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# Spinal coning after lumbar puncture in a patient with undiagnosed giant cervical neurofibroma

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### Abstract

Lumbar puncture in the presence of an intracranial tumor with raised intracranial pressure is known to have catastrophic consequences due to herniation of intracranial contents through the tentorial hiatus or foramen magnum. There are relatively few case reports about the same sequence of events when lumbar puncture is performed below the level of a complete spinal block. The mechanism of such deterioration is also subject to conjecture as the spinal cord (unlike the uncus or cerebellar tonsils) is tethered by the dentate ligament and roots on either side, and is hence less mobile. We present one such case of spinal coning and review the available literature.

### Key Words

Cervical neurofibroma, lumbar puncture, spinal coning

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### Introduction

Spinal coning is relatively rarely reported in literature compared to its intracranial counterpart. The majority of cases have been reported in conjunction with lumbar puncture in extradural compression - particularly bony secondaries. The causes of such neurological deterioration are not clearly delineated - relative movement of the cord with respect to the lesion and vice versa have both been speculated as being causative.

### Case Report

A 34-year-old man presented to a general physician with complaints of lower limb weakness and inability to stand that was worsening over 2 weeks. He had no sensory deficits. All reflexes were hypoactive. There was no sphincter involvement. A diagnosis of Guillain-Barre syndrome was made. He underwent lumbar puncture following which his weakness markedly worsened within 2 h, along with loss of lower limb sensation as well. Furthermore, he developed urinary retention and had to be catheterized. The lumbar puncture

was essentially normal except for marginally elevated protein levels. Opening pressure was not documented.

A computed tomography (CT) brain was done and was found to be normal. He then underwent magnetic resonance imaging (MRI) of the cervical and dorsal spines and was found to have an extramedullary intradural lesion with obliteration of the spinal subarachnoid space extending from C3-C4 to D3 levels [Figures 1-3].

On admission to our institute, he was found to have Grade 3/5 power in bilateral biceps and deltoids with complete loss of power (Grade 0/5) in all other muscles of both lower and upper limbs. He had complete loss to all modalities of sensation below D5 dermatome. He was referred to our hospital where he underwent C2 to D3 laminoplasty and total excision of the lesion [Figure 4]. The lesion was intradural but extramedullary. It was present posterior to the denticulate ligament and anterior to the dorsal roots, and was attached to a dorsal rootlet at C6 level. It had a good arachnoid plane all around with no extraforaminal extension.

Histopathology was reported as a neurofibroma.

He had slow postoperative improvement, and recovered motor power, sensory capabilities, and sphincter control over 1 year. After 8 years, except occasional neck pain he has no deficits.

### Discussion

Neurological deterioration following lumbar puncture can

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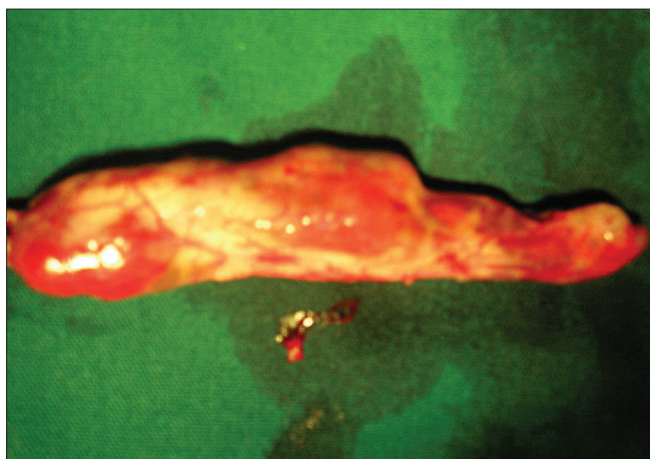
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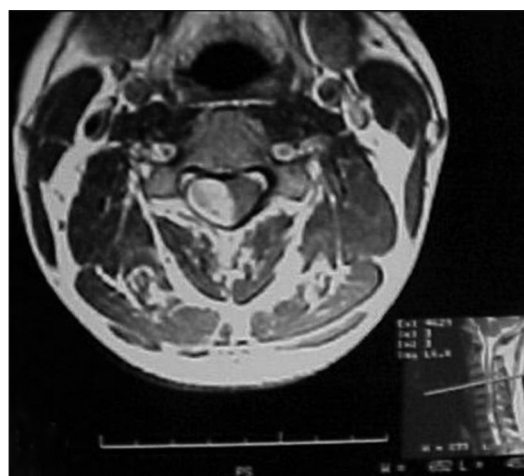
**Figure 1:** T2 sagittal image showing a partially solid and cystic mass extending from C3–C4 disc space to D3 body level



**Figure 2:** Coronal images showing a right-sided cervicodorsal lesion enhancing on contrast except at center and pushing cord to the left



**Figure 4:** Postoperative tumor specimen with solid and cystic areas



**Figure 3:** Axial images showing well-margined lesion lying to the right side of the cord

be due to a variety of reasons. Nerve root injury, inadvertent damage to a low-lying cord, spinal epidural hematoma, and drug- and dosage-related complications have all been described. Far less common is the deterioration in the presence of a spinal tumor.

Various mechanisms are speculated for neurological worsening in this setting. Eaton and Craig (1940) first reported lumbar puncture causing sudden paralysis in a patient with an extramedullary spinal tumor.<sup>[1,2]</sup> Elsberg held that the removal of the CSF buffer between the cord and the tumor caused the former to fall on the latter and injure it.<sup>[1]</sup> Another theory is that egress of CSF from the site of lumbar puncture may cause epidural venous engorgement in the low-pressure compartment below with compromise of venous drainage of cord.<sup>[2]</sup> Drug-induced hypotension (in cases of spinal anesthesia) with concomitant spinal cord ischemia has also been proposed as a cause of neurological deterioration.

The term spinal coning was coined by Jooma and Hayward<sup>[1]</sup> in 1984. They described four cases where relief of hydrocephalus by shunt placement caused spinal cord dysfunction, and

on investigation, the patients were found to have spinal tumors as well. Though in their series deterioration followed decompression of the pressure in the cranial compartment, they suggested that the term can be used for neurological deterioration following CSF removal below the level of the spinal lesion as well.

Spinal coning is due to the movement of spinal tumor or cord<sup>[1]</sup> relative to each other due to sudden change of pressure differences above and below the level of block, which may cause impaction of the tumor against the cord and neurological deterioration. This impaction can explain worsening in intradural extramedullary tumors. The spinal cord, though fixed by the roots and dentate ligament, does have the capability of some small movement (highlighted by Jooma *et al.*<sup>[1]</sup>) – that can happen with flexion/extension and deep breathing – and this relative movement of cord with respect to the lesion may cause shearing of neural tissue and deterioration after spinal tap in extradural tumors.

**Table 1: Reports of neurological deterioration following lumbar puncture**

Author	Year	No of cases	Location of lesion	Nature of lesion
Hollis <sup>[2]</sup>	1986	7	Extradural (6), intradural extramedullary (1)	Abscess (1) Metastatic (4) Osteoblastoma (1) Neurofibroma (1)
Mutoh <sup>[3]</sup>	1991	1	Extradural	Metastatic
Morgan <sup>[4]</sup>	1994	1	Extradural	Metastatic
Appelgren <sup>[5]</sup>	1997	3	Extradural	Metastatic
Doh <sup>[7]</sup>	2001	1	Extradural	Cervical disc prolapse
Karmaz <sup>[6]</sup>	2002	1	Extradural	Metastatic
Karaaslan <sup>[8]</sup>	2006	1	Extradural	Tuberculosis
Kim <sup>[9]</sup>	2010	1	Intradural extramedullary	Meningioma
Dureja <sup>[10]</sup>	2010	1	Intradural extramedullary	Meningioma

In the only available study on the frequency of occurrence of this complication, Hollis *et al.*<sup>[1]</sup> compared the incidence of neurological deterioration following myelography in two sets of 50 patients each – those who had a C1-C2 puncture versus those who had a lumbar puncture. They concluded that the incidence of neurological deterioration due to spinal coning following lumbar puncture in patients below a complete spinal block is at least 14% (7 out of 50 cases).

Most of the reports<sup>[3-9]</sup> in literature are descriptions of inadvertent complications encountered during spinal anesthesia (either via lumbar puncture or epidural block) for some non-spinal surgery or myelography [Table 1]. In our case, however, lumbar puncture had been done as a diagnostic tool.

The vast majority of lesions were found to be metastatic extradural lesions,<sup>[3-6]</sup> but benign extradural pathologies like cervical disc prolapse and tuberculosis also find mention.<sup>[7,8]</sup> Less frequently described are intradural extramedullary tumors like the present case.<sup>[2,9,10]</sup>

We found only one case report from India in the *Indian Anesthetists' Forum*, an online journal.<sup>[10]</sup> The authors report a patient with a cervicodorsal meningioma, who was found to have weakness of lower limbs after undergoing spinal anesthesia for arthroscopy. The patient underwent spinal tumor removal with satisfactory recovery.

To conclude, in all the case reports we found, the spinal lesion was incidentally diagnosed following development of neurodeficits after the lumbar or epidural puncture. It would never be cost-effective or rational to subject every patient to

an MRI of the spine before a lumbar puncture, but as urgent surgery subsequent to spinal coning in benign pathologies has yielded good results, one must be aware of this entity and carefully examine patients after epidural or lumbar punctures to see for development of fresh deficits and decide on further management.

We also highlight the need for careful clinical examination by which unnecessary investigations like lumbar puncture or CT scan can be avoided in such patients.

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