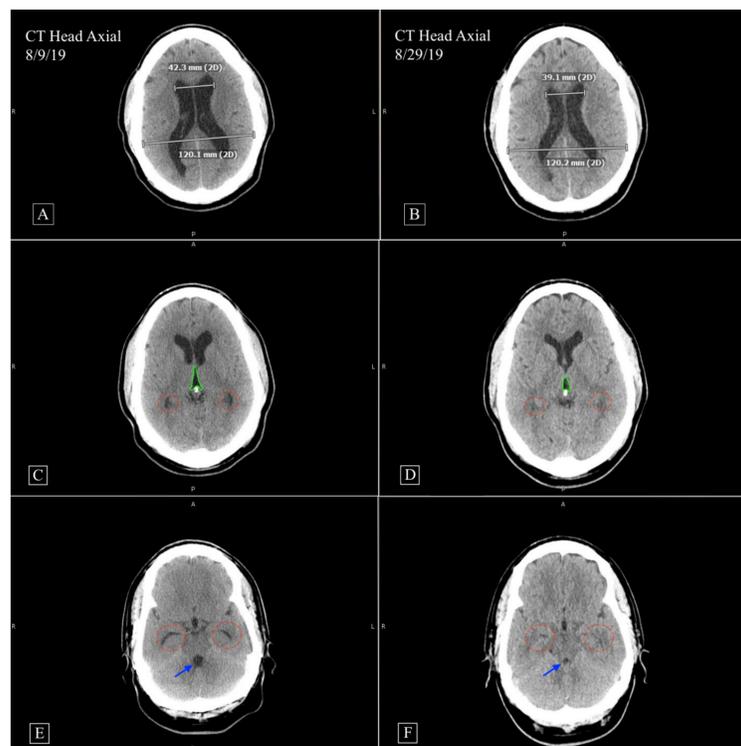


Introduction

Fourth ventricular outlet obstruction (FVVO) leading to obstructive hydrocephalus is a known sequelae of lesions causing mass effect at the foramen magnum. In order to alleviate symptoms of hydrocephalus, endoscopic third ventriculostomy (ETV) can reestablish flow of cerebrospinal fluid (CSF) from the ventricles to the subarachnoid space. When faced managing a patient with FVVO due to a lesion at the foramen magnum, the surgeon must decide to pursue either definitive skull-based resection versus treatment of hydrocephalus with CSF diversion via ventricular shunting or ETV. We present the case of a 52-year-old male who underwent ETV to treat FVVO caused by a foramen magnum meningioma which provided symptomatic relief and delayed major surgical resection for three years from initial diagnosis.

Figure #1: CT Head showing ventricular size before and after ETV



Endoscopic Third Ventriculostomy as Initial Treatment of Fourth Ventricle Outlet Obstruction in a Patient with Foramen Magnum Meningioma Providing Complete Resolution of Symptoms Delaying Definite Skull Base Resection by 3 Years

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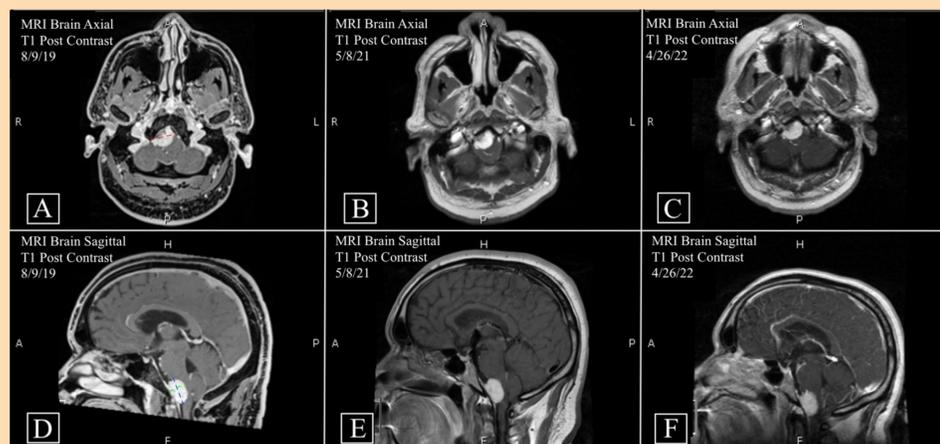
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Case Description

A 52-year-old male with a history of hypertension and no other significant medical history presented to the emergency department for two days of persistent headaches and emesis. He had severe headaches and other minor symptoms but was otherwise intact. Eventual MRI brain showed FVVO secondary to a right sided 2.8 cm homogeneously enhancing dural-based mass abutting the medulla, suspicious for a meningioma. Surgical options were discussed, and it was determined that an ETV would be done promptly. Approximately 32 months and 17 days after his initial presentation, the patient developed clear signs of worsening brainstem compression and was taken for surgical debulking of the mass without complications.

Figure #2: MRI brain showing relative stability in size of meningioma over 3 years



Discussion

The decision for surgical resection versus CSF diversion must take into consideration a myriad of operative risks and the likelihood of meaningful recovery. The hydrodynamics of CSF flow out of the fourth ventricle and across the foramen magnum are of vital importance for maintaining cerebral blood flow and intracranial pressure (ICP). When patients present with ventricular enlargement and symptoms consistent with hydrocephalus, more conservative treatment options such as an ETV may be a reasonable initial approach. Compared with immediate surgical debulking, the possibility of normalizing CSF flow allows for resolution of ICP and hydrocephalus so that surgery can be performed on a relaxed brain. Additionally, when compared with shunting, ETV has lower rates of both infection and mortality.

Figure #3: MRI brain CISS and T2 SPACE demonstrating preserved patency of ETV stoma before resection

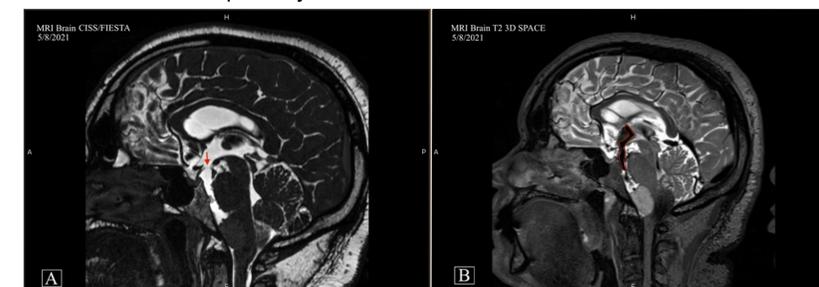


Figure #4: Proposed classification of fourth ventricular outflow obstruction by etiology

	Fourth Ventricle Outlet Obstruction: Intraventricular Obstruction	Fourth Ventricle Outlet Obstruction: Extraventricular Obstruction	Foramen Magnum Translocation Impedance
Location of obstruction	Intraventricular (Within fourth ventricle – internal outlet obstruction)	Extraventricular (Outside fourth ventricle – external outlet compression)	Extraventricular (Outside fourth ventricle – foramen magnum obstruction)
Compression	None	Extraventricular +/- Foramen Magnum Translocation Impedance	Obstruction affecting flow across foramen magnum
Type/example		Far Distal Obstructive Hydrocephalus (FDOH)	
Our patient	No	YES	YES
Examples	I.e. Webbing, scarring, ependymoma, hemorrhage, neurosarcoidosis	I.e. Medulloblastoma, meningioma compressing outlets, Chiari Malformation	I.e. Meningioma obstructing Foramen Magnum, Arachnoid thickening around brainstem (Rekate)

REFERENCES: (for full list please contact presenter)

- Bergsneider, M. (2014). Chapter 15 Hydrocephalus: New Theories and New Shunts?
- Bilgin E, Cavus G, Apik V, Arslan A, Olguner SK, Istemen I, Gezercan Y, Okten AI. Our surgical experience in foramen magnum meningiomas: clinical series of 11 cases. Pan Afr Med J. 2019 Sep 3;34:5. doi: 10.11604/pamj.2019.34.5.17536. PMID: 31762874; PMCID: PMC6850739.
- Buerki RA, Horbinski CM, Kruser T, Horowitz PM, James CD, Lukas RV. An overview of meningiomas. Future Oncol. 2018 Sep 14;21(21):2161-2177. doi: 10.2217/fon-2018-0006. Epub 2018 Aug 7. PMID: 30084265; PMCID: PMC6123887.
- Carpentier A, Brunelle F, Philippot J, Clemenceau S. Obstruction of Magendie's and Luschka's foramina. Cine-MRI, aetiology and pathogenesis. Acta Neurochir (Wien). 2001;143(5):517-21; discussion 521-2. doi: 10.1007/s007010170083. PMID: 11482704.
- Chowdhary, F. H., Haque, M. R., Rumi, J. U., & Arifin, M. S. (2020). Fourth ventricular outflow obstruction in an infant with leal atresia and taylorgatalacia: Endoscopic management. Indian Journal of Neurosurgery, 9(03), 219-224. https://doi.org/10.1055/s-0040-1710104
- Cuoco JA, Benko MJ, Klein BJ, Keyes DC, Patel BM, Wiltcher MR. Idiopathic fourth ventricular outlet obstruction misdiagnosed as normal pressure hydrocephalus: A cautionary case. Surg Neurol Int. 2020 Sep 25;11:305. doi: 10.25259/SNI.408.2020. PMID: 33059982; PMCID: PMC7568106.
- Di Rocco F, Jucá CE, Zerah M, Sainte-Rose C. Endoscopic third ventriculostomy and posterior fossa tumors. World Neurosurg. 2013 Feb;79(2 Suppl):S18.e15-9. doi: 10.1016/j.wneu.2012.02.018. Epub 2012 Feb 10. PMID: 22381845.

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