

Subdural Hematoma Following Cervical Dural Tear. Case Report and Review of Literature

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Abstract

Study Design: Case report.

Objective: To study a case of an acute subdural hematoma due to cerebrospinal fluid (CSF) leak following cervical spine surgery.

Summary of Background Data: When CSF is removed from the subarachnoid space due to intraoperative dural tear and subsequent CSF leak, Intracranial hypotension and subdural hematoma may occur. In the literature few reports described subdural hematoma following cervical spine surgery.

Methods: Retrospective review of the patient's medical record and brain CT and MRI.

Results: A 74 years old man underwent cervical spine surgery for severe canal stenosis and myelopathy. Intraoperatively, a dural tear was noted and repaired and covered by dural patch. 3 days later, patient's level of consciousness decreased and large epidural mass was detected in cervical MRI. Surgical decompression was performed immediately. Non hemorrhagic epidural fluid was detected and irrigation and drainage was carried out. no CSF leakage was revealed during the surgery. CSF drainage from his cervical wound was noted after second surgery. A brain MRI and CT revealed a subdural hematoma. Evacuation of the hematoma was not performed due to neurosurgeon's consultation. Patient's level of consciousness continued to decrease and two days later the patient passed away.

Conclusion: We report the rare case of a subdural hematoma caused by a dural tear and CSF leak following cervical spine surgery. This report identifies the potential morbidity and mortality associated with CSF leaks occurring after spinal surgery.

Keywords: *Subdural Hematoma; Cervical Spine Surgery; Dural Tear; CSF Leak*

Introduction

Subdural hemorrhage (SDH) in absence of head trauma is an uncommon condition that may be due to ruptured aneurysms or arteriovenous malformations, intracranial tumor bleeding, and coagulopathy.

The prevalence of dural tear during cervical spine surgery has been reported to range from 0.5% to 3% [1,2] and associated with surgeon's technique and patient's factor such as thin dura or dural adhesion.

Intracranial hypotension due to spinal cerebrospinal fluid (CSF) leak is a rare but possible cause of SDH [3]. Intracranial hypotension may result in postural headaches, photophobia, neck stiffness, nausea, vomiting, visual and auditory disturbances, changes in mental status, and seizures [4,5]. Intracranial hypotension with development of negative pressure and caudal movement of brain lead to traction on bridging venous structures and can be a pathophysiologic explanation of subdural hemorrhage development [6]. In the presence

of neurological deterioration in cases of intraoperative dural tear and CSF leak, a careful evaluation must be done in terms of cerebellar hemorrhage.

In this report, we present a case of an acute subdural hematoma occurring in the setting of an CSF leak following cervical spine surgery in patient with cervical spondylotic myelopathy.

Case Report

A 74 years old man referred from neurologist due to gait disturbance and awkward hand motion exacerbated gradually. The patient was known case of diabetic mellitus and was on medications. In physical examination myelopathy hand and positive Hoffman sign was revealed, as well as, diffuse paresthesia on hand and decreased motor power of hand and upper extremities were detected. DTR was exaggerated and Babinski was detected in both sides. On walking the patient had gait disturbance and according to the Nurick classification he was grade 3.

In MRI sever canal stenosis from C4 to C6 due to degenerative disc disease (DDD) and myelomalacia was seen. decreased Cervical lordosis in x-ray and disc space and osteophyte formation secondary to DDD in multiple level were evident. In dynamic cervical x-ray no instability was detected. The patient was scheduled for operation due to cervical myelopathy and all preoperative consultations was done and after optimization of patients pre operation condition, posterior laminectomy and fixation was done. laminectomy as en-bloc, by No-touch technique was performed from C3 to C6 and posterior fixation via lateral mass screw was done perfectly as well. Afterward posterior fusion by auto graft was carried on. After all procedures were completed as planned preoperatively an unplanned dural tear suddenly happened. Dural tear was repaired and covered by dural patch. After insertion of suction drain, wound was closed in layers and patient was transferred to ICU. Patient was conscious and the postoperative neurovascular examination was normal, and no neurologic deficit was revealed as well. Patient was transferred to the ward 2 days after the surgery and all things was well. The day after that patient's level of consciousness was decreased suddenly and MRI of brain and cervical spine was requested immediately and in cervical MRI large epidural mass was detected and surgical decompression was performed immediately because of high index of suspicious for epidural hematoma. non hemorrhagic epidural fluid was detected and irrigation and drainage was carried out and no CSF leakage was revealed during the surgery. Suction drain was inserted and wound was closed tightly in layers. The patient was transferred to ICU and level of consciousness was dropped gradually. Brain MRI was requested again and neurosurgery consultation was done. Subtle subdural hematoma was detected by MRI, however, surgical decompression was not performed due to neurosurgeon opinion that believed patients symptoms were not justified by MRI findings, as well as, he believed that subdural hematoma found in MRI was old. After that patient's general condition deteriorated and CSF leakage was detected regarding the analysis of drain fluid. Because of patient's cardiopulmonary comorbidity, cardiologist consultation was done to optimize the patient's condition. Patient was transferred to operation room for exploration of surgical wound and dural repair, however, surgery was not done due to sever tachycardia failed to control by antiarrhythmic drugs. Therefore, the patient transferred to ICU again. Patient's level of consciousness continued to decrease and two days later the patient passed away.

Discussion

One of the well-known complication following spinal surgery is Incidental durotomy and subsequent cerebrospinal fluid (CSF) leak, with reported incidence ranging between 2 and 20% [7,8]. CSF leakage following surgery may lead to development of some other complication such as headache, neurologic deficit, meningocele or fistula formation, wound dehiscence, meningitis, arachnoiditis, or even spinal abscess [9-11].

Dura may tear during operation in case of eroded or thin dura, dura adhesion, and redundant dura in patients diagnosed with a tight spinal stenosis. In patients who have epidural fibrosis and scar tissue adherent to the dura during revision of spine surgery, this complication is more common [12]. The operative technique plays a key role in avoiding injury to the dural tissue.

Subdural hematoma is a rare complication after cervical spine surgery [13,14]. The pathophysiological mechanism of subdural hematoma after spine surgery and CSF leak is not describe clearly in literature, but evidence suggests that the source of the cranial bleeds are venous [15]. It is suggested that CSF leak because of dural tear during surgery and continuing leakage after surgery, may cause a caudal

displacement of the brain, lead to traction and tears the bridging vessels, and results in a subdural hemorrhage and hematoma formation [16]. Declining neurological status may occur through caudal displacement of the cerebellum and brainstem compression [17].

Headache following low CSF pressure is the most common symptom in subdural hematoma. Other symptoms include somnolence, altered consciousness, and dysarthria. SDH must be included in the differential diagnosis for postoperative confusion and declining mental status after spinal surgery, with opioid reversal being a possible option to ensure accurate diagnosis [18-20].

A contrast-enhanced brain MRI examination is the analysis of choice because of its noninvasive nature [21]. CT or MRI cisternography/myelography are required to locate the exact site of spinal CSF leak.

Dehydration may disturb the balance between CSF loss and production [22] reduction of brain volume following dehydration could lead to subdural hemorrhage. Perioperative dehydration promotes excessive blood congestion in the bridging veins with consequent dilatation and increasing tension of the vessels, which are further stretched by a downward displacement of the brain, and consequently more vulnerable to the movement of the brain within its coverings due to the decreased cerebral volume [23]. In the present case, total intraoperative blood loss was 200 mL, fluid replacement was appropriate, ruling out dehydration. Spontaneous hematoma is also observed in anticoagulated patients [24]. In our case there was no history of head injury and the postoperative coagulation status was normal.

Spinal drains are suggested in uncertain closure, in the surgeon's opinion, or the dural edges are frayed complicating the closure [25-27]. Considering the consequences of failure if the dural defect does not heal, the spinal drain is left in place for 5 days. In one study, in cases where lumbar drain was utilized, success was achieved in 88% of patients [28].

According to the location and extent of hemorrhage and clinical examination status of the patient treatment of SDH is different. Patients who have a small hemorrhage without significant mass effect and normal neurological status may be managed conservatively. Treatment in these patients includes analgesics, hydration, laying supine for at least 24 hours, the administration of caffeine and/or steroids, and the application of a blood patch for refractory cases [29,30].

Patients with large hemorrhages and rapid deterioration must undergo surgical evacuation of the bleeds. Drains may be removed, but this risks causing additional leakage through the dural opening left behind. Branching off or intermittent clamping of the drains may be a safer option to control aspiration [31].

Most cases in the literature have shown a rapid improvement with medical treatment and bed rest, but rare cases needed a decompression therapy [32]. In this case, decompression might help the patient but because of comorbidities, surgical intervention was not possible.

According to this case, Patients with incidental dural tear during spine surgery and subsequent unexplainable and severe headaches postoperatively or acute confusion and lethargy, further evaluation such as brain MRI or CT should be considered. In the cases of severe neurological decline in patients with a large SDH, emergency surgery may save the patient. However, this subset of patients had the worst prognosis.

Conclusion

We report the rare case of a subdural hematoma caused by a dural tear and CSF leak following cervical spine surgery. This report identifies the potential morbidity and mortality associated with CSF leaks occurring after spinal surgery.

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