Delayed Presentation of Incidental Durotomy

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Abstract

Two case reports illustrate a delayed clinical presentation of incidental durotomy following surgical posterior decompression of the lumbar spine. The clinical presentation as well as radiographic imaging studies used in diagnosing this relatively rare surgical complication are discussed. Both nonoperative as well as surgical treatment alternatives are outlined.

Incidental durotomy during spine surgery reportedly occurs at a rate of 3% to 14%.

Case 1

A 37-year-old man presented with acute left lower extremity radiculopathic pain and weakness in the L5 and S1 nerve distributions, as well as a partial left-sided foot drop. An MRI revealed a large, superiorly sequestered L5-S1 disc herniation as well as a grade 1 isthmic spondylolisthesis at L5-S1. After discussion with the patient, the decision was made to perform an L5-S1 hemi-laminectomy and microdiscectomy, which were completed uneventfully. At the conclusion of the procedure, no durotomy or CSF leakage was noted. A Valsalva maneuver as well as a watertight fascial closure was performed. On postoperative day 1, the patient reported relief of the radiculopathic pain, but plantar flexion weakness was unchanged from his preoperative exam. Approximately 3 weeks after discharge, the patient was seen in the emergency room of an outside hospital complaining of an orthostatic headache and cervical pain for 24 hours. The patient was evaluated and discharged home with pain medication. The following day he presented to the emergency room of our institution with the same complaints. He denied any overt trauma, fevers, or visual disturbances. An MRI of the brain showed signs of intracranial hypotension (Fig. 1), and a repeat MRI of the lumbar spine was performed showing a small fluid collection at the L5 hemi-laminectomy site (Fig. 2). The diagnosis of CSF leak was made, and an epidural blood patch was performed. Briefly, the patient was positioned prone and 20 cc of blood was obtained from the patient’s arm under sterile technique while the epidural space was accessed under fluoroscopic guidance. The blood was slowly injected to back pressure. The patient reported immediate relief of symptoms, and he was discharged home the same day.

Case 2

A 30-year-old man referred by his primary care doctor presented with rapid onset radicular left leg pain and weakness. An MRI of the lumbar spine revealed a left sided, paracentral L4-L5 disc herniation. Physical exam was notable for left sided radicular pain in the L5 nerve distribution and grade 4/5 left tibialis anterior and extensor hallucis longus function. After discussion with the patient, he underwent an...
uneventful, left sided, L4-L5 microdiscectomy with partial medial facetectomy and laminotomy under loupe magnification. At the conclusion of the procedure, no durotomy or leakage of CSF was noted, and a Valsalva maneuver as well as watertight fascial closure was performed.

The patient was seen in the office one week after surgery and denied complaints. The following day, he began developing orthostatic headaches and some swelling under the incision, suggesting pseudomeningocele. He was instructed to lie supine for several days, however, continued to have headaches. An MRI confirmed the presence of a fluid collection likely due to a CSF leak (not shown). An epidural blood patch was administered using 20 cc of blood obtained from the patient’s arm as described above resulting in immediate relief of symptoms. Twenty-four hours later, the patient complained of recurrence of his headache. He was seen in the emergency department of our hospital where the pseudomeningocele was aspirated and a second epidural blood patch was performed. Again the patient reported immediate relief, and he was discharged home with instructions for strict bed-rest over the next 24 hours. His headache and fluid collection did not recur.

Discussion

Incidental durotomy is not uncommon during surgery of the lumbar spine. However, there is a paucity of studies in the literature that directly address the incidence of unrecognized durotomy during lumbar spine surgery. Brookfield and colleagues reported two cases over a 16-year period of delayed presentation of symptoms following incidental durotomy during lumbar spine surgery. Cammisa and coworkers noted 66 cases of incidental durotomy in a retrospective review of 2,144 patients, 6 of those dural tears were unrecognized at the time of surgery. In 2006, Khan’s group reported the results of 3,183 consecutive patients who underwent lumbar spine surgery over a 10-year period. His group found 338 patients with incidental dural tears; two of those patients had iatrogenic dural tears that were not appreciated at the time of the index procedure. Furthermore, one additional patient with a recognized dural tear had a second tear that was not appreciated intraoperatively.

Currently, at the time durotomy is recognized most spine surgeons perform a dural repair with a non-absorbable suture. The use of a gel sealant, patch, or graft is also occasionally used to enhance the repair. The placement of lumbar drains is variable, as is the time until their removal. The majority of surgeons agree that a watertight closure of the fascia is necessary to prevent pseudomeningocele; however, newer, minimally-invasive techniques, which utilize smaller fascial incisions, have made watertight fascial closures less critical. If a dural tear is appreciated intraoperatively, some investigators recommend a 24-hour period of bed-rest, followed by a period of recumbency with the head of the bed elevated 30°. If this is well-tolerated, trials of sitting and then standing are performed to assess for the presence of orthostatic headache. However, others suggest that if watertight closure is obtained, no special postoperative precautions are indicated.

At our institution, we have recently noted two cases where patients underwent otherwise routine lumbar surgery, and after an initial asymptomatic and routine postoperative course, each patient presented days to weeks later with clinical symptoms suggestive of a durotomy. Our annual incidence of this occurrence is two cases per every 400
(0.005%). During both procedures, no dural tear or CSF leak was noted intraoperatively. We are presenting these cases of occult durotomy to highlight the fact that this event can and does occur and is underrepresented in the literature. Additionally, we wish to bring attention to the possibility of late-presenting and unexpected durotomies, so that it is taken into consideration when formulating a differential diagnosis.

An orthostatic headache was seen in both of our patients and should alert the physician to the possibility that an occult durotomy may exist. Initial management, once CSF leak is confirmed and other pathologies excluded, may consist of a period of bed-rest for 24 hours with adequate hydration, similar to the treatment of recognized, acute durotomy. Admission to the hospital is not mandatory unless patient compliance is an issue. It should be emphasized to patients that no abrupt, laborious, or sudden movements should be performed since this initiates a Valsalva maneuver and can potentially disrupt an immature clot. MR imaging of the lumbar spine is strongly recommended as it can identify abnormal fluid collection, as was the case in our second example. Furthermore, MR imaging of the brain has utility and may show meningeal enhancement or hypoperfusion, as well as subdural or subarachnoid hemorrhages. It should be noted that in cases where a subcutaneous or submuscular fluid collection occurs, the collection may be aspirated and sent for Beta-2-transferrin analysis. A positive Beta-2-transferrin assay has been shown to be 94% to 100% sensitive and 98% to 100% specific, confirming the presence of CSF within the fluid. A pseudomeningocele may exert pressure on the nerve roots or cauda, thus aspiration can provide rapid and substantial pain relief as well as aid in the diagnosis.

If symptoms persist after 24 hours of bed-rest, the use of an epidural blood patch (EBP) should be considered. Epidural blood patches have shown good efficacy in treating durotomy of multiple etiologies including durocutaneous fistulas and post-lumbar puncture headaches. The technique is similar to that described in this article and results in near immediate relief of low-pressure headaches in the majority of cases, regardless of etiology. Pain relief is believed to occur via restoration of intrathecal volume rather than halting the flow of CSF from the canal. CSF production occurs too slowly (0.3 to 0.6 ml/min) to correct the hypovolemia over such a short period of time. CSF production and fluid dynamics have been well described. Approximately two-thirds of the total CSF volume is generated by the choroid plexus, with the remainder produced by extra-choroidal tissue. Via homeostatic mechanisms, the pressure is kept at approximately 100 mm H2O in young, healthy adults; however, both production and pressure have been noted to decrease with age. Cerebrospinal fluid flow is pulsatile and proceeds from the lateral ventricles, to the third and fourth ventricles, respectively. It exits the fourth ventricle through the ventricular foramen to the basal cisterns and from there proceeds to the spinal and cortical subarachnoid spaces. The total volume of CSF in the central nervous system is approximately 160 ml, with 120 ml residing in the subarachnoid space, and the remainder found in the ventricular system; mammalian CSF is turned over almost four times each day; however, this decreases with ageing.

In our institution, EBP were administered using 20 cc of blood taken from the patient’s arm and injected into the epidural space one level cranial to the surgical procedure level, verified by fluoroscopy. The level of the laminotomy was not used due to potential scarring, as well as the post-surgical disruption of normal anatomy and possible obliteration of the epidural space. Injection of blood was continued until back pressure was felt by the patient. The patients reported marked reduction of the headache upon resuming sitting and standing positions. If the patient’s symptoms abate following the patch, he is permitted to leave the hospital and are not given any restrictions other than to perform only “reasonable” activities (i.e., no strenuous activity). If symptoms recur, a second blood patch may be attempted in a similar fashion as the first. We recommend that if the second patch fails, the patient should return to the operating room for an exploration and attempted repair of the dural leak. Placement of a diverting lumbar drain is optional and controversial at this time. If an occult CSF leak turns into wound drainage, then one may either return to the operating room for exploration of the leak and an attempt at primary repair along with a sealant or placement of a diverting drain.

Dural tears during spine surgery have been reported to occur in 1% to 17% of all lumbar cases. Fortunately, the majority of these tears are discovered and addressed at the time of the index procedure. However, some tears may not present themselves so readily, even following a Valsalva maneuver, and may only be realized postoperatively after many days, or even weeks of asymptomatic activity. The rare nature of these occult tears, coupled with the delayed presentation, makes them the exception rather than the rule. A high suspicion and proper vigilance can help discover and address occult CSF leaks with little morbidity. The unusual occurrence of an occult, late-presenting durotomy can be successfully treated non-operatively with an epidural blood patch, thereby avoiding the need for re-exploration and repair.

Disclosure Statement
None of the authors have a financial or proprietary interest in the subject matter or materials discussed, including, but not limited to, employment, consultancies, stock ownership, honoraria, and paid expert testimony.

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