Neuroimaging Highlight

Editors: Richard Farb, David Pelz

A Case of Incomplete Voiding Improved by Head Turning

Submitted by: Negar Asdaghi, James Scozzafava, Ravi Bhargava, George Elleker

Can. J. Neurol. Sci. 2008; 35: 247-249

A 64-year-old woman described a five year history of progressive neurological symptoms including the inability to void urine completely. The urinary retention consistently improved with head turning to the right side. She was referred to the Neurology service after developing progressive right sided hearing loss, gait instability, and intermittent diplopia. Other symptoms included burning dysesthesiae of her left foot and arm, which were aggravated by non-direction-specific neck movements.

On exam she was found to have mild right lateral rectus weakness, bilateral gaze-evoked nystagmus and high frequency hearing loss in the right ear. The remainder of her neurological and systemic examination was unremarkable. There were no long motor or sensory tract findings.

Prior Urological investigations for determining the cause of her urinary retention were unremarkable. Magnetic resonance imaging (MRI) of her brain and cervical spine showed a large extra-axial, diffusely enhancing clival mass extending into the suprasellar cistern and caudally through the foramen magnum (Figures 2, 3 and 4). A stereotactic biopsy was undertaken. Pathological examination of the tissue showed a grade I meningioma.

While still undergoing a course of radiotherapy, 11 months after diagnosis, she continued to note difficulty initiating urine flow without turning her head to the right.

Discussion

The storage and evacuation of urine depends ultimately on the spinal reflex arc. Supraspinal input is needed to preserve continence and coordinate urinary evacuation.[1] The ponto-mesencephalic micturition centre (PMC) receives afferent fibers from sacral parasympathetic nucleus located at the S2-S4 segments of the spinal cord. The efferent fibers originating in PMC are in turn regulated by cortical and subcortical micturition centers located in the superomedial aspect of the frontal lobes, anterior aspect of cingulate gyrus and genu of corpus callosum (Figure 1). Various subcortical areas also contribute to the PMC outflow via the reticulospinal tracts to detrusor motor neurons in the interomediolateral cell column at S2-S4 level.

The localization of the structures responsible for micturition has been demonstrated through functional studies highlighting the significant role of the PMC throughout the active coordination of the process.[2] Interestingly Positron Emission

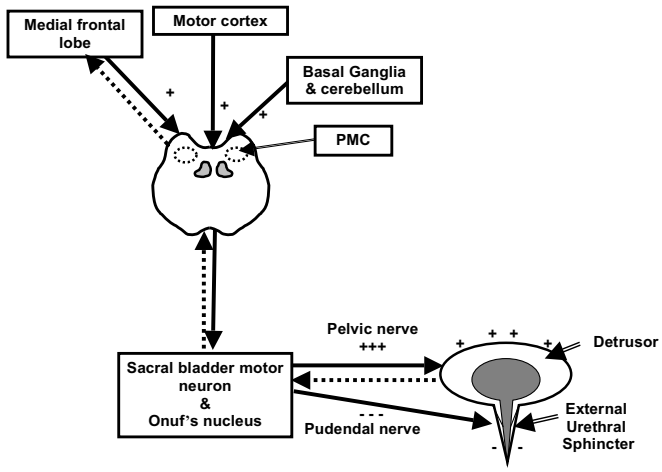

Figure 1: *Neuronal pathway for voiding: Numerous areas of the brain, including the cerebral motor cortex, medial frontal cerebrum, cerebellum and basal ganglia provide input to the Pontine Micturation Centre (PMC) within the dorsal aspect of the pons. The efferent pathway from PMC activates the sacral bladder motor neurons (parasympathetic) in the sacral spinal cord, and through inhibitory sacral interneurons inhibits the Onuf's nucleus (somatic). This results in coordinated relaxation of the external urethral sphincter and contraction of the detrusor muscle through pelvic (parasympathetic) and pudendal (somatic) nerves as depicted. PMC in turn receives afferent regulatory feed back from the spinal cord. PMC: Pontine Micturition Centre, black arrow: efferent, hatched arrow: afferent, +activation, - - - Inhibition*

From the Division of Neurology (NA, GE), Department of Radiology & Diagnostic Imaging (RB), University of Alberta, Edmonton; Department of Critical Care Medicine (JS), University of Calgary, Calgary, Alberta, Canada.

Received September 10, 2007. Final Revisions Submitted February 16, 2008.

Reprint requests to: N Asdaghi, 9325 Aberhart 1, University of Alberta, Edmonton, Alberta, T6G 2J3, Canada

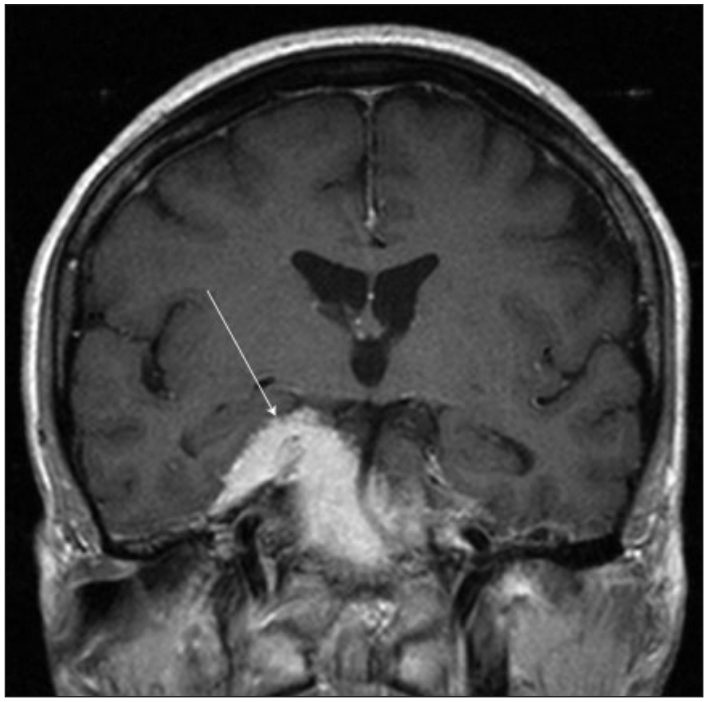

Figure 2: *T1-weighted magnetic resonance imaging with gadolinium shows diffusely enhancing mass (arrow) centred on the dorsal aspect of the clivus extending laterally into the right middle cranial fossa and medially to the left of midline, compressing the brain stem*

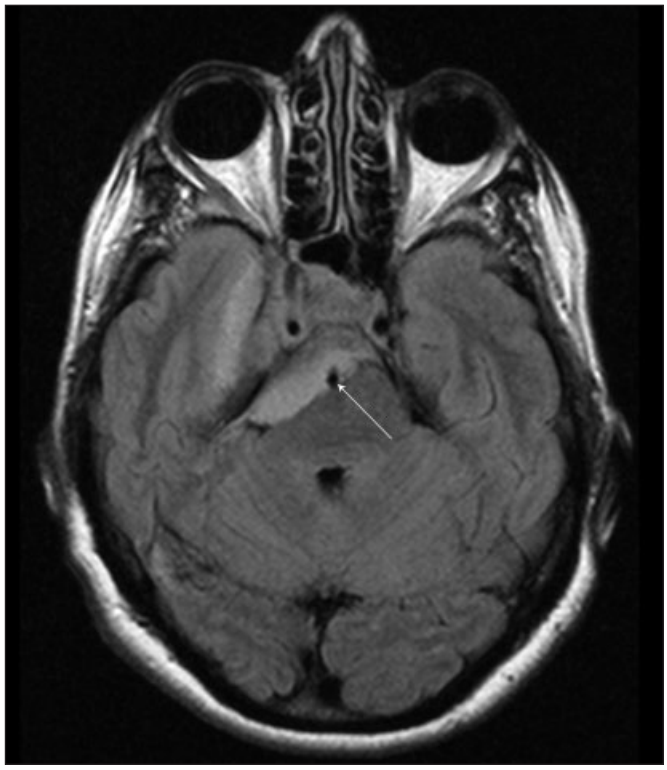

Figure 3: *Fluid-attenuated inversion recovery magnetic resonance axial imaging shows the tumor encasing the basilar artery (arrow) and right internal carotid artery and compressing the pons on the right side*

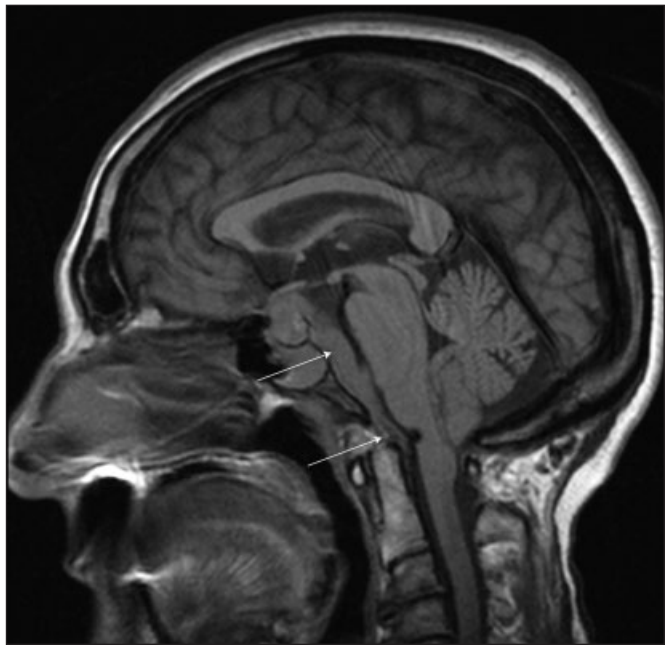

Figure 4: *Sagittal T1-weighted magnetic resonance imaging shows the tumor extending rostro-caudal along the clivus (both arrows) to the level of cervicomedullary junction (lower arrow)*

https://doi.org/10.1017/S0317167100008726 Published online by Cambridge University Press

Tomography (PET) case studies have shown lateralized increased blood flow in the right dorsomedial pontine tegmentum, and the periaqueductal gray in the brain stem during micturition, but not on the left side.[3,4]

Here we present a case of clival meningioma with compression over the right pontine segment (Figure 2) in a woman with significant urinary retention relieved by turning her head to the right side. Although it is difficult to ascertain the exact mechanism of this phenomenon in this case, it is hypothesized that the tumor compromises the functioning of the pontomesencephalic micturition centers by altering dynamics of arterial blood flow or venous outflow, and that this compromise may be mechanically relieved by head turning. Compromise of descending pathways subserving micturition at the cranio-cervical junction alleviated by head turning might provide an alternative explanation for the phenomenon in this case give the extension of the lesion through the foramen magnum. However there were no other signs indicating cervical spinal cord dysfunction.

Although urinary retention has been previously described in patients with brain stem tumors or strokes, it is an uncommon presenting symptom and rarely associated with initial presentation of petroclival meningioma.[5] To our knowledge, urinary retention relieved by head turning to one side in association with posterior fossa meningioma has not been previously reported. Clinicians' awareness of central as well as peripheral causes of urinary retention should prompt appropriate neurological investigations and referral.

References

1. Griffiths DJ. The pontine micturition centres. Scand J Urol Nephrol. 2002;Suppl.(210):21-6.
2. Seseke S, Baudewig J, Kallenberg K, Ringert RH, Seseke F, Dechent P. Voluntary pelvic floor muscle control--an fMRI study. Neuroimage. 2006;31(4):1399-407.
3. Blok BF, Sturms LM, Holstege G. Brain activation during micturition in women. Brain. 1998;121(Pt 11):2033-42.
4. Blok BF, Willemsen AT, Holstege G. A PET study on brain control of micturition in humans. Brain. 1997;120(Pt 1):111-21.
5. Funakoshi K, Fukutake T, Nishino H, Sato S, Yamanishi T. Urinary retention caused by a small cortical infarction. JNNP. 2005; 76(3):457-8.

https://doi.org/10.1017/S0317167100008726 Published online by Cambridge University Press