procedure (patient #1).

Table 1
Patients' clinical characteristics

Patient	Previous interventions	Age	Weight, kg	Maximum diameter	Cannulation	Lecompte maneuver	Surgery	Comments	Follow-up
1	1	16 y	50	49 mm AR	Central	Trunk	David procedure		5 y Trivial AR
2	1	12 y	28	25 mm AR	Femoral	Right branch	Prosthetic aortic valve		5 y Prosthetic valve
3	1	10 y	43	36 mm AR	Central	Trunk	Bentall procedure	Single coronary artery (right)	1 y Prosthetic valve
4	Palliative switch	6 mo	6	20 mm No AR	Central	Trunk	Neovalve		6 mo Trivial AR
5	2	21 y	64	38 mm AR	Femoral	Trunk	Yacoub technique + pulmonary valve	Posterior loop (circumflex artery)	2 mo Trivial AR
6	3	12 y	55	41 mm AR	Central	Trunk	Bentall procedure + conduit	Pulmonary branch conduit	2 meses Prosthetic valve

AR, neoaortic valve regurgitation.

coarctation, subaortic stenosis, and transposition of the vessels. Although the valve appeared to be normal, its small size made it impossible to replace the ascending aorta and it was therefore decided to replace it with a heterologous pericardial "cylinder".[4] Trivial valve regurgitation was observed in 3 patients (David, Yacoub, and cylinder techniques) in successive follow-up visits; the prosthetic valves functioned normally in the other patients (table 1).

Progressive dilation of the neoaortic root (translocated in ASO) and associated valve regurgitation are serious complications.[1–3] Neoaortic complications requiring surgery can be expected after ASO and they present later than neopulmonary complications. Arterial cannulation and access to the neoaortic root, however, are challenging due to the anatomy of the vessels following the Lecompte maneuver. With successive interventions, the pulmonary arteries can become fragile and may be found to require repair

or replacement during surgery. Preoperative imaging tests (computed tomography and Doppler ultrasound of the femoral vessels) can also show the origin and path of the coronary arteries, providing essential information for remodeling or reimplantation techniques and situations in which one of the coronary arteries passes behind the root (patient #5 in our series). We favor valve-sparing techniques[5,6] (David procedure [figure 1D] or Yacoub technique) in patients with normal-appearing valves and reserve replacement (prosthetic valves, Bentall procedure) for patients with dysplastic valves. Creative solutions are possible in cases of early-onset valve regurgitation after ASO.

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Stress echocardiography in nonhospital centers: need to reorganize imaging units according to guidelines on chronic coronary syndromes

Ecocardiografía de estrés extrahospitalaria: necesidad de adecuar las unidades de imagen cardiaca a la guía europea de síndrome coronario crónico

To the Editor,

Stress echocardiography is used for the diagnosis and prognostic assessment of patients with known or suspected coronary artery disease. In Spain, stress echocardiography is generally carried out in the hospital setting. The latest European Society of Cardiology (ESC) guidelines on chronic coronary syndromes recommend that patients with a pretest probability > 15% should initially be tested by noninvasive functional imaging for myocardial ischemia or coronary computed tomography angiography.[1] The ESC guidelines indicate that the choice of the initial noninvasive test used for diagnosis and to establish prognosis should be based on availability and local expertise. The new recommendation is principally spurred by the low positive and negative predictive value of conventional exercise electrocardiography compared with imaging techniques.[2]

At our center, with a catchment population of 530 000 people, implementation of the new recommendation has led to an increase in the number of stress echocardiograms and a correspondingly sharp reduction in the number of conventional exercise electrocardiography tests. This change has required an operational reorganization of the cardiac imaging unit.

In response to the growing demand for stress echocardiography, a dedicated program has been established at a specialized nonhospital health center that previously carried out conventional treadmill exercise electrocardiography tests. The nonhospital center is located 5 km from the referral hospital, and the estimated ambulance transfer time is normally 10 to 15 minutes.

Here, we report the analysis of the first 200 patients referred to the nonhospital center for stress echocardiography to diagnose coronary artery disease or assess its prognosis.

Studies were performed by a nurse and a cardiologist with expertise in cardiac imaging, and practitioners were trained in stress echocardiography and advanced life support. The stress echocardiography service is equipped with a defibrillator, oxygen equipment, an aspirator, and drugs and instruments required for advanced life support, including all material needed for orotracheal intubation.

Table 1
Baseline characteristics

Patients, N	200
Men	126 (63)
Age, y	63.9 ± 10.7
HT	94 (47)
DM	75 (37.5)
DLP	81 (40.5)
Smokers	64 (32)
Obesity	85 (42.5)
CKD	22 (11)
Previous CAD	29 (14.5)
Baseline LVEF	61.8 ± 5.9
Pretest probability	23.63 ± 14.31
Pretest probability < 5%	10 (5)
Pretest probability 5-15%	63 (31.5)
Pretest probability > 15%	127 (63.5)

CAD, coronary artery disease; CKD, chronic kidney disease; DLP, dyslipidemia; DM, diabetes mellitus; HT, hypertension; LVEF, left ventricular ejection fraction.
Unless indicated otherwise, data are expressed as no. (%) or mean ± standard deviation.