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Brain & Spine
Surgery

Beyond Vascular Neurosurgery

Case Illustrations by **Jonathan L. Brisman, M.D.**

I want to thank you for taking the time to look at this newsletter.

Many of you may know me as a vascular/endovascular neurosurgeon and, of course, that continues to be my passion. I actively treat patients with strokes, brain aneurysms, brain arteriovenous malformations, spinal arteriovenous malformations, and carotid stenosis among other things, including temporal artery biopsies to rule out arteritis.

That said, I have also recently found an opportunity to expand my practice in three particular areas that I'd like to tell you about today, namely: **1**. Normal Pressure Hydrocephalus; **2**. Meningioma Surgery, and **3**. Chiari I Malformation.

I would like to use this platform to briefly describe three cases that I have treated recently, to thank those of you who referred these patients to me for care, and to use the cases as demonstrations of how routine neurosurgical procedures can be performed successfully with good patient outcomes. In addition, I'm going to present a preoperative and postoperative image to demonstrate the technique.

Lastly, I will ask and then answer three of what I believe are the most relevant questions asked by referring doctors and/or patients about these disease entities.

Hydrocephalus

Case Illustration 1

The patient is a 77-year-old right-handed gentleman with a history of hypertension and congenital hearing loss who was referred to me for worsening gait over the last six months. An MRI of the brain was performed, which reveals hydrocephalus (see Figure 1A). Prior to being seen by me, he had been referred for a lumbar puncture, which resulted in marked improvement in his gait. Although the patient and his daughter who accompanied him to the clinic consultation, denied dementia or worsening cognitive or intellectual functioning, he did admit to some more recent urinary incontinence. On exam, the gentleman appears with all his faculties and is oriented to time, person, place, and thing. He is awake, alert, with normal cranial nerve function. Although he does appear to have good motor antigravity strength in all four extremities, he requires a cane to ambulate and his walking is somewhat slowed and broad-based.

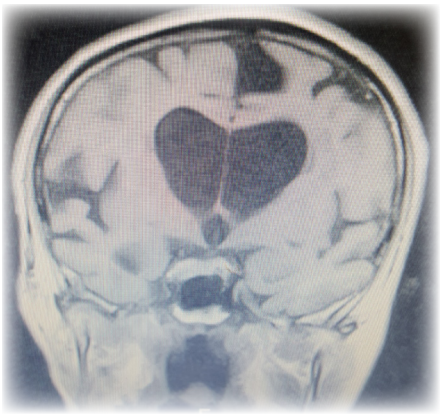

Figure 1A: *Pre-Operative Image - Normal Pressure Hydrocephalus*

I diagnosed this gentleman with Normal Pressure Hydrocephalus and recommended laparascopic-assisted ventriculoperitoneal shunting to alleviate his symptoms. I explained to the gentleman that given his improvement with the spinal tap that I thought there was a good chance that his gait would improve with the shunting. I explained to him that the urinary incontinence was less likely to improve, but may have some beneficial effect from the shunting. He underwent shunting and was discharged the following day at his neurologic baseline. At the one-year followup, the gentleman has had remarkable increase in his ability to walk and now walks routinely without the use of any assistance. I continue to check his percutaneously programable valve on the shunt in the office and maintain it at a 1.5 setting, which is roughly equivalent to 100 mmHg.

This is considered a very successful outcome and a postoperative image showing the ventricular catheter in good position without significant change in the ventricular size (Figure 1B). This is the expected outcome. Normal pressure hydrocephalus is a well-recognized clinical entity that generally affects older individuals and presents with a clinical trial of gait disturbance, dementia, and urinary incontinence. Typically, the gait disturbance is the first symptom to appear and is often misdiagnosed as there are a myriad of other diagnoses in the differential for elderly people with gait disturbance. Urinary incontinence is usually the second symptom to develop and dementia is only found as a late symptom. Upon evaluation of these patients, MRI or CT scan almost always does show communicating pan-ventricular enlargement out of proportion to the sulci, which are often quite large particularly in elderly

individuals. Response to lumbar puncture, which is usually a large volume spinal tap taking off at least 30 to 40 cc of spinal fluid, is the hallmark diagnostic test influencing my decision to proceed with shunting. If there is no response, I do not offer a shunt in general. The major risks of shunting include failure to improve if there has been a long presentation of the symptoms and particular failure to improve symptoms of incontinence and dementia. The other major risk is that of subdural hematoma development.

Questions & *Answers*:

Q: *Do you always require a lumbar puncture prior to proceeding with shunting for normal pressure hydrocephalus?*

A: In general, yes. If the hydrocephalus is severe and/or there is a question that it is obstructive in nature, meaning that it is not the typical communicating hydrocephalus that is the hallmark of Normal Pressure Hydrocephalus, then I do not. I proceed directly to shunting, particularly symptomatic somewhat younger individuals, as a spinal tap could be injurious to someone who has an obstructive component of hydrocephalus.

Q: *Does lumbar drainage in the hospital for several days play a role in your algorithm for surgery?*

A: In general not. I am aware that this is something that some physicians are using, but I feel that it is unnecessary to make the determination and that if the patient does not respond to the spinal tap then I do not proceed with surgery in general. I typically will see the patients myself in the office within 24 to 36 hours after the lumbar puncture to confirm both a subjective and objective improvement in the gait.

Q: *Is normal pressure hydrocephalus always associated with a normal pressure in the lumbar puncture?*

A: In general yes. Although special care must be taken to make sure that the spinal tap, which I usually have performed by the radiologist using fluoroscopic guidance, is performed in the lateral decubitus position as if it is performed in the prone position that can give falsely elevated pressures.

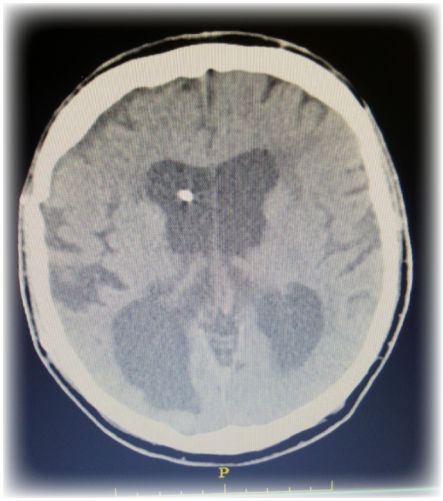

Figure 1B: *Post-Operative Image – Normal Pressure Hydrocephalus*

Meningioma

Case Illustration 2

The patient is a 45-year-old part-time school teacher, who has been having approximately ten months of headaches and visual disturbance mostly in her right eye. MRI reveals a large tuberculum sellae/planum sphenoidale meningioma and she is referred to me for evaluation. She has not been having headaches, or difficulty with olfaction and feels that her visual disturbance is mostly in the right eye. She is otherwise a healthy woman. Her physical exam revealed decreased visual acuity in the right eye, which was noted to be 20/150 without her glasses and 20/25 in the right eye with her glasses to gross evaluation by myself in the office. Visual acuity in the left eye appeared to be intact. She did have some monocular field cut in the right eye as well. Imaging revealed the meningioma as described. Figure 2A shows a large homogenously enhancing mass in the region of the optic apparatus on the anterior skull base consistent with a large skull base meningioma.

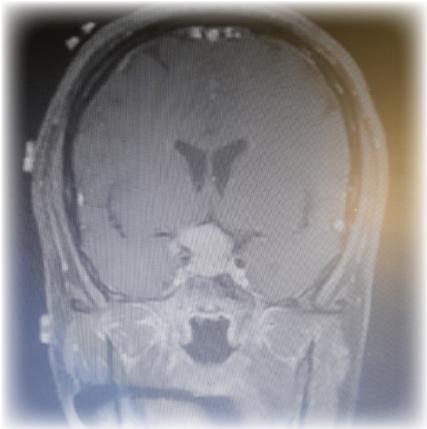

Figure 2A: Pre-Operative Image – Meningioma Surgery

Initial evaluation was conducted, which included neuro-ophthalmologic evaluation with documented visual acuity as well as pituitary axis, hypothalamic axis, and blood work evaluation. Given her young age, large intracranial mass, and symptoms of vision loss, I offered her a craniotomy to remove the tumor. My concern was that not operating would risk increased mass effect and increased neurologic deficit particularly that of lost vision in either the right eye or with further optic apparatus compression, possibly even blindness in the left eye as well. Cerebral angiography was considered, but given the location in the lower skull base, it was felt that embolization would not be helpful in this particular case. The patient was brought to the operating room and a large bicoronal craniotomy was fashioned with a predominantly right-sided approach. The sylvian fissure was split using the operating microscope. The internal carotid artery and its branches into the middle cerebral artery and anterior cerebral artery were identified and the large mass was debulked and ultimately removed with a gross total resection. Postoperatively, the imaging looked good, as can be seen (Figure 2B). The patient has since gone on to do extremely well with stabilization of her visual loss and no visual deterioration on the left side.

Intracranial meningiomas are a well known and not uncommon lesion that might bring a patient to the

attention of a neurosurgeon. The imaging characteristics are classic for a homogenously enhancing mass, although the pathologic spectrum of meningiomas can vary in ranges from benign with typical features to atypical features, mitotic features, or even necrosis in the very rare malignant cases. Small asymptomatic lesions particularly in older individuals are often either observed or treated with radiosurgery. Symptomatic lesions, larger lesions, or lesions where there is a question of the pathology often undergo neurosurgical intervention, which is typically a craniotomy to remove as much of the mass as is feasible and that can be done safely. Preoperative embolization after cerebral angiography is often recommended to de-vascularize these typically bloody tumors. Typical presentations include either incidental finding, seizures, headaches, or neurologic symptoms encountered in a patient such as visual loss when the tumor is growing in the skull base near the optic apparatus. This patient had a very successful outcome and is a good illustration of how surgical intervention can be used in a curative manner for such patients.

Questions & *Answers*:

Q: *Is the radiographic imaging adequate to confirm a diagnosis of meningioma?*

A: Often this is in fact the case. That said, only pathologic evaluation can confirm this. Typically, however, a homogenously enhancing mass that is adjacent to one of the dural surfaces is close to being pathognomonic for meningioma.

Q: *Which meningiomas do you recommend conservative management?*

A: Patients who are elderly tend not to do well with craniotomies for meningioma. Typically I am referring to patients over the age of about 70. Clearly, if the lesions are large enough and causing enough mass effect and symptoms, I will proceed with surgery even in older individuals, but my threshold is higher.

Q: *What are the goals of surgery and what is the followup after surgical resection?*

A: The goals of surgery are in general complete surgical gross total resection. Unlike malignancies, meningiomas

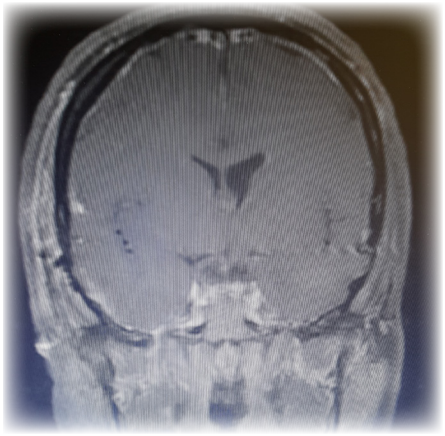

Figure 2B: *Post-Operative Image – Meningioma Surgery*

do not invade the brain and often a complete gross resection is possible. That said, meningiomas can occur along the skull base where they are hard to resect without neurologic sequelae and we therefore debulk them as much as possible. Sometimes radiation in the form of radiosurgery can be used after an incomplete resection if symptoms persist. Followup is routine surveillance MRI and if there is a regrowth or regrowth with symptoms in particular, additional resection or more commonly radiation is then entertained.

Chiari I Malformation

Case Illustration 3

The patient is a 23-year-old college student who was evaluated by me in the office for a possible type I Chiari malformation. This was detected after her complaint of posterior neck and occipital headaches that was lasting a few months. The headaches got worse when she performed the Valsalva maneuver

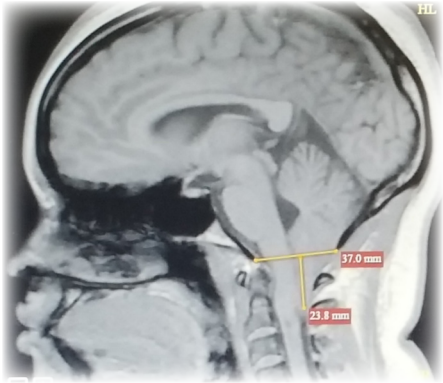

Figure 3A: *Pre-Operative Image – Chiari I Malformation*

such as when she was straining to go to the bathroom, sneezing, or coughing. She did have some tingling in her right hand associated with this head pain, but no other neurologic complaints. MRI was obtained which showed at least a 2-cm cerebellar-tonsillar descent below the foramen magnum, consistent with a type I Chiari malformation. She was otherwise neurologically intact on examination.

I proceeded with a suboccipital craniectomy, C1 bilateral laminectomy, and duraplasty, as well as tonsillar coagulation, and the patient was discharged home on postoperative day number 2, neurologically intact with significant reduction in her headaches.

Figure 3A is a sagittal MRI demonstrating quantitative measurements of the amount of cerebellar tonsils that have descended below the level of the foramen magnum, which is very abnormal.

Postoperatively (Figure 3B) you can see on this axial noncontrast head CT the amount of bony decompression and increased space in the posterior fossa provided by the decompression.

Questions & *Answers*:

Q: *What are your indications for surgery in patients with a type I Chiari malformation?*

A: Many people have asymptomatic Chiari type I malformations. By definition any evidence of cerebellar tonsillar descent more than approximately 4 to 5 mm below the foramen magnum is consistent with a Type I acquired adult type Chiari malformation.

The more descent, the more likely for there to be symptoms but there is not a direct correlation. Symptoms are often varied and manifestations of

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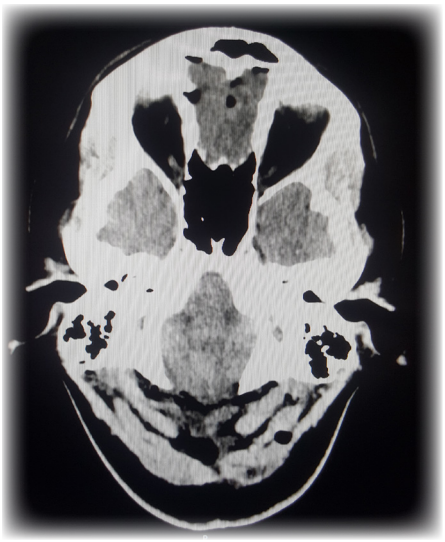

Figure 3B: *Post-Operative Image – Chiari I Malformation*

this disease can include anything from numbness and tingling, particularly in the upper extremities to walking disturbance, Valsalva-induced posterior occipital and neck pain, and/or even ringing in the ears or hearing loss. If the patients are completely asymptomatic with a normal neurologic exam, I think it is reasonable to observe such patients despite the degree of herniation. If, however, the patients are symptomatic and the amount of descent is more than 5 mm, that is an indication for surgical decompression. Type I Chiari malformation is often associated with syrinx of the spinal cord, typically in the cervical region, and if there is a syrinx I do consider that an independent indication for surgical decompression.

Q: *What additional workup is necessary if a type I Chiari malformation is identified?*

A: I usually obtain at least a cervical spine MRI, making sure that there is no cervical spinal cord syrinx which is often associated with Chiari malformations. MRI CSF flow studies are an adjunct test that I usually do not obtain as it does not change management decisions in my opinion.

Q: *What are the surgical options for relieving the symptoms of Chiari malformation?*

A: There are numerous different procedures described for the treatment of type I Chiari malformation ranging from simple to the complex. For headaches alone it is acceptable to perform a wide bilateral suboccipital craniectomy and decompression with scoring of the dura to expand the dura and create more room in the foramen magnum. More complex aggressive procedures including tonsillar coagulation which was performed in this patient, are typically reserved for patients with a significant downward herniation of the tonsils. Additionally some surgeons will explore the posterior fossa region opening up arachnoid spaces near the fourth ventricle. The operation that I perform most often is performed in the prone position, with the patient in the Mayfield Tongs, and includes a wide suboccipital craniectomy with removal of the bone around the foramen magnum including a C1 bilateral laminectomy. If there is significant downward herniation up to the level of C2, I remove that lamina, or part of it, as well. I then open the dura in a Y-shaped fashion and sew in a synthetic dural patch and then close the muscular layers without placing any metallic mesh or other cranioplasty.

Jonathan L. Brisman, M.D., Neurosurgeon

Jonathan L. Brisman, M.D, is a board certified neurosurgeon who specializes in cerebrovascular and endovascular conditions, including brain aneurysms, arteriovenous malformations (AVM), carotid stenosis, and stroke. He is one of about 100 neurosurgeons nationally, trained in both endovascular and micro-neurosurgical techniques and the first endovascular neurosurgeon on Long Island.

Dr. Brisman was the first neurosurgeon on Long Island to coil a cerebral aneurysm and the first physician in Nassau County to place an intracranial, FDA-approved stent for artherosclerotic disease. He is currently the Director of Cerebrovascular and Endovascular Neurosurgery at both Winthrop-University Hospital and South Nassau Communities Hospital.

Dr. Brisman received his undergraduate degree, magna cum laude, in History and Science from Harvard University and his medical degree from Columbia College of Physicians and Surgeons. He then completed a general surgery internship and neurosurgical residency at Massachusetts General Hospital, serving as Chief Neurosurgical Resident in his final year. Dr. Brisman completed an interventional neuroradiology fellowship at Roosevelt Hospital in New York City under Alejandro Berenstein, MD, and a microvascular neurosurgical fellowship at Swedish Hospital, Seattle, Washington, under Drs. David Newell and Marc Mayberg.

Dr. Brisman is the first and only neurosurgeon on the Editorial Board of the prestigious *American Journal of Neuroradiology* and is the Section Editor of both Vascular Neurosurgery and Endovascular *Neurosurgery* for the journal *World Neurosurgery*. He has been recognized by his peers as a Castle Connolly "Top Doctor: New York Metro Area" in 2012-2016. He has been the only neurosurgeon from Nassau and Queens Counties included in *New York Magazine's* "Best Doctors" listing for the past four years.

For Dr. Jonathan Brisman's complete biography, visit **nspc.com**.