Case Reports

Congestive Heart Failure in Neonates Due to Intracranial Arteriovenous Malformation: Endovascular Treatment

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SUMMARY. Newborns with intracranial arteriovenous malformations and congestive heart failure have an extremely poor prognosis. This report describes two infants with intracranial arteriovenous malformations and severe congestive heart failure successfully treated in the newborn period with endovascular embolization. Both infants had immediate improvement in symptoms and both had second embolization procedures performed. Ventriculoperitoneal shunting was necessary in both children because of progressive hydrocephalus. At follow-up of more than 4 years, neither patient has any sign of congestive heart failure, and one is developmentally normal.

KEY WORDS: Congestive heart failure — Intracranial arteriovenous malformations — Neonates

Intracranial arteriovenous malformations causing congestive heart failure in the neonatal period are rare, and survival of these infants is quite poor [7]. Johnston et al. [9], in a comprehensive review of vein of Galen malformations, reported a mortality of 91% for patients presenting in the newborn period with congestive heart failure secondary to a vein of Galen aneurysm. Intracranial arteriovenous malformations of the epidural vessels are even more rare with few reported cases [1].

In this report we describe the clinical presentation, diagnostic studies, management, and follow-up of two neonates with cranial arteriovenous malformations who presented with congestive heart failure in the first week of life.

Case Report

Case 1

KT was born after an uncomplicated term pregnancy. She was noted on the second day of postnatal life to have tachypnea and a
springs were intertwined into this matrix. The heart rate immediately slowed from 140 to 115/min. The embolization was terminated.

Following the procedure the patient improved remarkably and was feeding well. She was discharged from the hospital 7 days postembolization. At discharge she had a systolic murmur and a cranial murmur, but because she was doing well, no further intervention was performed. At 2 months of age her weight increased from 3.7–4.7 kg and she was eating well. At 3 months of age the patient presented again in congestive heart failure with poor feeding and tachypnea. The murmur was louder and a gallop was present on auscultation. She was readmitted and cineangiography by left ventricular contrast injection showed an arteriovenous malformation with a dilated vein of Galen. Through the previously placed craniectomy a 5F catheter was placed near the anterior wall of the vein of Galen aneurysm and into the previously established wire matrix ten 8-mm thrombogenic coils were placed (Fig. 1B). The venous blood pressure in the anterior portion of the vein of Galen rose from 17–26 cm/H₂O.

Since the second embolization procedure the patient has done extremely well. Because of progressive hydrocephalus, a ventriculoperitoneal shunt was placed at 21 months of age. Currently at 4½ years of age she is developing normally, and takes no medications. Denver developmental screening shows function at the 5-year-old level in all four phases of the testing.

Case 2

AB was born after an uncomplicated term pregnancy and was noted to have tachypnea and a loud systolic murmur shortly after birth. Cardiology consultation on day 3 of postnatal life showed a hyperactive precordium, normal S₁, loud S₂, and a grade II/VI ejection murmur along the upper left sternal border. A cranial murmur was also noted on initial exam. The chest radiograph showed an enlarged cardiothoracic index and increased pulmonary vascular markings. Echocardiography showed normal ventricular function and normal intracardiac anatomy.

The patient underwent cardiac catheterization with a presumptive diagnosis of an intracranial arteriovenous malformation. A left cardiac ventriculogram was performed with the cameras focused on the cranium. A bilateral dural arteriovenous malformation was visualized. This malformation was supplied by multiple branches of the external carotid arteries and communicated directly with a large superior sagittal sinus (Fig. 2A). Because of significant congestive heart failure the patient underwent embolization. Using the right femoral artery a 3F catheter was placed within the right external carotid artery and the tip positioned in the origin of the right middle meningeal artery. This artery was embolized with polyvinyl alcohol mixed with avitine. The same mixture was used to embolize the right occipital artery, left middle meningeal artery, and left retroauricular artery (Fig. 2D and E). After the embolization the dural arteriovenous malformation became significantly smaller supplied only by enlarged tentorial branches of both internal carotid arteries (Fig. 2B).

Following the embolization the patient required diuretics and increased caloric feedings but she gained weight well. At 7 months of age a ventriculoperitoneal shunt was placed because of progressive hydrocephalus. Developmentally, the patient progressed slowly with focal motor seizures and a continual cranial murmur. At 14 months both external carotid arteries were reembolized. Following the second embolization she was more active, but at 4 years of age has severe developmental delay, and requires anticonvulsants.