TECHNICAL CASE REPORT

ENDOVASCULAR MANAGEMENT OF VENTRICULAR CATHETER-INDUCED ANTERIOR CEREBRAL ARTERY FALSE ANEURYSM: TECHNICAL CASE REPORT

OBJECTIVE AND IMPORTANCE: We describe the case of a 3.3-kg infant who developed an anterior cerebral artery pseudoaneurysm after ventricular catheter placement. The lesion was treated with endovascular vessel sacrifice.

CLINICAL PRESENTATION: A 3.3-kg infant with a myelomeningocele underwent repair and ventricular catheter insertion for hydrocephalus. During shunt insertion, intracerebral arterial bleeding was encountered. Subsequent arteriography demonstrated an anterior cerebral artery pseudoaneurysm.

TECHNIQUE: Via a transfemoral artery approach, the aneurysm and feeding vessel were catheterized with a microcatheter and wire. The aneurysm and vessel were then sacrificed with detachable platinum coils.

CONCLUSION: Arterial injury is uncommon after ventricular catheter placement. When it does occur, however, an unstable pseudoaneurysm may form. Endovascular techniques can be used to remedy this problem, thus at times obviating the need for a standard craniotomy, which can be particularly difficult in a newborn.

KEY WORDS: Endovascular, Pseudoaneurysm, Ventricular catheter

Intracerebral hemorrhage is a known complication of ventricular puncture and ventriculoperitoneal shunting. Bleeding may occur in the subdural, epidural, ventricular, parenchymal, or subarachnoid space. Management may be aggressive or expectant depending on location, cause, and symptoms. We report the case of an infant born with a sacral myelomeningocele who developed subarachnoid hemorrhage immediately after coronal ventriculoperitoneal shunt placement. Cause and management are reviewed.

CASE REPORT

A 3.3-kg boy was born to a gravida 2 para 2 mother after 38 weeks of gestation. Apgar scores were 8 and 9. The child was noted at birth to have a myelomeningocele with a 1 × 5-cm sacral placode. A neurological examination demonstrated absent planter flexion bilaterally. The head circumference was 34 cm. The meningocele was repaired within 24 hours of delivery. Because of hydrocephalus and surgical wound cerebrospinal fluid leakage, a right coronal ventriculoperitoneal shunt was placed 7 days after birth. On passing the ventricular catheter into the right lateral ventricle, brisk red bleeding was encountered. The catheter was irrigated until the fluid was pink stained and was left as an external ventricular drain. The child awoke from anesthesia with normal examination results yet soon displayed apnea, seizure activity, and posturing movements.

A computed tomographic arteriogram obtained the same day was of poor quality and failed to demonstrate any vascular abnormalities. A cerebral computed tomographic scan revealed intracranial hemorrhage (Fig. 1), and a subsequent computed tomographic scan demonstrated an anterior distribution anterior cerebral artery infarct. A cerebral arteriogram obtained 3 weeks later revealed a 2-mm aneurysm involving the left A3 division. The lesion was not at a branch point and seemed to have an artery entering and exiting from the base.

After we concluded that the lesion was traumatic in nature and represented a false aneurysm or pseudoaneurysm, the decision was...
made to eliminate it from the circulation using endovascular techniques. The intubated patient had a 5-French arterial sheath placed into his right common femoral artery using a micropuncture set and the Seldinger technique. A 5-French Berenstein catheter was then advanced into the left internal carotid artery. By use of a road-mapping technique, a Rapid Transit 0.018-in microcatheter (Cordis Corp., Miami Lakes, FL) was advanced into the A3 segment of the left anterior cerebral artery over a Gold Tip 0.016-inch guidewire (Boston Scientific/Terumo, Natick, MA). The catheter tip was placed into the aneurysm, and the lesion was partially filled with a 2-mm \( \times \) 4-cm Ultrasoft Guglielmi detachable coil (Boston Scientific/Target, Fremont, CA). The more proximal vessel was then sacrificed using three 2-mm \( \times \) 3-cm Ultrasoft Guglielmi detachable coils. A final angiographic image demonstrated no aneurysm opacification (Figs. 2–4).

After surgery, the patient remained stable without any change in the results of the neurological examination. Bacterial meningitis was treated with appropriate antibiotics. One year later, the child has normal neurological examination results. Repeat angiography has not been performed.

**DISCUSSION**

Intracerebral hemorrhage (intraparenchymal, intraventricular, or subarachnoid) secondary to an external ventricular drain or ventriculoperitoneal shunting is rare. Several articles have been published relating such events as being secondary to primary catheter placement or proximal catheter revision (1, 2, 4–9). Shirane et al. (8) reported one case of subarachnoid hemorrhage in a 4-month-old girl secondary to left internal carotid artery and anterior choroidal artery pseudoaneurysm formation as a consequence of proximal catheter-induced trauma. The child was treated with clip reconstruction and made an uneventful recovery.

We have previously reported two cases of basilar artery injuries after endoscopic third ventriculostomy, one of which was managed with open surgical clipping and the other with
endovascular occlusion (3). Clinical outcomes in both cases were excellent. Although such vascular injuries are rare after endoscopic ventriculostomy, they are virtually unheard of after ventricular catheter cannulation. A review of 1860 pediatric ventriculoperitoneal shunts placed at our institution during the past 10 years provided no incidence of pseudoaneurysm or false aneurysm production (0.05% risk, including the current case), and a search of the MEDLINE literature provided only one published case and one unpublished case (referred to in the article) (8). With the advent of endovascular therapy, such vascular lesions can now be treated in a minimally invasive manner. Although reconstruction sounds safer and less radical than vessel sacrifice, one must keep in mind that such lesions are likely to be false aneurysms with blood contained only by the fibrin clot and brain parenchyma. The risk of rehemorrhage of such lesions is high, and complete exclusion of the lesion from the native circulation is necessary to avoid delayed regrowth and rupture. When these lesions are present in young children with ample capacity to recover from ischemic tissue loss or are located in territories with robust collateral blood supply, sacrifice may carry no long-term consequence to the individual’s neurological function.

REFERENCES


COMMENTS

Horowitz et al. present a succinct case report of a ventriculostomy-induced anterior cerebral artery false aneurysm in a newborn managed with endovascular sacrifice of the parent vessel. This report is important for all practicing neurosurgeons and serves as an acute reminder that no intracranial procedure, no matter how seemingly straightforward, is without serious risk. We agree with the authors that, compared with surgical treatment, the endovascular option was a much better approach for this patient.

Sacrifice of the parent vessel is not always required. Pseudoaneurysms, by definition, lack a true vascular wall and would seem more prone to intraprocedural hemorrhage if only a lesion obliteration was the goal: pseudoaneurysms with wonderful results. Parent artery sacrifice does not necessarily have to be performed as part of the endovascular management of an intracranial aneurysm. Occasionally, self-expanding stents may also be used in combination with coils to occlude the pseudoaneurysm while preserving the patency of the parent artery.

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The authors describe a complication resulting from ventricular catheter placement in a 3.3 kg infant with hydrocephalus, of acute subarachnoid and intracerebral hemorrhage owing to perforation and pseudoaneurysm formation of the anterior cerebral artery. The lesion and parent vessel were managed with endovascular coil occlusion. The authors point out that, although vascular perforation is a rare complication of ventricular placement, endovascular techniques for definitive treatment are much less invasive than surgical craniotomy with clipping, particularly in the neonatal period. Endovascular therapy should be considered as an appropriate therapeutic alternative in all high-risk medical or surgical cases.

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The authors present the case of an infant who, after placement of a ventricular puncture, shunt developed a subarachnoid hemorrhage and was documented to have an anterior cerebral artery false aneurysm on angiography. The article is brief and concise and presents an interesting issue given both the capabilities of endovascular management in a newborn, but also with regard to traumatic aneurysm formation after ventricular catheterization. After endovascular management, the infant had no evidence of residual on follow-up angiography and remained neurologically stable. Although the presentation of traumatic aneurysms is not novel, the complication as reported is rare and defines the fact that placement of a ventricular catheter is not an entirely benign procedure. The same needs to be said for endoscopic third ventriculostomies, given the increase in the number of these procedures performed in younger children. The article also points out that, in the scenario of potential arterial compromise, angiography is indicated. Despite the paucity of reported interventional procedures on 3-week old infants, we found this an attractive alternative to craniotomy.

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