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Letter to the Editor: New Observation

Headache with Cerebrospinal Fluid Hypovolemia after Radiotherapy for Jugular Paraganglioma

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A 50-year-old woman presented to Headache clinic with new-onset orthostatic headache (worse upright), neck stiffness, and tinnitus in October 2020. Her medical history was significant for episodic migraine (1–2 headaches per month) and right-sided jugular paraganglioma, treated with primary radiotherapy between January and February 2020. Her jugular paraganglioma was diagnosed in November 2019 when she developed binocular diplopia and magnetic resonance imaging (MRI) with gadolinium revealed an expansile lesion at the right jugular tubercle with the classic radiographic appearance of a paraganglioma, eroding the foramen magnum and infiltrating the posterior fossa. The tumor was dopamine-secreting based on the 24-hour urine collection providing biochemical support for the diagnosis of paraganglioma. Primary radiotherapy was favored over resection based on associated risks, and biopsy was deferred barring disease progression.

Her new-onset orthostatic headache developed 8 months after completing radiation therapy. She described the headache to be severe (8–10/10 intensity on a scale of 1–10, 10 being the worst) localized to the retro-orbital and occipital region, worse upright. Headache intensity would improve in supine position (1–3/10 intensity). MRI with gadolinium revealed features of intracranial hypotension, with extensive pachymeningeal enhancement, slumping of the brainstem, reduced mamillopontine distance and partial effacement of the prepontine and suprasellar cistern (Figures 1B, 2). Compared to neuroimaging immediately prior to radiotherapy, these findings were new. Fortunately, there was also evidence of treatment effect as tumor size had decreased. 1.5 T MRI spine with 3D Fast Spin Echo sequence was unrevealing. There was a plan for digital subtraction myelography, but this was aborted due to patient discomfort following the injection of iohexol. Subsequently, computed tomography myelogram neither did demonstrate any extrathecal fluid collection nor any clear structural vulnerability for cerebrospinal fluid (CSF) leak. Aside from the radiotherapy, she denied any recent procedures or trauma. Lumbar puncture revealed an opening pressure of 12 cm H_2O and CSF profile was unremarkable. Blind epidural blood patch was offered; however, she elected for a trial of conservative management with compression stockings, aggressive oral hydration, caffeine tablets, and generous bedrest. When seen in follow-up 3 months later, her headache resolved completely and repeated imaging demonstrated the resolution of features associated with intracranial hypotension (Figure 1C).

Paragangliomas are rare neuroendocrine tumors, derived from extra-adrenal paraganglia. Paragangliomas arise from varied anatomic locations, including the skull base, and can be functional or nonfunctional, leading to a vast array of presenting symptoms.[1] In jugular paraganglioma, treatment is individualized, since resection and radiotherapy each offer durable tumor control.[2]

To our knowledge, this is the first case of low CSF pressure headache following primary radiation therapy of jugular paraganglioma. While the site of CSF leak responsible for our patient's presentation was not discovered, the emergence of radiographic features of intracranial hypotension was temporally associated with radiotherapy. Also, no alternative etiology or vulnerability was identified. This suspected treatment-related complication would be facilitated by the tumor's location abutting the dura and extending intracranially. As a result of radiotherapy, the size of the tumor decreased radiographically, perhaps leaving a dural defect. In cases of delayed postoperative CSF leak after adjuvant radiotherapy, it has been suggested that radiation may impair dural repair mechanisms.[3] In the setting of orthostatic headache and MRI head findings compelling for intracranial hypotension, failure to localize CSF leak on conventional CT myelography may be attributable to a slow, intermittent, or rapid leak. In these circumstances, dynamic CT myelography, MR myelography, MR cisternography with intrathecal gadolinium, or radioisotope cisternography can improve detection. Use of intrathecal gadolinium remains off-label in Canada due to concern of neurotoxicity at high doses. Even then, no evidence of spinal leak is found in 10–15% of these patients.[4] Our patient's symptoms resolved with conservative therapy; therefore, further investigation was not indicated.

While counterintuitive, low CSF pressure headache can be diagnosed despite a normal opening pressure, in the presence of compatible cranial imaging findings, as in our patient, per the International Classification of Headache Disorders 3rd edition.[5]

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The authors have not published, posted, or submitted any related manuscripts from the same study.

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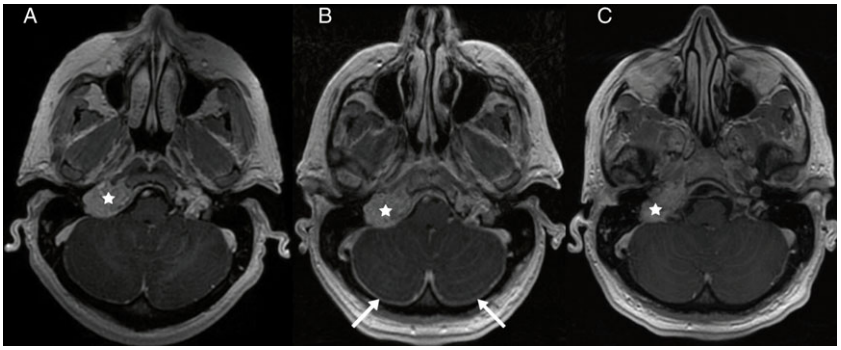

Figure 1: MRI Head (Axial T1 post-gadolinium) before (A) and after (B) radiotherapy, as well as at follow-up (C), demonstrating right jugular paraganglioma abutting dura (starred). Note pachymeningeal enhancement on image B has resolved on image C.

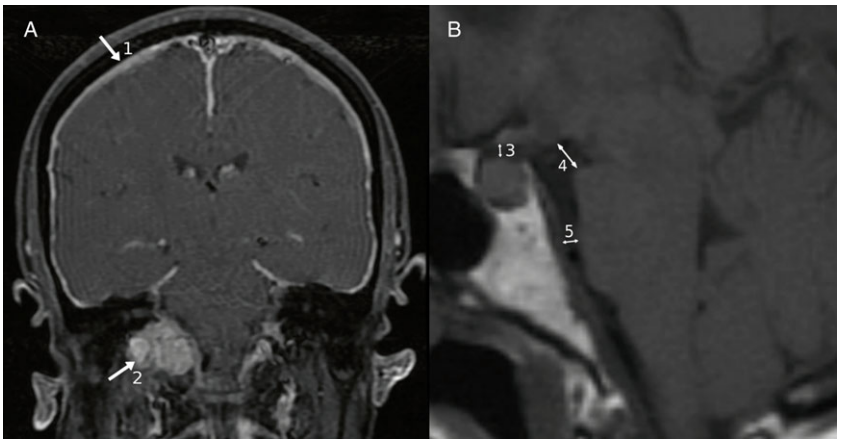

Figure 2: MRI features of intracranial hypotension following radiotherapy of jugular paraganglioma (arrow 2). Pachymeningeal thickening and enhancement (arrow 1) (A), reduced mamillopontine distance (arrow 4: 5.0 mm, pathologic ≤6.5), partial effacement of the prepontine and suprasellar cisterns (arrow 5: 3.0 mm, pathologic ≤5 mm; arrow 3: 2.4 mm, pathologic ≤4.0 mm) (B).[7]

In a large case series of 106 patients with spontaneous intracranial hypotension, 61% of patients had a normal CSF pressure.[6] Authors theorized that symptoms were secondary to intracranial hypotension relative to patient's baseline pressures or alternatively, that physiologic compensatory mechanisms normalized CSF pressure without resolving symptoms.[6] For our patient, 2 months of conservative management conferred symptomatic improvement in orthostatic headache and was associated with an increased opening pressure (20 cm H_2O) at the time of CT myelogram.

In the management of infiltrative epidural lesions, whether by resection or radiotherapy, dural defects are possible. Patients should be informed of the theoretical risk of CSF leak, and subsequent orthostatic headache should prompt investigation for intracranial hypotension. Future research in the form of large population studies, selecting for patients with infiltrative epidural lesions undergoing radiotherapy alone, could further characterize the risk of intracranial hypotension.

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Consent to Participate/Consent for Publication. Patient provided written consent for the case presentation and publication.

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