

# Acute Paraplegia Following Lumbar Puncture in a Patient with Cervical Disc Herniation

- Case Report -

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= Abstract =

경추간판탈출증 환자에서 요추천자후에 발생한 급성 양하지마비  
- 증례보고 -

도재원 · 황선철 · 윤석만 · 배학근 · 이경석 · 윤일규 · 최순관 · 변박장

The incidence of paraplegia following drain of cerebrospinal fluid (CSF) by lumbar puncture below a spinal block is rare, and most of them occurred in spinal tumor. We report a case of acute paraplegia following lumbar puncture for computed tomography myelography (CTM) in a 42-year-old man who sustained a cervical disc herniation. Four hours after lumbar puncture for CTM, sudden paraplegia was developed. After emergent anterior cervical discectomy and fusion with cervical plating, the patient recovered completely. To the authors' knowledge, this is the first case of spinal shock complicating lumbar puncture for routine myelography in a patient with cervical disc herniation. The prompt recognition of this unusual complication of lumbar puncture may lead to good clinical outcome. Instead of CTM requiring lumbar puncture, MRI should be considered as the initial diagnostic procedure in a patient of cervical disc herniation associated with myelopathy. We discuss the possible mechanisms of acute paraplegia following lumbar puncture with literature review.

**KEY WORDS :** Lumbar puncture · Myelography · Paraplegia · Cervical disc herniation.

## Introduction

The danger of neurological deterioration after lumbar puncture performed below a spinal space-occupying lesion is not well recognized compared to intracranial mass lesion. The acute onset of neurological deterioration after lumbar puncture has been known in some cases of spinal cord tumor<sup>2)3)7-10)</sup>. However, acute rupture of an intervertebral disc associated with neurological worsening following lumbar puncture for myelography is very rare. Only one

such case of thoracic disc has been previously reported<sup>6)</sup>. To date, this is the first report of acute paraplegia complicating lumbar puncture in a patient with cervical disc herniation. The acute change in CSF pressure subsequent to lumbar puncture below the level of the lesion may lead to impaction of spinal mass against the spinal cord. This phenomenon has been referred to as "spinal coning"<sup>3)4)</sup>. We speculate that spinal coning was related to acute neurological deterioration in this patient. We report a case of spinal coning complicating lumbar puncture in a patient with cervical disc herniation.

## Case Report

### 1. Presentation

This 42-year-old male farmer was admitted because of neck pain and both arm pain for 10 days. Three days before admission, paresthesia of both leg was newly developed. However he could walk slowly without support.

### 2. Examination

The patient's general physical examination was normal. On neurological examination, he has T6 sensory level to all modalities and symmetrical hyperreflexia of lower extremity. Pathologic reflex was absent bilaterally. At admission, Japanese Orthopedic Association (JOA) score was 12 points. Plain x-ray films of the cervical and thoracic spines were normal. In order to discern correct level of lesion and cause of myelopathy, a myelogram with CT scan was performed. A lumbar puncture was done uneventfully at the L3-L4 level. Immediately after lumbar puncture for myelography, the patient reported newly-developed severe paresthesia of both leg. One hour after myelography, the patient can't void by himself. Four hours after lumbar puncture, T4 sensory level paraparesis (motor Grade 2) was demonstrated. Myelogram and CT scan showed complete subarachnoid block at the C6-C7 level (Fig. 1). MRI demonstrated ruptured cervical disc causing a cord compression (Fig. 2). Six hours after lumbar puncture, just before the emergent surgery, the patient had been aggravated to spinal shock with T4 sensory anesthesia and complete paraplegia except intact anal reflex (JOA score 5).

### 3. Operation

Emergent operation was done using an operating microscope. A standard left anterior cervical approach was performed at C6-C7 level. Although all disc tissue of C6-7



Fig. 2. Contrast-enhanced sagittal T1-weighted MRI taken 5 hours after myelogram showing ruptured cervical disc causing a cord compression in C6-7 level. Thin contrast enhancement is noted around the periphery of the extruded disc material.

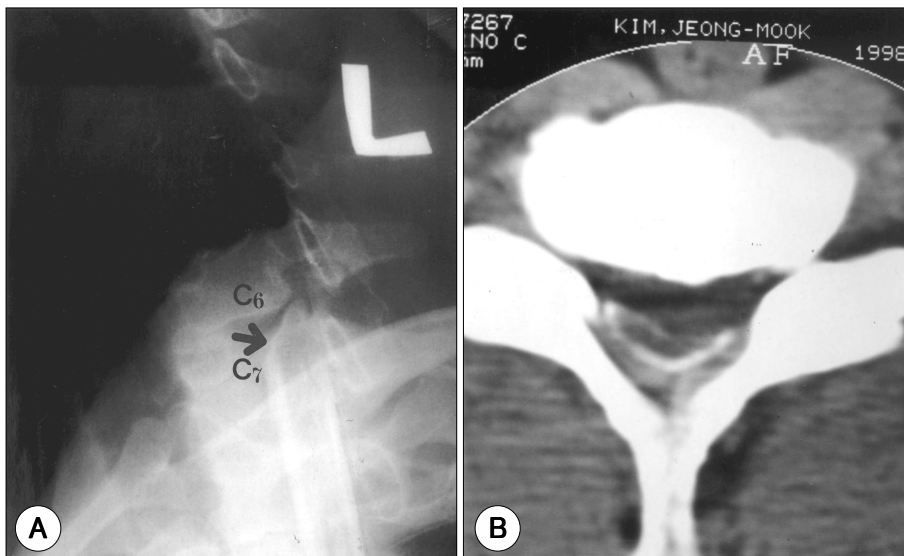


Fig. 1. A : Oblique cervical myelogram showing complete block of contrast column at the level of C6-7 (arrow). B : Spinal CT scan taken 4 hours after myelogram showing marked compression of spinal cord by the ruptured disc material, especially left side.

was totally removed, dural pulsation was not visible through ruptured site of posterior longitudinal ligament(PLL). After additional incision along the ruptured site of PLL, four pieces of sequestrated disc materials were removed. The 4 x 3 cm sized largest one was located to left side of spinal canal(Fig. 3). After confirmation of normal dural pulsation, autologous interbody bone fusion and cervical plate fixation was followed.

**4. Postoperative course**

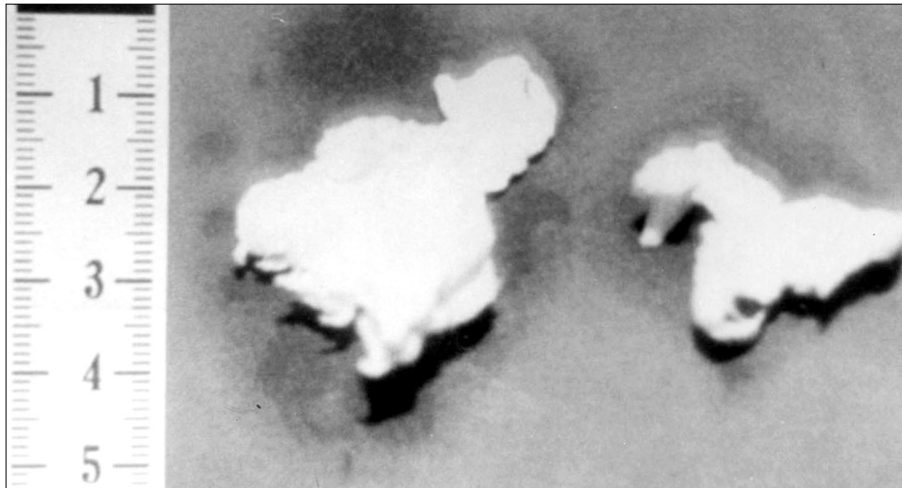
Paresthesia of both leg was promptly resolved after surgery. Although immediately improved, his preoperative paraplegia required 3 months to resolve completely. He returned to his occupation as a farmer 3 months after surgery. At present, 32 months postoperatively, he could enjoy swimming ; however, some sensory paresthesia of both thigh persist(JOA score 16).

**Discussion**

Most clinicians have recognized the dangers of lumbar puncture in the presence of raised intracranial pressure from

a mass lesion. However, danger of neurological deterioration after lumbar puncture performed in the presence of spinal cord compression was not well recognized. The first report of neurological worsening after lumbar puncture was with an spinal epidural neurofibroma in 1940<sup>2)</sup>. Hollis et al.<sup>3)</sup>, reviewed 50 patients with complete spinal subarachnoid block undergoing lumbar puncture for myelography. They reported that the incidence of neurological deterioration after lumbar puncture below a spinal block is at least 14%. Most common spinal disease as a cause of neurological deterioration after lumbar puncture was a spinal tumor<sup>2)3)7-10)</sup>. Herniated disc was a very rare disease causing neurological deterioration following lumbar puncture for routine myelography. Only one such case of thoracic disc herniation was reported to date<sup>6)</sup>. To authors' knowledge, this is the first report of acute paraplegia complicating lumbar puncture in a patient with cervical disc herniation.

As a mechanism of neurological deterioration after lumbar puncture below a complete spinal subarachnoid block, so-called "spinal coning" was proposed. The spinal coning was defined as impaction of a spinal mass against the spinal cord after removal of CSF<sup>4)</sup>. The spinal coning results



**Fig. 3.** Photograph showing removed sequestrated disc materials. Intraoperatively four pieces of sequestrated disc materials were removed through ruptured posterior longitudinal ligament. The largest one was large as 4 x 3cm in size.

**Table 1.** Summary of reported cases of acute paraplegia after lumbar puncture

Authors	Year	Preoperative myelopathy	Block level	Diagnosis	Time interval*	Treatment	Outcome
Eaton, et al	1940	yes	C3	Neurofibroma	Sudden	Surgery	Improved
Hollis, et al	1986	yes	T4	Prostatic carcinoma	30 minutes	?	?
Sebugwawo, et al	1987	yes	T6	Angiolipoma	3 hours	Surgery	Improved
Blatt, et al	1988	yes	T10	Disseminated malignancy	2 hours	Conservative	Unchanged
Lehman	1989	no	T10-11	Thoracic disc	several minutes	Surgery	Improved
Wong, et al	1992	no	T7	Chloroma	2 hours	Conservative	Dead
Present case	1999	yes	C7	Cervical disc	4 hours	Surgery	Improved

\* : Time Interval : duration from lumbar puncture to paraplegia

from compartmental pressure differences. Above a spinal mass, CSF is produced and absorbed at normal rates that maintain a pressure within a physiologic range. The presence of spinal mass may impair flow of CSF. Below a spinal mass causing a complete block, there is a low-pressure compartment isolated from that above the tumor. Removing CSF by lumbar puncture below a complete spinal subarachnoid block exacerbates the already dangerous pressure differences above and below the mass. Consequently impaction of spinal mass against the spinal cord is followed. In the present case, we speculate that neurological deterioration was caused by cord impaction due to shift in the position of pre-existent ruptured cervical disc following lumbar puncture.

The other mechanisms also may play a role. One possible mechanism is epidural venous engorgement exacerbated by reduction of intrathecal pressure after CSF release. This engorgement further compromise venous drainage from the spinal cord below the mass, resulting in cord swelling and increasing the degree of compression<sup>3,4)</sup>. Hayward<sup>4)</sup> also postulated that physiologic movement of cord itself may adversely affect cord function after CSF removal. Although the cord was anchored by the dentate ligament, the cord has a small range of mobility expressed during flexion-extension movement of spine and deep breathing.

Onset time of neurological deterioration after lumbar puncture was variable. In the Hollis series, most patients had slowly worsened in periods ranging from 1 to 4 days<sup>3)</sup>. This observation of slow onset of neurological worsening attests to the continued leakage of CSF from the puncture site over the succeeding few days. However, rapid onset of paraplegia within several hours after lumbar puncture was very rare such that only six cases have been reported sporadically (Table 1). We speculate that lumbar puncture precipitated sudden and severe spinal cord impaction in these patients due to acute change in CSF pressure occurring subsequent to lumbar puncture. The prompt recognition and surgical decompression of this unusual complication of lumbar puncture may lead to good clinical outcome<sup>2,6,9)</sup>.

To prevent downward spinal coning after lumbar puncture, Morgan et al.<sup>7)</sup>, proposed that lumbar puncture should only be performed above the level of lesion, rather than at the same level or below. Hollis et al.<sup>3)</sup>, also recommended a C1-2 puncture for myelography, in their study, there was no neurological deterioration after a C1-2 puncture while

14% of lumbar puncture group had significant deterioration. However, both benefits and risks of a C1-2 puncture should be considered because many serious complications of lateral C1-2 puncture had been reported<sup>5)</sup>. Sebugwawo et al.<sup>9)</sup>, emphasized that clinicians must consider spinal coning before undertaking lumbar puncture as part of myelography although this complication is an unusual event. Wong et al.<sup>10)</sup>, suggested advantage of MRI over myelography to avoid the risk of spinal coning.

## Conclusions

Downward spinal coning is a potentially dangerous complication of lumbar puncture below the spinal mass causing subarachnoid block. The prompt recognition of this unusual complication of lumbar puncture may lead to good clinical outcome. To prevent this potential complication of myelography, MRI should be considered as the initial diagnostic procedure when cord compression is obvious or suspected in the patient with spinal mass.

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