

Symptomatic Pneumocephaly and Pneumorrhachis Secondary to Incidental Durotomy in Lumbar Spinal Surgery

Lomber Spinal Cerrahide Olası Durotomiye Sekonder Gelişen Semptomatik Pnömocefali ve Pnömorakis

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ABSTRACT

The coexistence of pneumocephalus and pneumorrhachis is very rare after spinal surgery. Iatrogenic cerebrospinal fluid leakage is a risk for these complications. They are usually asymptomatic and the diagnosis is made radiologically. Clinical findings vary from patient to patient. We report the case of a patient who developed widespread pneumocephalus and pneumorrhachis after lumbar disc surgery and pedicle screw fixation. Serious neurological deterioration were detected after mobilization. The radiological images showed extensive air entrapment into spinal and cranial cavity. The patient was discharged on the seventh post-operative day with full recovery after conservative treatment.

Keywords: Pneumocephalus, pneumorrhachis, spine, surgery

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ÖZET

Spinal cerrahi sonrası pnömocefali ve pnömorakis birlikteliği çok nadirdir. İyatrojenik beyin omurilik sıvısı kaçağı bu komplikasyonlar için bir risktir. Genellikle asemptomatikler ve tanı radyolojik olarak konur. Klinik bulgular hastadan hastaya değişir. Bu çalışmada, lomber disk cerrahisi ve pedikül vidası tespiti sonrası yaygın pnömocefali ve pnömorakis gelişen bir hastayı sunuyoruz. Hastanın mobilizasyonu sonrası ciddi nörolojik bozulma tespit edildi. Radyolojik görüntüler, omurilik ve kraniyal boşlukta yoğun hava sıkışmasını gösterdi. Hasta konservatif tedavinin ardından post-operatif yedinci günde şifa ile taburcu edildi.

Anahtar Sözcükler: Pnömocefali, pnömorakis, omurga, cerrahi

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INTRODUCTION

Many complications have been reported in literature after spinal surgery. Pneumorrhachis is defined as air leak to spinal canal while pneumocephalus is defined as air leak to inside the cranial cavity. Pneumocephalus and pneumorrhachis are rare after spinal surgery and have only been reported as case reports in literature (3,4,6,7,10). The coexistence of these complications is even rare (1,5,8). Iatrogenic cerebrospinal fluid (CSF) leakage is a risk for these complications. The diagnosis of these complications, which are usually asymptomatic, is usually made radiologically. There is no definitive guideline for treatment due to its rarity and various etiologies. In this study, a patient with symptomatic pneumorrhachis and pneumocephaly after instrumented lumbar degenerative disc surgery was presented with a smooth recovery of conservative treatment. Such a widespread air entrapment is quite rare in the literature.

CASE REPORT

The patient who underwent posterior stabilization to L2-3 level 10 years ago, was admitted to our clinic with right sciatica. Neurological examination revealed a loss of right ankle dorsiflexion and hypoesthesia in the right L3 and L4 dermatomes. Magnetic resonance imaging (MRI) of lumbar spine detected L2 and L3 transpedicular screws due to previous surgery. In addition, the right L3-4 level has an extruded disc herniation and serious neural compression (Figure 1). The patient who had no significant illness, underwent surgery in elective

conditions. Right L3 partial hemilaminectomy, medial facetectomy was applied and extruded disc material was excised. L4 bilateral transpedicular screws were placed and combined with the previous rod-screw system. Dural injury and CSF leakage were observed during discectomy. The defect could not be repaired as a primerly because it was at the anterior region of dura. Muscle flap was implaned and patched. The operation was finalized by placing a suction drain on the surgical area. In the early post-operative period, radicular leg pain improved and no additional neurological deficitis were detected. CSF leakage was seen from the drain, followed without pressure. The patient, who was mobilized at post-operative 24 hours, complained severe bilateral leg pain and weakness that began several hours after mobilization. In neurological examination of lower extremity, the motor power was determined as left lower extremity 2/5, and 0/5 in the right lower extremity. Hypoesthesia was recorded in bilateral leg, sphincter examination had no deficits. Shortly afterwards, severe headache, vomiting and confusion were added to this situation. Cranial and spinal computer tomography (CT) investigations, widespread pneumocephaly (Figure 2) and air in the entire spinal canal, much more intensely in lumbar area (Figure 3). The drain was removed from the operation area. Bed rest, hydration, 100% oxygen after close follow-up gradually began to decline complaints. The patient was also given meningitis prophylactic medication. After 1 hour of treatment, movements were observed in the legs and after 4 hours the symptoms were completely improved. On the twelfth hour, headache and nausea regressed. Complaints were fully recovered and the patient was discharged on the seventh post-operative day. First year follow-up was uneventful without any complaints and neurological deficitis.



Figure 1: Pre-operative sagittal (A) and axial (B) lumbar spinal MRI findings showing L2 and L3 transpedicular screws due to previous surgery and right L3-4 extruded disc herniation and serious neural compression.

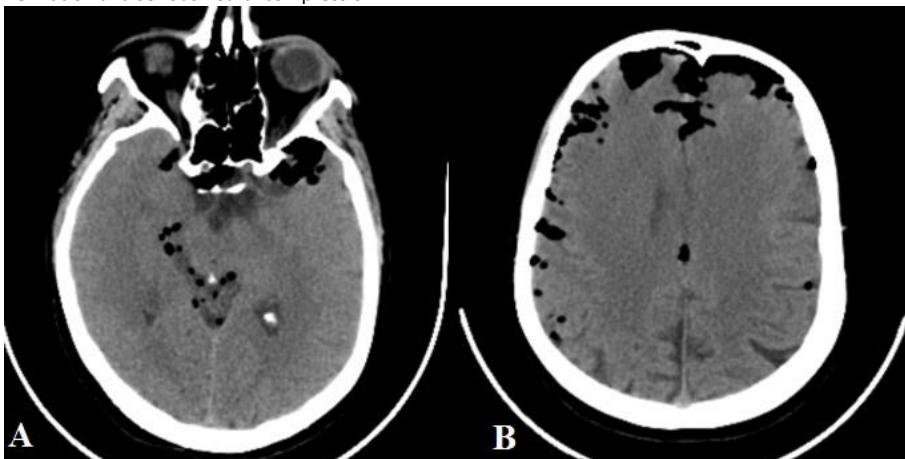


Figure 2: Post-operative axial cranial CT findings showing pneumocephalus.

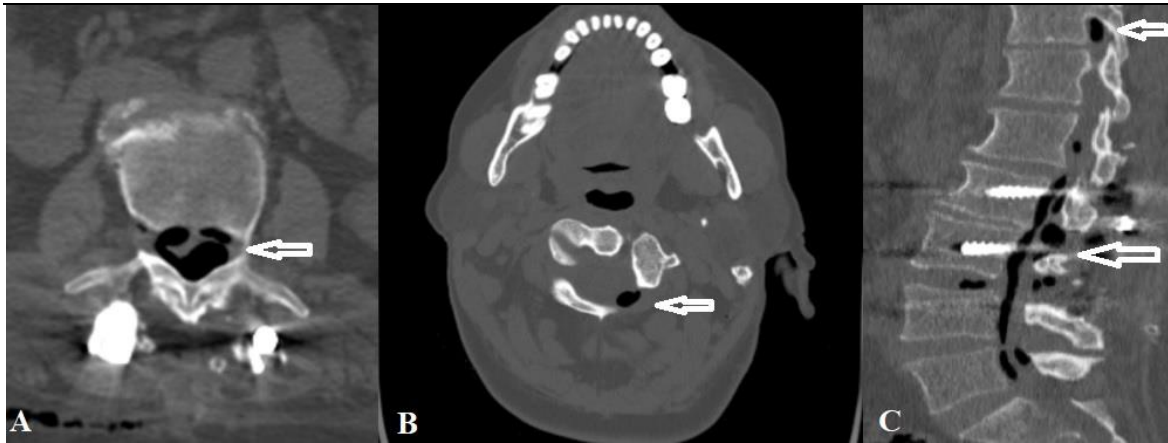


Figure 3: Post-operative axial (A,B) and sagittal (C) spinal CT findings showing pneumorrhachis.

DISCUSSION

Pneumorrhachis was used for the first time by Newbold in 1987 to describe air in the cervical subarachnoid cavity (9). It has been reported after cranial, respiratory, spinal, abdominal injuries (3). Although it is usually observed at extradural space, air can also be observed in the spinal subarachnoid cavity after dural injury. Pneumocephaly means the occurrence of air in the epidural, subdural, subarachnoid, intraparenchymal or intraventricular area under the calvarial bones. Trauma, infections, brain surgeries constitute the most common causes. Durotomy is a complication that may occur during spinal surgery and is usually asymptomatic. Rarely, neurological deficits due to root herniation or laceration, headache, CSF fistula can occur. Post-operative neurological deficits may also be related to intraspinal or intracranial air collection (10). CSF leakage after spinal surgery is reported 0.3-5.9% (5,11). Although many complications are reported due to CSF fistula, the spinal surgery-related symptomatic pneumocephaly and pneumorrhachis are very rare. There are publications in the literature as case reports, but there is no clear information about its frequency. Although volume of leakage air can be variable, the accumulation as widespread as in our case is quite rare (2,3,4,5,6,7,12).

Pneumocephaly and pneumorrhachis are usually asymptomatic, so it is necessary to suspect primarily for clinical diagnosis. These diagnoses should be kept in mind especially in the presence of dural injury and CSF leakage in spinal surgery. The most characteristic manifestations of pneumocephalism are headache, dizziness, nausea, vomiting. Neurological deficits may be within hours or weeks depending on the speed of CSF leak (8). In cases of pneumorrhachis, motor or sensory losses due to cord or nerve root compression may be observed (3,10). In our case, after 24 hours of surgery, severe headache, vomiting, confusion, severe sensory and motor power loss in the legs are developed due to pneumocephaly and pneumorrhachis. In literature, only one case has a serious morbidity such as post-operative partial Cauda Equina syndrome (12). In our case, a similar complication was observed, and in addition, neurological deficits related to pneumocephaly occurred.

Air escape to intraspinal and intracranial area after dural injury during surgery is explained by inverted-bottle mechanism. This hypothesis assumes that CSF leaks through dural rupture creates a negative pressure in the subarachnoid cavity (4,11). In the case, dural injury could not be repaired. When the patient has mobilized with suction drain, the air in the drainage reached the intraspinal canal from defect on dura, and from there to the intracranial cavity. Patients with pneumocephaly and pneumorrhachis were also reported in the literature, even though dural injury and CSF were not observed in surgery (2,4,5).

Intracranial-intraspinal air can be diagnosed by radiography and MRI, whereas CT is more effective. CT can be detect 0,55 ml air (1,5,8). There are no definitive treatment modalities in the guidelines for the treatment of pneumocephalic and pneumorrhachis after spinal surgery. 85% of patients with pneumocephaly and 98% of patients with pneumorrhachis were reported spontaneous absorption of air (3,5,9). Hydration, bed rest, 100% oxygen inhalation and analgesics are administered as conservative treatment. In a few cases, intraspinal air were discharged with decompressive laminectomy (12,13).

In our case, a very rapid neurological recovery was recorded after conservative treatment and no surgical intervention was needed.

Consequently, trendelenburg position should be applied when there is a dural rupture and an CSF leak in spinal surgery. To prevent air escape, dural tear must be repaired as quickly as possible. The closure of the dural tear with fascia or muscle, the use of synthetic adhesives such as surgical sponge, albumin, collagen and glutaraldehyde, is of great importance in preventing fugitive from defect, reducing the risk of intraspinal and intracranial air. It should be kept in mind that the advantages of the drain placed in the surgical area can lead to the accumulation of spinal and cranial air.

CONCLUSION

The majority of pneumocephaly and pneumorrhachis cases are asymptomatic. Symptomatic cases also heal spontaneously with conservative treatment. Radiologic and close clinical follow-up is important in these patients. In symptomatic cases which spontaneous resorption is not observed, decompressive surgery may be required rarely.

Conflict of interest

No conflict of interest was declared by the authors.

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