Endovascular Management of a Basilar Artery False Aneurysm Secondary to Endo... Report

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Abstract

OBJECTIVE AND IMPORTANCE: Third ventriculostomy for the management of noncommunicating hydrocephalus is a complication rate. One of the known complications is basilar artery injury.

CLINICAL PRESENTATION: We report a case of basilar artery injury, intraventricular hemorrhage, and false aneurysm ventricle floor fenestration.

INTERVENTION: The false aneurysm was managed with endovascular trapping by use of Guglielmi detachable coils.

CONCLUSION: Endovascular therapy can be used successfully to manage vascular injury after third ventriculostomy.

Endoscopic third ventriculostomy has become a viable alternative to shunting for the management of noncommunicating hydrocephalus. This procedure remains approximately 5%, with risks that include intraparenchymal bleeding and vascular injury with subsequent hemorrhage. In 1997, our institution reported the development of a basilar artery (BA) aneurysm after laser fenestration. This lesion, which ruptured, was managed successfully via a subtemporal craniotomy and aneurysm clipping. The patient subsequently underwent endovascular third ventricle floor fenestration by use of a Bugby wire in a 30-month-old boy. The injury resulted in a BA 1 endovascular embolization.

CASE REPORT
An 18-kg, 30-month-old boy with noncommunicating hydrocephalus and a Chiari I malformation underwent endoscopy (Karl Storz GmbH & Co., Tuttingen, Germany). A Bugby wire with low coagulating current was used to fenestrate the infundibular recess. As soon as the floor was fenestrated, brisk arterial bleeding came forth. The endoscope was withdrawn, and the ventricular catheter was left in place. The procedure was terminated. The patient awoke slowly. A computed tomographic scan obtained immediately revealed interpeduncular cistern and the lateral and third ventricles. The next day, a cerebral arteriogram demonstrated a 6- to 8-mm pseudoaneurysm below the level of the superior cerebellar arteries (SCAs) along the anterior basilar wall (Figs. 1 and 2). The patient had The right PComA was not fetal although the left one was.

FIGURE 1. Anteroposterior right vertebral artery arteriogram showing the BA pseudoaneurysm.
The next day, the patient was returned to the angiography suite. He was placed under general endotracheal anesthesia. Neurophysiological monitoring by use of electroencephalography, somatosensory evoked potentials, and brain stem auditory evoked potentials was used to insert a 6-French sheath. The right vertebral artery was selectively catheterized with a 4 Fr catheter (Cordis, Miami Lakes, FL) and the patient was heparinized with 1800 units of heparin. Activated coagulation time obtained 20 minutes during the next hour, and heparin was excluded from the flush bags. After diagnostic studies of the verteobasilar system (Cordis, Miami Lakes, FL) was advanced over a 0.014-inch Transend wire (Boston Scientific/Target, Natick, MA) to a post the SCAs (Fig. 3). The BA above the aneurysm, the aneurysm itself, and the BA just below the aneurysm were then embolized with detachable coils ranging in length from 2 to 6 cm. After the aneurysm was trapped and embolized, repeat angiography revealed filling of the right posterior cerebral, distal basilar, and bilateral SCAs (Figs. 3). Demonstration BA opacification to the level of the aneurysm base with filling of small mid-BA perforators.
Throughout the procedure, no changes in neurophysiological monitoring parameters were noted. Burst suppression administered aspirin, and heparin was discontinued but not reversed. Two days later, the patient underwent magnetic aneurysm obliteration and flow through the posterior cerebral arteries, distal BA, and proximal BA (Figs. 6 and 7). The midbrain without associated ischemic findings on diffusion studies (Figs. 8 and 9). The next day, the child was extubate.
hemiparesis, which improved during the ensuing days. Of interest, the hemiparesis did not correlate with the left midbrain hemorrhage. The patient underwent ventriculoperitoneal shunting 1 week later without incident and was discharged home. A 6-month follow-up MRI/magnetic resonance angiography.

FIGURE 6. Magnetic resonance angiogram, 2 days after embolization, showing posterior cerebral flow.
FIGURE 7. Magnetic resonance angiogram, 2 days after embolization, showing vertebral artery and proximal BA flow.

FIGURE 8. T2-weighted MRI scans showing signal change in the ventral midbrain.
DISCUSSION

Third ventriculostomy was first advocated by Walter Dandy. The advent of the endoscope rendered this minimally invasive technique less burdensome to patients. It is particularly useful in individuals with noncommunicating hydrocephalus (4, 5, 7-9). No surgical procedure, however, is risk free. Complications can include parenchymal injury, subdural hematoma, infection, failure, and subarachnoid and intraventricular hemorrhage. The presence of delayed aneurysm development and subarachnoid hemorrhage after endoscopic laser fenestration of the third ventricle has been managed successfully with craniotomy and aneurysm clipping 1 month after the initial procedure. Others have reported similar outcomes (7, 12, 13).

Anatomically, the BA apex lies within the upper interpeduncular cistern. In most individuals, the basilar tip lies at a bony prominence, it is positioned closer to the base of the third ventricle. Hayashi et al. (6) measured the distance between the third ventricle and the BA apex using MRI scans in 217 individuals. The mean distance in those without hydrocephalus was 10.5 ± 2.3 mm, and it was 12 ± 3.7 mm in those with hydrocephalus. There was no difference between the two groups in this article, the authors point out that preoperative sagittal MRI scans can provide useful information about the location of the third ventricle floor. In our patient, preoperative MRI scans revealed normal anatomy. Intraoperative Doppler ultrasound of the BA apex was performed to confirm the supratentorial location of the BA apex. Although reports are limited, these authors have found micro-Doppler ultrasonography clinically useful.

In the above-reported case, basilar trunk injury occurred despite the use of a blunt probe with low monopolar current that was positioned at least 14 mm above the posterior clinoid, thus the vessel apex was near the floor of the third ventricle. This injury was associated with aneurysm trapping along with direct aneurysm embolization caused by the presence of a left fetal PComA and a large right posterior cerebral artery and bilateral SCAs. The development of high-quality digital imaging with roadmapping capabilities has made it possible for endovascular surgeons to accurately deposit coils in a non-traumatic fashion. As the vessel course changes, the rupture site, SCA origins, and more caudal short and long pontine perforators, made selection difficult. We placed coils within the true aneurysm, we risked mechanical Hunterian ligation risked subsequent rupture from retrograde filling of the sac. It is our opinion that trapping provided.

Because of the child’s age and small femoral arteries, which possibly increased the risk of arterial injury during catheterization, MRI/magnetic resonance imaging. A study performed 48 hours after embolization revealed aneurysm obliteration and no evidence of ischemic changes on diffusion MRI scans suggests that parenchymal injury was minimal.

http://ovidsp.tx.ovid.com/sp-3.7.1b/ovidweb.cgi
CONCLUSION

BA injury is a rare but reported risk of endoscopic third ventriculostomy. The development of a false aneurysm mal fragile and lethal nature of these lesions. New endovascular technologies now make it possible to consider treating the:

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COMMENT

This is a single case report of a basilar artery (BA) perforation occurring as the result of and endoscopic third ventricle managed by use of endovascular coiling.

I am aware of at least one other similar case, which also was managed successfully with coiling. This represents a list of endovascular techniques, even in selected infants. The concern in these cases is the possibility of delayed recanalization, which is certain that the vessel remains occluded. This is probably the optimal method of treating this complication, when possible.

Various techniques have been used to perforate the floor of the third ventricle, including “hot” wires, “cold” wires, and the endoscope itself. Each of these carries risk of damage to the BA and its branches.

Leslie N. Sutton

Philadelphia, Pennsylvania

Horowitz et al. describe their experience repairing a false aneurysm created of the upper basilar trunk after endoscopy. The authors indicated that this procedure has a 5% complication rate; however, it is remarkable that this patient survived with BA occlusion and trapping of this false aneurysm, which clearly resulted in an excellent outcome. Occluding a BA in an individual had a fetal circulation on the side involving the posterior cerebral artery. I recommend performing a test occlusion, technology available, it may be possible to preserve the BA and either coil through the aneurysm or coil through the stenosis in other vessels. Nonetheless, the authors achieved an excellent outcome.

Robert H. Rosenwasser

Philadelphia, Pennsylvania
The authors describe a feared complication of endoscopic third ventriculostomy, namely, injury to the BA. In this case, the Chiari I malformation developed hemorrhage from a false aneurysm of the upper BA trunk after endoscopic third ventricle fenestration of the third ventricular floor. The present case occurred after fenestration by use of radiofrequency energy in reporting their complications. At the same time, I think they should change their operative technique. If the BA or its ventricular floor, they may be injured by the transmitted effects of laser or monopolar coagulation. Therefore, it is advisable to fenestrate the third ventricular floor. A variety of techniques are available to perform the third ventriculostomy. The safest is to perform a small opening with a balloon catheter. The location of the BA can be checked preoperatively on a sagittal magnetic resonance imaging (MRI).

Alan R. Cohen
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The authors report the use of coils to trap a BA pseudoaneurysm that developed subsequent to the performance of fenestration of the third ventricular floor. The use of coils to fill a pseudoaneurysm cavity is a suboptimal strategy. The coils are likely to occlude the pseudoaneurysm. However, the coils will not fill the pseudoaneurysm cavity. The authors are fortunate that this child had adequate collateral supply to the basilar caput. Another alternative for treatment of pseudoaneurysms is temporary balloon occlusion of the parent vessel. Balloon occlusion may be necessary to increase the metal-to-artery ratio and effectively occlude the pseudoaneurysm. In other vascular beds, placement of a stent, especially when the parent vessel cannot be sacrificed. Extreme care must be taken to avoid rupture of the pseudoaneurysm.

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Key words: Basilar artery; Endovascular; Guglielmi detachable coils; Hemorrhage; Third ventriculostomy

IMAGE GALLERY