Spine Publish Ahead of Print
DOI: 10.1097/BRS.0000000000001074

Obstructive Hydrocephalus Due to Intraventricular Hemorrhage Following Incidental Durotomy during Lumbar Spine Surgery

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The manuscript submitted does not contain information about medical device(s)/drug(s). No funds were received in support of this work. Relevant financial activities outside the submitted work: consultancy, grants, royalties, stocks.

ABSTRACT

Study Design: Case report and review of literature.

Objective: To present an exceedingly rare occurrence of obstructive hydrocephalus (HCP) secondary to intraventricular hemorrhage (IVH) after incidental durotomy during lumbar spine surgery.

Summary of Background Data: Incidental durotomies are uncommon but well recognized complications associated with spine surgery. While mostly considered benign with no untoward clinical sequele, it can be symptomatic and present with spinal headaches, pseudomeningoceles, wound infection, meningitis and rarely intracerebral hemorrhage.

Methods: A 76-year-old woman underwent L3-S1 laminectomies and fusion for lumbar spondylosis and stenosis. Intraoperatively, a small incidental durotomy was encountered and primarily repaired.

Results: The patient developed altered mental status on post-operative day 2. Computed tomography of the brain revealed obstructive hydrocephalus and IVH. The patient was immediately transferred to the neurosurgery intensive care unit and an external ventricular drain (EVD) was placed emergently with high opening pressure. Her mental status improved immediately after cerebral spinal fluid diversion. The EVD was successfully removal after 8 days. The patient made a full recovery and was discharged in stable condition.

Conclusions: Obstructive hydrocephalus following intraventricular hemorrhage is an exceptionally rare but potentially life-threatening complication of incidental durotomies. Spine surgeons should be aware of this rare but serious complication.

Key Words:

Hydrocephalus, intraventricular hemorrhage, incidental durotomy, complication, spine surgery, spinal fusion, laminectomies, dural tear, CSF leak, external ventricular drain, back pain

Level of Evidence: 4

Mini Abstract:

Obstructive hydrocephalus due to intraventricular hemorrhage is a rare but life-threatening complication of incidental durotomy after lumbar spine surgery. Early recognition and prompt treatment of obstructive hydrocephalus can minimize potential morbidity/mortality and lead to complete recovery.

Key Points:

- Rare but potentially dangerous complications can occur following incidental durotomies.
- Incidental durotomies should be primarily repaired whenever possible.
- Patients with incidental durotomies should be monitored closely for signs and symptoms that could indicate rare but life threatening complication such as hydrocephalus.
- Early recognition and prompt treatment of hydrocephalus can lead to complete recovery.

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Introduction

Incidental durotomies are an uncommon but well recognized complication associated with spine surgeries with an estimated incidence ranging from 1.6% to 17.4%.[1–4]Fortunately, most patients with incidental durotomies are asymptomatic and have a benign post-operative course.[1,2,5,6]Symptomatic patients usually present with spinal headaches, nausea/vomiting, cerebral spinal fluid (CSF) leak,CSF-cutaneous fistula pseudomeningocele wound infection,and rarely meningitis or even intracranial hemorrhage(ICH).[1,2,7–9]Obstructive hydrocephalus as a complication of incidental durotomy after lumbar spine surgery is extremely rare.[10,11]We encountered an exceedingly rare case of obstructive hydrocephalus secondary to intraventricular hemorrhage (IVH) following an inadvertent durotomy during lumbar fusion surgery.

Case Report

A 76-year-old woman with low back and leg pain underwent L3-S1 laminectomies and posterolateral fusion**(Figure 1A)** for diffuse lumbar spondylosis and stenosis.Intraoperatively,a small incidental durotomy occurred at the L4 level during bone removal with a Kerrison rongeur. **(Figure 1B)**The dural defect was primarily repaired with 6-0 Prolene and a watertight closure was confirmed with Valsalva maneuver.Remaining parts of the surgery were uneventful.Immediately after surgery,the patient was neurologically intact and she was kept on flat bed rest for 24 hours.However, the patient became obtunded on post-operative day 2 with a Glasgow Coma Score of 9.Computed tomography(CT) of the brain revealed gross enlargement

of lateral and third ventricles**(Figure 2A)**along with IVH within the cerebral aqueduct and fourth ventricle **(Figure 2B)** consistent with obstructive hydrocephalus.

The patient was immediately transferred to the neurosurgery ICU and an external ventricular drain(EVD) was placed with high opening pressure**(Figure 3**).The patient had dramatic improvement in mental status after CSF diversion and soon returned to her neurological baseline.Vascular studies of the entire neural axis were negative for any vascular abnormality. The CSF drainage was continued for 8 days.The EVD are removed after she passed the clamp trial without the need for a ventriculoperitoneal shunt. The patient recovered completely and was discharged in a stable condition.

Discussion

Incidental durotomies are a well-recognized complication associated with spine surgery. The management strategies vary greatly amongst spine surgeons.[1,2,6,12]While flat bed-rest is employed by most surgeons,the optimal length of recumbence has not been well defined.Recent studies have shown increased morbidity associated with prolonged bedrest[13] and good clinical outcome with early mobilization(<24 hours).[2]Even though most patients with incidental durotomies have a benign course with its occurrence often considered inconsequential,[5,6] serious complications such as wound infection, meningitis and ICH are not unusual.[1,2,7–9]While there are very few reports of ICH following durotomy diagnosed secondary to their symptomatic nature,the exact incidence is difficult to estimate as a number of such cases goes unnoticed because of their asymptomatic course.This can be envisaged from the discrepancy between the incidence of remote cerebellar hemorrhage(0.08%) and incidental durotomies(1.6% to

17.4%).[1,2,10]In the setting of metastatic spinal tumor cases,intradural spread of malignancy has been reported after incidental durotomy.[14]These rare but potentially serious complications have prompted most spine surgeons to attempt primary repair of incidental durotomies intraoperatively whenever possible.[1,2,15]

While hydrocephalus following an incidental durotomy during lumbar spine surgery has been reported,[10,15]the pathogenesis involved development of cerebellar infarction with subsequent hemorrhagic transformation and mass effect in the posterior fossa as was described in the report by Cavanilles-Walker, et al.[10] Our patient developed hydrocephalus due to obstruction of CSF pathway from the blood clot in the cerebral aqueduct and fourth ventricle after incidental durotomy in the absence of any intraparenchymal hemorrhage,a mechanism different from previously reported cases.The exact pathophysiology of this exceedingly rare complication is unclear.One possible mechanism could be the diffusion of blood into the thecal sac from surgical cavity with subsequent cephalad migration and clotting in the ventricular system. The supine position from bedrest may potentially facilitate this process.If this theory is true,one could argue that slight head elevation of 5-10 degree could potentially minimize this complication.Another plausible hypothesis could be the change in transmural pressure in ventricular wall after incidental durotomy leading to spontaneous IVH and subsequent hydrocephalus.This theory is less probable given the dura is routinely opened for intradural spinal pathologies and yet this complication has never been reported before in literature after intended durotomy.[2]This case highlights the fact that rare but potentially life-threatening complications can occur after incidental durotomies.Medical practitioners providing post operative care to patients with spine surgery should be vigilant about this rare but life threatening complication so that early recognition and prompt treatment can minimize potential morbidity/mortality.

Conclusion

Obstructive hydrocephalus in association with intraventricular hemorrhage can be a rare but dangerous complication following incidental durotomies during spine surgery.Early recognition and prompt treatment of obstructive hydrocephalus can lead to complete recovery. Spine surgeons should be aware of this rare complication.

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Figure 1: (A) Post-operative X-ray after L3-S1 laminectomies and fusion; (B) Magnetic imaging resonance of the spine demonstrating incidental durotomy site and associated pseudomeningocele.

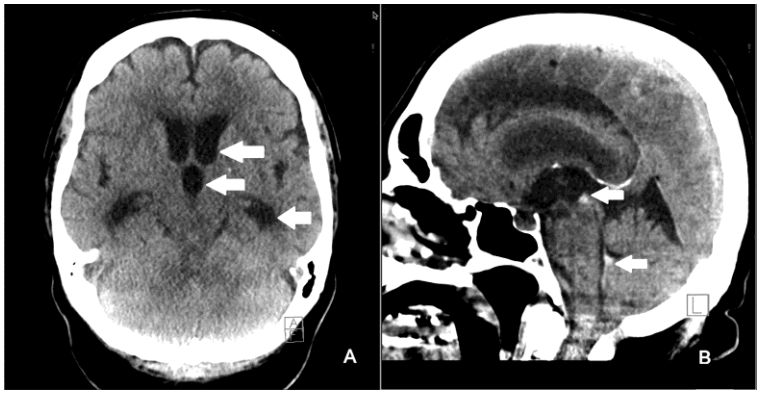

Figure 2: (A) Axial CT of the brain demonstrating gross enlargement of the lateral and third ventricles consistent with hydrocephalus; (B) Sagittal CT of the brain revealing intraventricular hemorrhage at the cerebral aqueduct and fourth ventricle with resultant obstruction of CSF flow.

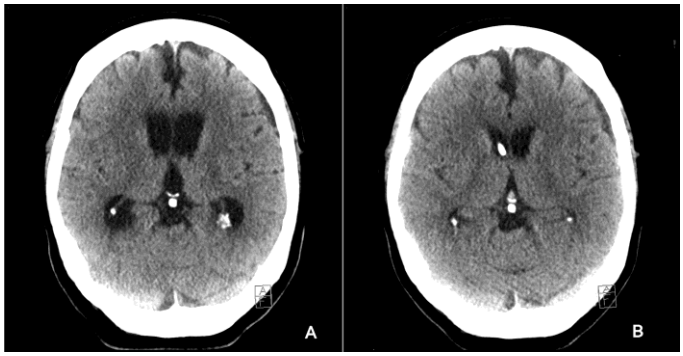

Figure 3: Axial CTs of the brain showing ventricle size BEFORE (A) and AFTER (B) EVD placement demonstrating normalization of the ventricle size.