Symptomatic pneumorachis associated with incidental durotomy during microscopic lumbar disc surgery

Case report

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Unintended incidental durotomy is not a rare complication of lumbar microsurgery and is usually recognized and treated immediately. The reconstruction process can be complicated further by unpredictable factors. To their knowledge, the authors report the first case of a symptomatic pneumorachis associated with the accidental awakening of a patient during reconstruction of an incidental durotomy following lumbar microdiscectomy.

Incomplete cauda equina syndrome developed in the patient on awakening from surgery after reconstruction of an unintended incidental dural tear that occurred during lumbar microdiscectomy. Symptomatic pneumorachis was revealed on an emergency computed tomography scan, and the patient underwent immediate repeated operation to remove air and decompress the spinal canal.

The increasing number and complexity of surgical procedures in the lumbar spine contribute to the growing incidence of unintended durotomy. The surgeon should be aware of rare complications that may arise. Development of a vacuum phenomenon in conjunction with a ball–valve mechanism may lead to pneumorachis during durotomy repair. If this rare complication is promptly recognized and confronted, the outcome will not be associated with long-term sequelae.

KEY WORDS • accidental awakening • durotomy • microdiscectomy • cauda equina syndrome • tension pneumorachis

INCIDENTAL durotomy during lumbar microdiscectomy is an unintended tear of the dura mater. Although undesirable, this complication remains commonplace in spine surgery. The true prevalence is hard to ascertain because the majority of these patients remain asymptomatic during the postoperative period and no statistically significant morbidity is associated with this group related to uncomplicated surgery. Unintended incidental durotomy is not a rare complication of lumbar microsurgery and is usually recognized and treated immediately. The reconstruction process can be complicated further by unpredictable factors. To their knowledge, the authors report the first case of a symptomatic pneumorachis associated with the accidental awakening of a patient during reconstruction of an incidental durotomy following lumbar microdiscectomy.

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Case Report

Examination. This 64-year-old woman had a 2-year history of persistent low-back pain with left L-5 radiculopathy symptoms due to a left posterolateral L4–5 intervertebral disc protrusion. Unsuccessful long-term physiotherapy and other nonoperative treatments along with a recent exacerbation of clinical symptoms led her to the decision to undergo surgery.

Operations. After the patient was placed prone, general anesthesia was induced using a combination of narcotic agents and a muscle relaxant with a mixture of air and O₂, followed by Sevoflurane. With the aid of microscopic visualization, a left L4–5 discectomy was performed through an enlarged fenestration. During the procedure, an unintended incidental durotomy at the shoulder of the L-5 root was immediately recognized and repaired with fine silk sutures and fibrin glue. At some point in the dural repair process, the patient was accidentally awakened. During this incident, tube intolerance led to bucking and coughing by the patient and significant leakage of CSF.
from the repair site. The patient then returned to a state of deep anesthesia after administration of a muscle relaxant and Sevoflurane hyperventilation. At the conclusion of the operation, no CSF leak was noted and no wound drainage was left in place.

On awakening, an incomplete cauda equina syndrome developed in the patient and was associated with significant neurological dysfunction, motor weakness, and saddle anesthesia. An emergency CT scan showed massive intradural air entrapment in the spinal canal at the L-1 to L-5 level (Fig. 1).

The patient underwent an emergency repeated operation and a wide L-4 laminectomy. No CSF leakage was observed through the repaired durotomy site at the shoulder of the L-5 root. A new 3-cm midline durotomy permitted intradural insertion of a fine silastic catheter guided cranially to the level of L-1 and caudally to the level of S-1. The trapped air was washed out gently with repeated administration of isothermal saline through the catheter; the generated bubbles were softly aspirated until no bubbles were exiting the surgical wound. The durotomy was then shielded with fine silk suture, fibrin glue, and fascia.

Postoperative Course. Steroid agents were administered to the patient in high doses for a total period of 5 days. No CSF leakage was noted from the surgical wound during this period. The patient underwent intense physiotherapy and gradual resolution of her symptoms was noted in the following weeks; the patient was discharged 1 month later. At that time she had Grade 4/5 lower-extremity muscle strength and L4–5 light-touch sensation impairment with no sphincter disturbance.

Discussion

With the increasing number and complexity of surgical procedures in the lumbar spine, the incidence of unintended durotomy is growing and recently has been reported as being as high as 14%. The true incidence may be difficult to ascertain, however, because the majority of these patients remain asymptomatic during the postoperative period and no statistically significant morbidity is associated with this group compared with uncomplicated lumbar spine surgery.

Persistent recurrent spine-related headaches that present with tinnitus, nausea, and vomiting; superficial or deep wound infection; meningitis; pseudomeningocele; cutaneous CSF fistula from persistent CSF leaks; and neurological deficits due to nerve root herniation, laceration, contusion, or injury have all been reported, and most symptoms are relieved after short-term bed rest and/or re-revision surgery.

Accidental awakening of the patient during surgery is not uncommon in all types of surgery and is related to an increase of negative pressure in body cavities, and especially in the thorax because of coughing reflexes.

Pneumorachis, defined as the presence of a gaseous collection within the spinal canal, is usually related to some form of trauma, especially to the skull and thorax, or barotrauma. A few cases have been reported that are associated with pneumomediastinum, pneumothorax, or pneumocephalus. Other causes include iatrogenesis during surgery, lumbar puncture, or epidural injection of anesthetic.

In our patient the association of incidental durotomy with accidental awakening caused aspiration of air through the durotomy site while the defect was being repaired. This led to the development of tension pneumorachis and incomplete cauda equina syndrome when she awoke intraoperatively.

We propose a vacuum phenomenon in conjunction with a ball–valve mechanism to explain the entrapment of air in the spinal canal as the durotomy defect was being repaired. The elevation of air temperature in relation to body temperature could explain the tension that elicited neurological symptoms associated with this case of pneumorachis. The development of a neurological deficit after lumbar surgery could be associated with nerve root contu-
sion or traction injury, hematoma, or infection. The surgeon should keep in mind that pneumorachis may also occur and thus should proceed to establish the appropriate diagnosis and treatment. As the outcome in our patient demonstrates, this extremely rare complication has no long-term sequela if recognized and treated promptly.

Rapid and accurate diagnosis can be accomplished using CT of the spine; treatment choices vary according to the extent of neurological impairment and the experience of the surgeon.

References
7. Delabrousse E, Lerais JM, Jacob D, Fourrer C, Narboux Y: [Spontaneous pneumorachis during sports exertion with a closed glottis.] J Radiol 80:1587–1588, 1999 (Fr)

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