



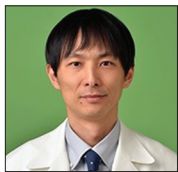
Case Report

Two cases of normal pressure hydrocephalus caused by ependymoma of the cauda equina

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ABSTRACT

Background: Normal pressure hydrocephalus (NPH) associated with tumors of the cauda equina is rare. Here, we report two cases of NPH attributed to cauda equina ependymomas.

Case Description: A 63-year-old male presented with progressive gait disturbance, dementia, and urinary incontinence. When the lumbar MR documented an intradural tumor involving the cauda equina at the L2-L3 level; the tumor was excised; pathologically, it proved to be a myxopapillary ependymoma. Postoperatively, however, the patient's continued gait disturbance led to a brain CT that documented ventricular dilation consistent with NPH; following ventriculoperitoneal (VP) shunt placement his symptoms improved. A 65-year-old female also presented with gait disturbance, dementia, and urinary retention. Here, procedures were performed in reverse. When a brain CT showed hydrocephalus, a VP shunt was placed. When symptoms persisted, a lumbar MR demonstrated a T12-L2 intradural tumor; following a lumbar laminectomy for tumor excision, symptoms stabilized. The pathological diagnosis was also consistent with a conus/cauda equina ependymoma. Over the next 10 years, the patient had residual bladder dysfunction (e.g., requiring straight catheterization), but had no shunt dysfunction.

Conclusion: We observed two cases of ependymomas of the cauda equina and brain CTs documenting NPH that was successfully surgically managed with stabilization of neurological deficit. In the first case, L2-L3 laminectomy for tumor removal was succeeded by shunting for NPH, while in the second case, initial VP shunting for NPH was followed by a T12-L2 laminectomy for tumor excision.

Keywords: Cauda equina, Ependymoma, Myxopapillary ependymoma, Normal pressure hydrocephalus, Spinal tumor

INTRODUCTION

Normal pressure hydrocephalus (NPH) associated with tumors of the cauda equina is rare.^[1,5] Here, we treated two patients with NPH and ependymoma of the cauda equina successfully treated with surgery: in the first case, the patient underwent lumbar decompressive L2-L3 surgery for tumor excision, followed by ventriculoperitoneal (VP) shunt placement for NPH, while in the second case, VP shunt placement for NPH was succeeded by T12-L2 laminectomy for tumor removal.

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CASE DESCRIPTION

Case 1

A 63-year-old male developed right lower extremity weakness over a 6-month period associated with gait disturbance, dementia, and urinary incontinence. The lumbar MR demonstrated an intradural tumor at the L2-L3 level involving the cauda equina: the lesion was hypointense on T1 and hyperintense on T2-weighted images, but due to renal failure, no contrast was administered [Figure 1a-c]. A head CT showed hydrocephalus/diagnosed as NPH [Figure 1d]. Gross total removal of the intradural reddish tumor that originated from a nerve root was accomplished [Figure 2a and b]. Pathologically, the lesion was a myxopapillary ependymoma [Figure 3]. Postoperatively, when the patient continued to demonstrate gait disturbance, a head CT showed hydrocephalus/diagnosed as NPH and required VP shunt placement [Table 1].

Case 2

A 65-year-old female also presented with gait disturbance, dementia, and urinary retention; her neurological examination only revealed an ataxic gait. The brain CT demonstrated ventricular dilation consistent with NPH and a VP shunt was placed [Figure 4a and Table 1]. However, as the urinary

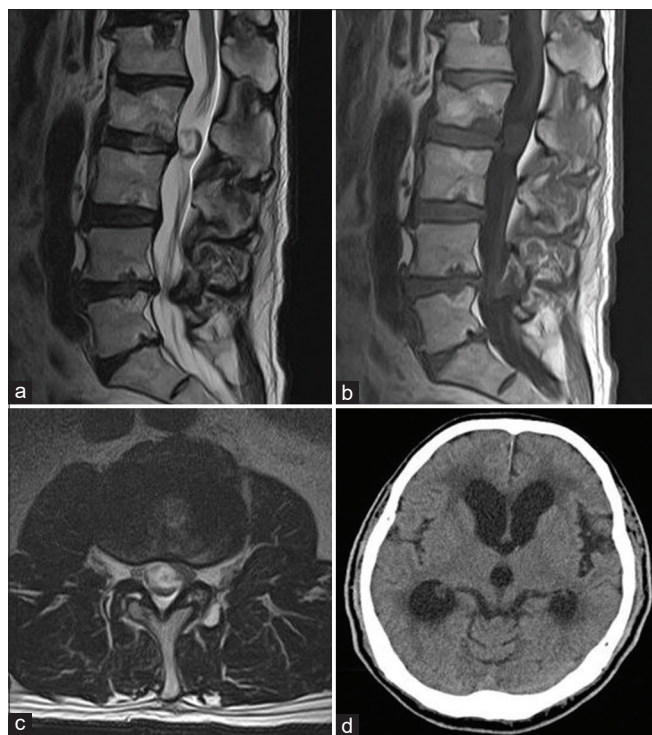


Figure 1: Radiographic findings of case 1. (a) T2 sagittal image showing an intradural extramedullary mass at the level of L2-L3. (b) T1 sagittal image. (c) T2 axial image. (d) Head computed tomography demonstrating enlargement of the ventricles.

retention/sphincter dysfunction persisted, a lumbar MRI was obtained; it shows an intradural T12-L2 tumor that was hypointense on T1 and hyperintense on T2-weighted images, and markedly enhanced with gadolinium [Figure 4b-e]. At surgery, although some cauda equina nerves were attached to the tumor, internal decompression was accomplished utilizing an ultrasonic aspirator and facilitated gross total tumor excision. Pathologically, the lesion was an ependymoma. Postoperatively, the patient's deficit remained unchanged, and she continues to self-urinary catheterize 10 years later.

DISCUSSION

NPH associated with tumors of the cauda equina is rare.^[1,5] While neurinomas frequently produce gradually progressive

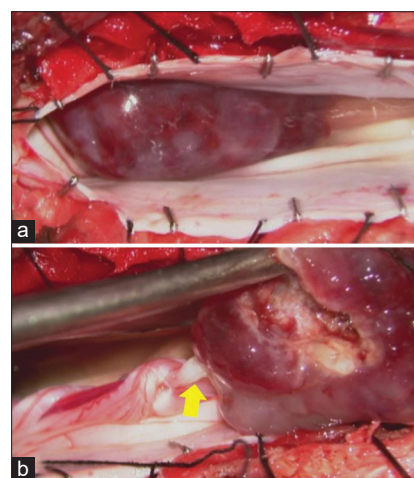


Figure 2: Intraoperative microscopic view. (a) A deep red-colored tumor can be seen. (b) The tumor originates from a cauda equina nerve (yellow arrow).

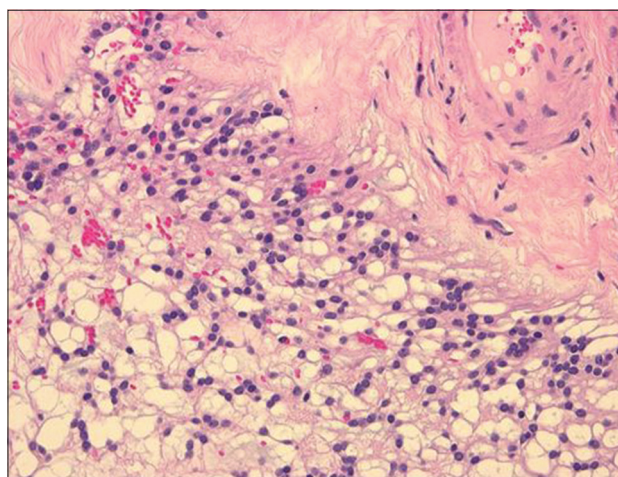


Figure 3: Hematoxylin and eosin stain high-power view ($\times 20$). Perivascular pseudorosettes were found from tumor cells tapering radial to blood vessels. Myxoid material is present within pseudorosettes.

Table 1: Clinical data on two patients with NPH and thoraco/lumbar ependymomas.

Patient	Age/sex	Brain CT	Localization of tumor	Surgery	CSF analysis before VP shunt		MMSE		The 10 m gait test time (seconds)		Other
					Pressure (mm H ₂ O)	Protein level (g/L)	At admission	At discharge	At admission	At discharge	
1	63/Male	NPH	L2-L3	1 st tumor removal 2 nd VP shunt	175	0.167	23/30	28/30	17.2	12.6	Self-urinary catheterize is case 2
2	65/Female	NPH	T12-L2	1 st VP shunt 2 nd tumor removal	80	1.80	24/30	25/30	13.0	5.0	



Figure 4: Radiographic findings of case 2. (a) Head computed tomography image demonstrating enlargement of the ventricles. (b) T2 axial image showing an intradural extramedullary mass at the L1. (c) T2 sagittal image. (d) T1 sagittal image. (e) T1 contrast-enhanced sagittal image.

hydrocephalus, ependymomas, including myxopapillary thoraco/lumbar ependymomas, can also contribute to hydrocephalus/intracranial hypertension (ICH).^[3,4] Treatment of ICH may warrant ventriculoperitoneal shunting and tumor excision in varying sequences.^[2,5] Here, in case 1, NPH did not improve after L2-L3 ependymoma tumor was removed, and warranted secondary, VP shunt placement. Alternatively, in case 2, initial VP shunt placement did not resolve the patient’s complaints, and secondary T12-L2 laminectomy for excision of the cauda equina ependymoma was necessary.

CONCLUSION

Here, we presented two cases of cauda equina ependymomas that contributed to increased intracranial pressure (e.g., consistent with NPH). The first patient required primary thoracolumbar/lumbar L2-L3 ependymoma tumor excision followed by secondary VP shunting, while in the second case, initial VP shunting was succeeded by T12-L2 laminectomy for tumor removal.

Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent.

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Nil.

Conflicts of interest

There are no conflicts of interest.

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