Transcatheter intervention for double-steal syndrome from isolation of the subclavian artery associated with patent ductus arteriosus

Isolation of the subclavian artery is a rare aortic arch anomaly, in which the left subclavian artery (LSCA) does not originate from the aortic arch and is connected to the pulmonary artery, through the arterial duct. A five-year-old girl, with left-arm claudication symptoms and a diagnosis of patent ductus arteriosus (PDA), was referred for interventional PDA closure. Blood pressure measurement showed that her right-arm systolic pressure was 30 mm Hg higher than that of her left arm. An unusual PDA was detected on echocardiography. During catheter angiography, a right-sided aortic arch was observed, and injection into the right vertebral artery (RVA) demonstrated a retrograde flow, down the left vertebral artery (LVA) to the LSCA, PDA, and pulmonary artery (Videos 1 and 2). The patient had a pathology resulting in double-steal syndrome, from the LVA to the left arm and the pulmonary artery. PDA closure was planned to eliminate the pulmonary artery steal. However, passing the PDA through the antegrade route was not possible. The PDA was closed with an Amplatzer duct occluder type II device, via the retrograde route (Videos 3–7). After 1 month, pain in the left arm was decreased. When coarctation is not detected in a patient with PDA, an isolated LSCA should be considered, particularly when the left upper extremity blood pressure is low. Due to subclavian steal syndrome, the PDA closure using the transcatheter intervention and disconnecting the subclavian artery from the pulmonary artery represents a safe therapeutic alternative to surgery in patients without critical extremity ischemia.

Informed consent: Informed consent was obtained from the patient’s parents.

Video 1. Catheter angiography, demonstrating a right-sided aortic arch. The left subclavian artery was opacified later.
Video 2. Catheter angiography, showing an injection into the right vertebral artery, which fills the left vertebral artery via a connection between the arteries, before forming the basilar artery. The left vertebral artery is filling both the left subclavian artery and the patent ductus arteriosus.
Video 3. Catheter angiography, demonstrating the right vertebral artery (RVA), which was reached retrograde from the arterial pathway. A 0.014” soft coronary guidewire was pushed forward from the RVA into the left vertebral artery, via the connection between the arteries.
Video 4. After passing the coronary guidewire in a retrograde manner, the wire was snared via an antegrade route in the pulmonary artery, and the arteriovenous loop was formed.

Video 5. Catheter angiography image, showing an injection into the subclavian artery with a 5F JR4 catheter sent over the created arteriovenous loop.
Video 6. Catheter angiography shows the antegrade injection into the pulmonary artery, which demonstrated the patent ductus arteriosus closure using Amplatzer duct occluder type II. The steal was decreased to the pulmonary artery.
Video 7. Catheter angiography, demonstrating the retrograde injection into the right vertebral artery, which fills the left vertebral artery and the left subclavian artery. The flow to the left subclavian artery increased.