Endoscopic resection of intraventricular choroid plexus papillomas in infants

TO THE EDITOR: We read with great interest the recent articles by Santos and Souweidane1 and Sufianov et al.2 on the endoscopic resection of choroid plexus papillomas in infants (Santos MM, Souweidane MM: Purely endoscopic resection of a choroid plexus papilloma of the third ventricle: case report. J Neurosurg Pediatr 16:54–57, July 2015; Sufianov AA, Gaibov SSK, Sufianov RA: Endoscopic monoportal removal of a choroid plexus papilloma in the posterior third ventricle in a child. J Neurosurg Pediatr 16:107–111, July 2015). In both cases, complete endoscopic removal was achieved with no recurrence at follow-up and with good neurological recovery. We believe that such accounts are essential in contributing to the rapid expansion of the field of neuroendoscopy. In this letter, we include our account of the complete endoscopic resection of a choroid plexus papilloma in an infant, as part of our broader endoscopic experience, to demonstrate the challenges we faced and overcame and those we continue to face in this ever-growing field.

Our patient presented at the age of 5 months with symptoms and signs of raised intracranial pressure. Imaging revealed hydrocephalus and an avidly enhancing 2.7 × 3.7 × 3.3–cm lobulated lesion within the left lateral ventricle (Fig. 1).

After the risks, benefits, and alternative treatments were discussed with the parents, the child was taken for an urgent image-guided endoscopic resection of the lesion through a left parietooccipital bur hole.

The choice of endoscope in neurosurgery depends on many factors—not least, the preference and experience of the neuroendoscopist. The ideal scope should have at least one large channel, preferably large enough to allow bimanual manipulation. The InVent endoscope (Aesculap/B Braun) was our choice for this procedure. It has an external diameter of 8.3 mm, and its largest channel is 3.7 mm × 6.5 mm. It has a smaller 2.2-mm channel, which directs small instruments into the larger channel midway down the shaft. It also has a 1-mm irrigation channel. It uses a 30° scope to minimize the risk of damage caused by instruments as they exit the working channel by bringing them into view earlier. It requires experience and slight adaptation of surgical technique. There is a variety of instruments for manipulation and sharp and blunt dissection as well as cautery. We have used a variety of tubes for suction, including small nasogastric tubes, but have moved more recently to rigid 2-mm-diameter suction cannulas (Aesculap/B Braun) specifically designed for use with neuroendoscopes. We have found these essential, especially in controlling bleeding.

The child was positioned on a horseshoe headrest with the head turned to the right. A left parietooccipital bur hole was created. A cruciate dural incision was followed by introduction of Tisseel under the dural leaflets in an
attempt to reduce the risk of hygroma formation. The endoscope was inserted into the left lateral ventricle under AxiEM (Medtronic Stealthstation S7 electromagnetic system) guidance. The tumor was identified and its surface coagulated to reduce its size. The pedicle was then visualized and coagulated, but the tumor was still adherent to the choroid plexus on the ventricular floor, requiring further coagulation and dissection prior to removal (Fig. 2). A Söring endoscopic ultrasonic aspirator was used to aid in the piecemeal resection of the tumor. It is designed for use with the GAAB endoscope (Karl Storz), but after some modification we have successfully used it with disposable Medtronic endoscopes as well as the InVent.

The tumor was pathologically classified as an atypical choroid plexus papilloma (WHO Grade II). Despite the use of Tisseel, the patient developed a hygroma and hydrocephalus postoperatively, requiring insertion of a ventriculoperitoneal shunt.

The patient made an excellent recovery. His last follow-up visit was 6 months postresection; there was no radiological recurrence and only a small scar from the resection (Fig. 3).

The applications of neuroendoscopy in the field of hydrocephalus are certainly well described. The endoscopic approach is also increasingly becoming a viable alternative to open transcranial surgery for the treatment of small avascular ventricular tumors and colloid cysts of the third ventricle. Its advantages are those of a minimally invasive approach and result in an accelerated postoperative recovery. Furthermore, neuroendoscopy allows better visualization of a wider field at depth in comparison to microscopy. However, reports describing endoscopic resection of solid ventricular tumors, especially vascular tumors in infants, are infrequent at best. This can be easily explained by the limitations of endoscopic instrumentation and the technical difficulties in controlling hemorrhage and in achieving a resection equal to that performed microscopically when treating larger and/or potentially hemorrhagic lesions. A purely endoscopic technique to resect solid tumors is hindered by the inadequacies of the equipment available and by the limited bimanual maneuverability of instruments within the endoscope. It is only recently that adequate endoscopic bipolar cautery has allowed more effective hemostasis. Development of endoscopic aspirators, ultra-

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FIG. 3. Left: Contrast-enhanced T1-weighted MR images obtained 6 months after resection demonstrating significant reduction in the size of the ventricles and showing the right parietooccipital shunt. Right: The scar from the endoscopic resection. Figure is available in color online only.

The ventricles and showing the right parietooccipital shunt. Right: The scar from the endoscopic resection. Figure is available in color online only.

sonic or otherwise, has certainly at best lagged behind that for microscopic counterparts, and the main commercially available aspirator requires modification to allow use with different endoscopes, but holds significant promise.

The obstacles are being slowly overcome, and it is our hope that in discussing and sharing experiences and organizing and attending endoscopic courses and conferences, as well as through closer collaboration with the industry, the field of neuroendoscopy will gain increased momentum to drive developments at an accelerated pace for the benefit of those we treat.

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References

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Response
Neuroendoscopy has great potential for the treatment of different neurosurgical diseases, especially in pediatric patients. It has lately become an important alternative to open surgery for many pathologies.

The importance of implementation of neuroendoscopy is mainly connected with its minimal invasiveness. Nevertheless, it is worth mentioning that there are few articles on this topic, especially with respect to endoscopic removal of tumors in pediatric patients.

There is no doubt that any successful experience of the use of neuroendoscopy in the treatment of various neurosurgical diseases must become a subject for discussions and exchange of experience, and we appreciate the contribution that Gerard et al. have provided in their letter. They have focused on the challenges associated with this method of treatment, which is a necessary issue for consideration.

We agree with the opinion that the choice of the endoscope and other instruments for neurosurgical interventions plays a significant role. In our practice, we use different endoscopic systems, but we prefer the Lotta system (Karl Storz). This system creates optimal conditions for visualization and illumination of the surgical field. The design of the Lotta neuroendoscope also makes it possible to use its working port as a retractor. This feature is very helpful in some cases, as it is used to protect or move aside important neural or vascular structures or to perform tumor dissection. The Lotta system also offers good maneuverability, allows the use of additional flexible endoscopes and rigid endoscopes (0°, 30°, 45°, and 70°), and enables the surgeon to manipulate bimanually, which increases technique options and safety of the surgery.

One of the most essential issues connected with neuroendoscopic removal of tumors is hemostasis, as it is crucial for complete tumor resection. In our practice, we successfully use Karl Storz instruments, the Lotta system in particular, and a very effective new method of arresting bleeding that Professor Henry Schroeder has kindly introduced to us (personal communication, 2015). The endoscope is to be pulled backward inside the sheath in order to create a fluid layer in the internal space between the tip of the endoscope and the bleeding area. The hemorrhage area is limited with the help of the endoscope sheath, and in conditions of the “fluid chamber” that can be intensively irrigated, the source of bleeding is adequately visualized and coagulated. This technique contributes to reduction of blood loss and saving time as it makes it possible to locate the bleeding point and coagulate the bleeding vessel within a very short time.

It is obviously very important to develop available endoscopic systems for increasing the opportunities of neuroendoscopy. Recently, new technologies have appeared on the market for resection of a major part of a tumor with the use of different systems, such as NICO Myriad variable aspiration tissue resector, which incorporates automated, nonablative, mechanical cutting technology with a direct view of tissue resection.12 Most likely, this device will significantly improve the possibilities of neuroendoscopic tumor resection.

The next, especially promising way of raising the ef-
efficiency of neuroendoscopy in cases of complex anatomy of the tumor region, in our view, is the use of multiportal endoscopic technique. It involves the use of several working ports instead of one, and these ports can be utilized in different stages of tumor resection. The method was put into practice by Professor Albert Sufianov in 1994 and first reported on in 1997. Multiportal endoscopic technique was further described in detail in other publications by Sufianov and colleagues. An example of a clinical case in which the multiportal endoscopic approach was used for removal of an intraventricular tumor in an infant is presented in Fig. 1.

The stage of preoperative planning of the approach including preoperative visualization of the pedicle of the tumor is very important for successful tumor resection, especially when using multiportal technique.

As it was stated by Gerard et al. in their letter, in order to overcome the difficulties and resolve arguments related to a neuroendoscopic method of treatment, it is necessary to share new knowledge. Publications addressing different aspects of neuroendoscopy are very valuable as contributions to our knowledge base in important ways and thereby increase the effectiveness and safety of surgical treatment.

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References
4. Sufianov AA: [Endoscopic diagnostics and surgical treatment of brain and spinal cord diseases in children (dissertation)]. Irkutsk, Russia: Irkutsk State University, 2000 (Russian)

FIG. 1. Multiportal (biportal) approach in endoscopic removal of choroid plexus papilloma. A and B: Preoperative axial (A) and sagittal (B) T1-weighted Gadovist 1.0–enhanced MR images revealing the choroid plexus papilloma; a indicates the vascular pedicle of the tumor, b indicates the tumor. C: Intraoperative photograph showing placement of the main and additional (second) working ports; c indicates the second working port. D: Endoscopic view after placement of the second working port. The tumor can be observed in the lower left corner of the image. E and F: Postoperative axial (E) and sagittal (F) T1-weighted Gadovist 1.0–enhanced MR images demonstrating total resection of the choroid plexus tumor. Figure is available in color online only.