

Intracranial hypotension as a complication of lumbar puncture prior to elective aneurysm clipping

Jian Guan, William T. Couldwell, Philipp Taussky

Department of Neurosurgery, Clinical Neurosciences Center, University of Utah, 175 N. Medical Dr. East, Salt Lake City, UT 84132, USA

E-mail: Jian Guan - jian.guan@hsc.utah.edu, William T. Couldwell - william.couldwell@hsc.utah.edu; *Philipp Taussky - phil.taussky@hsc.utah.edu

*Corresponding author:

Received: 14 January 14 Accepted: 26 Jun 14 Published: 26 September 14

This article may be cited as:

Guan J, Couldwell WT, Taussky P. Intracranial hypotension as a complication of lumbar puncture prior to elective aneurysm clipping. *Surg Neurol Int* 2014;5:S427-9.

Available FREE in open access from: <http://www.surgicalneurologyint.com/text.asp?2014/5/10/427/141751>

Copyright: © 2014 Guan J. This is an open-access article distributed under the terms of the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original author and source are credited.

Abstract

Background: Lumbar dural defects are an uncommon but important cause of persistent intracranial hypotension in the neurosurgical population. We present a case of intracranial hypotension after elective craniotomy due to a lumbar puncture performed 3 weeks earlier.

Case Description: A 55-year-old female underwent uneventful craniotomy for clipping of an unruptured left middle cerebral artery bifurcation aneurysm. Postoperatively, the patient showed a gaze deviation and failed to wake up. Computed tomography demonstrated significant postoperative pneumocephalus. Family members indicated that the patient underwent a lumbar puncture 3 weeks prior to surgery to rule out a subarachnoid hemorrhage. The excessive pneumocephalus was initially interpreted as a result of spinal cerebrospinal fluid leak, and the patient was placed in the Trendelenburg position. This positioning resulted in some improvement in her mental status, although she was unable to tolerate any subsequent elevation in the head of her bed. Magnetic resonance imaging analysis of her spinal axis did not demonstrate any evidence of cerebrospinal fluid leak, but a subsequent lumbar blood patch resulted in rapid and dramatic improvement in the patient's status. She was subsequently discharged after an uneventful hospital stay.

Conclusion: Although uncommon, persistent intracranial hypotension caused by lumbar dural defects must be considered in patients who have recently undergone procedures that compromise the lumbar dura because prompt intervention can significantly improve the patient's condition.

Key Words: Defect, intracranial hypotension, lumbar dura, lumbar puncture, tension pneumocephalus

Access this article online

Website:

www.surgicalneurologyint.com

DOI:

10.4103/2152-7806.141751

Quick Response Code:



INTRODUCTION

Intracranial hypotension is an uncommon, but well-described sequela of lumbar access procedures.^[2] Symptoms of persistent cerebrospinal leak from the access

site range from transient orthostatic headache to cranial nerve palsies.^[3] We present a case of persistent intracranial hypotension that developed after craniotomy for clipping of an unruptured aneurysm preceded by a lumbar puncture 3 weeks earlier.

CASE REPORT

A 55-year-old female who began to experience severe headaches, dizziness, and nausea was admitted to an outside hospital for evaluation. During the course of these investigations, an unruptured left middle cerebral artery bifurcation aneurysm was discovered. The patient's history includes multiple family members whose deaths resulted from ruptured cerebral aneurysms. The patient's symptoms improved without intervention, except for her headache, which, although improved, remained severe.

After extensive consideration with the patient, she presented 3 weeks later for craniotomy for clipping of her aneurysm at our institution. The procedure proceeded uneventfully, and the aneurysm was successfully clipped. Postoperatively, the patient was extremely lethargic and was unable to follow commands or be safely extubated. The patient was taken to the neurocritical care unit and closely monitored for improvement. During this time, the patient's examination slowly improved and initial plans for emergent imaging were postponed. Approximately 5 h after surgery, however, the patient was noted to no longer be following commands and had developed a left lateral and inferior gaze deviation.

A computed tomography (CT) scan of the brain showed significant pneumocephalus [Figure 1]. The patient was immediately placed in the Trendelenburg position and 100% oxygen was administered via her ventilator. The patient's family indicated that the initial workup at the outside facility included a diagnostic lumbar puncture. The patient's neurological status improved overnight, and by the morning she was once again able to follow commands and had resolution of her gaze deviation. Subsequent attempts to slowly raise the patient to a seated position, however, were unsuccessful, with a rapid decline in the patient's mental status each time her head was raised. A repeat CT showed near-complete resolution of her pneumocephalus [Figure 2], but her persistent symptoms prompted us to use magnetic resonance imaging (MRI) of her cervical, thoracic, and lumbar spine to assess whether she had a cerebrospinal fluid leak [Figure 3]. No leak was readily identified on these studies, but, because of the high level of clinical suspicion for a persistent lumbar dural defect, a blood patch procedure was undertaken.

After the blood patch procedure, the patient's neurological status improved dramatically, with extubation occurring the following morning and a return to her baseline neurological status within 24 h. The patient was subsequently discharged without any persistent deficits.

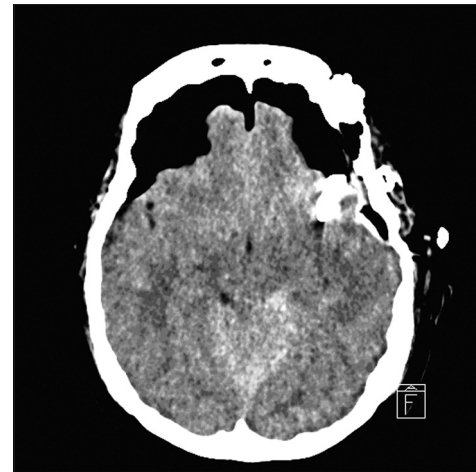


Figure 1: Axial CT obtained immediately after surgery demonstrating significant pneumocephalus



Figure 2: Follow-up axial CT scan demonstrating interval resolution of pneumocephalus after placement in the Trendelenburg position and 100% oxygen administration



Figure 3: Sagittal MRI of cervical, thoracic, and lumbar spine obtained to evaluate the patient for a possible cerebrospinal fluid leak. No obvious source of leakage was identified

DISCUSSION

Persistent intracranial hypotension is a known complication of dural access procedures including lumbar puncture,^[2] lumbar drain placement,^[3] epidural steroid injections,^[12] and epidural catheter placement.^[11] Although it often presents only as postural headaches, serious complications including cranial nerve palsies,^[3,11] venous thrombosis,^[6] and spinal epidural hematomas^[4] have been reported. In our case, the patient's family noted that she continued to have persistent headaches through the day of surgery following her lumbar puncture at the outside facility, but because her initial reason for presentation was headache, there was little suspicion of any relationship between this symptom and her lumbar puncture.

Management of intracranial hypotension is complicated by difficulties in diagnosis. Many patients, like ours, present with headaches, making a headache due to persistent cerebrospinal fluid leak more difficult to diagnose.^[7] Although imaging can be of assistance, findings such as dural thickening and cerebellar tonsil descent can be nonspecific,^[2] and the sensitivity and specificity of conventional MRI for discovering cerebrospinal fluid leak can be as low as 50%.^[9] A low index of suspicion for persistent intracranial hypotension can also lead to misdiagnosis of other, more widely known complications of dural access such as meningitis, thus delaying treatment.^[11] The frequent presence of postoperative pneumocephalus can also lead to the diagnosis of tension pneumocephalus in this population, especially since a persistent cerebrospinal leak can lead to the so-called "inverted bottle phenomenon,"^[13] resulting in greater than normal volumes of postoperative air in the cranial vault. The differentiation between these two diagnoses is especially important as the treatment for tension pneumocephalus—emergent burr hole and evacuation of trapped air—can exacerbate the effects of a cerebrospinal fluid leak.

Treatment for persistent intracranial hypotension due to cerebrospinal fluid leak is often conservative. Measures such as bed rest can allow the defect to close, while caffeine can ameliorate symptoms.^[8] When such measures fail, treatment with autologous epidural blood patch remains the initial invasive treatment of choice,^[1] although one with its own associated complications.^[5] In rare cases, surgery to repair persistent leaks with the assistance of myelography may be necessary.^[10]

REFERENCES

1. Bezov D, Ashina S, Lipton R. Post-dural puncture headache: Part II—prevention, management, and prognosis. *Headache* 2010;50:1482-98.
2. Burns J, Scheinfeld MH. Back to the scanner: Expected and unexpected imaging findings following spinal puncture and access. *Emerg Radiol* 2013;20:291-7.
3. Cain RB, Patel NP, Hoxworth JM, Lal D. Abducens palsy after lumbar drain placement: A rare complication in endoscopic skull base surgery. *Laryngoscope* 2013;123:2633-8.
4. Cha KH, Cho TG, Kim CH, Lee HK, Moon JG. Spinal epidural hematoma related to intracranial hypotension. *Korean J Spine* 2013;10:203-5.
5. Han IB, Ropper AE, Teng YD, Ryou YH, Kim O. Bladder and bowel dysfunction following small-volume epidural blood patch for spontaneous intracranial hypotension. *J Clin Neurosci* 2013;20:325-8.
6. Kate MP, Thomas B, Sylaja PN. Cerebral venous thrombosis in post-lumbar puncture intracranial hypotension: Case report and review of literature. *F1000Res* 2014;3:41.
7. Louhab N, Adali N, Laghmari M, Hymer WE, Ben Ali SA, Kissani N. Misdiagnosed spontaneous intracranial hypotension complicated by subdural hematoma following lumbar puncture. *Int J Gen Med* 2014;7:71-3.
8. Lunsford LD, Maroon JC, Sheptak PE, Albin MS. Subdural tension pneumocephalus—Report of two cases. *J Neurosurg* 1979;50:525-7.
9. Mammis A, Agarwal N, Mogilner AY. Alternative treatment of intracranial hypotension presenting as postdural puncture headaches using epidural fibrin glue patches: Two case reports. *Int J Neurosci* (In press).
10. Mokri B. Spontaneous cerebrospinal fluid leaks: From intracranial hypotension to cerebrospinal fluid hypovolemia—evolution of a concept. *Mayo Clin Proc* 1999;74:1113-23.
11. Schievink WI, Maya MM. Ventral spinal cerebrospinal fluid leak as the cause of persistent post-dural puncture headache in children. *J Neurosurg Pediatr* 2013;11:48-51.
12. Sudhakar P, Trobe JD, Wesolowski J. Dural puncture-induced intracranial hypotension causing diplopia. *J Neuroophthalmol* 2013;33:106-12.
13. Sykes KT, Yi X. Intracranial hypotension headache caused by a massive cerebrospinal fluid leak successfully treated with a targeted C2 epidural blood patch: A case report. *Pain Physician* 2013;16:399-404.