



## Case Report

# Unexpected complication after lumbar disc surgery, peripheral facial paralysis due to pneumocephalus: A case report

Aydemir Kale, Zeynep Balaban<sup>1D</sup>, İmran Asadov

Department of Neurosurgery, Gazi University Faculty of Medicine, Ankara, Turkey.

E-mail: \*Aydemir Kale - aydemirkale@gmail.com; Zeynep Balaban - zeynep.balaban@yahoo.com; İmran Asadov - imran010216@gmail.com



### \*Corresponding author:

Aydemir Kale,  
Department of Neurosurgery,  
Gazi University Faculty of  
Medicine, Ankara, Turkey.  
aydemirkale@gmail.com

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## ABSTRACT

**Background:** Pneumocephalus, characterized by air in the cranial cavity, is a rare condition typically associated with surgical procedures but may also result from trauma, infection, or spontaneously. Cranial nerve palsies following pneumocephalus are seldom documented in the literature, and, in particular, facial nerve palsies due to pneumocephalus following lumbar spine surgery have not yet been reported.

**Case Description:** A 47-year-old male patient underwent surgery due to a herniated disc. Isolated grade 4 facial palsy, according to the House–Brackmann scale, on the left side developed after surgery. Computed tomography revealed pneumocephalus in the basal cisterns. The patient was treated without any problems conservatively.

**Conclusion:** While most cases are due to intracranial surgery, pneumocephalus caused by spinal surgery is extremely rare. Pneumocephalus usually occurs without symptoms but can occasionally be accompanied by headaches and rarely leads to focal neurological or cranial nerve deficits. This case emphasizes the importance of considering pneumocephalus as a possible complication after spinal surgery and highlights its rare association with cranial nerve deficits.

**Keywords:** Facial nerve palsy, Lumbar discectomy, Pneumocephalus

## INTRODUCTION

Pneumocephalus is defined as the presence of gas in the intracranial space, usually consisting of air. It is typically associated with surgical procedures but can also result from trauma, infection, and sporadic cases.<sup>[8]</sup> While most cases are due to intracranial surgery, pneumocephalus caused by spinal surgery is extremely rare.<sup>[1]</sup> Pneumocephalus is usually asymptomatic. However, it can occasionally manifest with headaches and rarely lead to focal neurological or cranial nerve deficits. The mechanism of cranial nerve palsy in pneumocephalus is attributed to direct compression by air.<sup>[7]</sup> Cranial nerve palsy following pneumocephalus is rarely documented in the literature, and specifically, cranial nerve palsy due to pneumocephalus following lumbar decompression has not been reported to date.

In this article, we report a case of isolated facial nerve palsy in the postoperative period in a patient who developed a dural tear during lumbar decompression surgery.

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## CASE PRESENTATION

A 47-year-old man was admitted to our clinic complaining of lower back pain and radicular pain in the left lower extremity for 2 years. The patient had no significant medical history. Neurological examination revealed decreased muscle strength in dorsiflexion of the left ankle (4/5). No other abnormalities were noted on physical and neurological examination. Magnetic resonance imaging of the lumbar spine revealed a herniated disk at the left L4–5 and L5–S1 [Figure 1]. The patient underwent an L4–L5 inferior partial laminectomy, an L5–S1 foraminotomy on the left side, and an L4–L5 microdiscectomy. The operation was performed under general anesthesia in a modified prone position. A dural tear was observed during the operation. The tear was repaired by suturing with a muscle flap.

In the postoperative period, an improvement in the motor deficit in the extremities was noted. Radicular leg pain also disappeared. However, he developed grade 4 facial paralysis on the left side of the face [Figure 2]. Computed tomography (CT) of the brain showed pneumocephalus in the ventricles, subarachnoid spaces, and basal cisterns [Figure 3]. In the postoperative period, bed rest was prescribed, intravenous fluids and steroids were administered, and the patient was nasally oxygenated for 24 h. The patient was discharged on the 2<sup>nd</sup> postoperative day. Three weeks after the operation, the left-sided facial paralysis had completely disappeared [Figure 4]. In the CT examination, it was observed that the air was completely resorbed [Figure 5].

## DISCUSSION

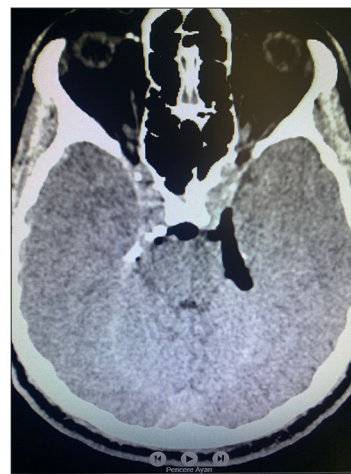
Pneumocephalus, also known as pneumatocele or intracranial aeroceles, can be localized in various spaces, including subdural, subarachnoid, epidural, and intraventricular



**Figure 1:** Sagittal T2 magnetic resonance imaging images of L4–5 and L5–S1 intervertebral disc protrusions.



**Figure 2:** Early postoperative image of the patient with peripheral facial paralysis.



**Figure 3:** Pneumocephalus in the basal cisterns on axial brain computed tomography examination.



**Figure 4:** Image of the patient's facial paralysis resolved 3 weeks after surgery.



**Figure 5:** Resorption of pneumocephalus on axial brain computed tomography examination 3 weeks after surgery.

spaces. Many cases of iatrogenic pneumocephalus occur as a result of supratentorial surgery, but in rare cases, it can also occur as a result of spinal surgery.<sup>[3]</sup> The probable cause of pneumocephalus is an accidental defect in the dura that allows air to enter the cranial cavity. In addition, two other possible mechanisms have been proposed: the ball valve theory states that a defect in the dura acts like a one-way valve and traps air in the cranial cavity, while the inverted bottle theory states that the intracranial negative pressure created by the loss of cerebrospinal fluid is replaced by air.<sup>[4]</sup> This condition is usually asymptomatic, although it can manifest with symptoms such as headache, dizziness, and vomiting.

Isolated cranial nerve deficits following pneumocephalus have been rarely described in the literature, with most observed as oculomotor and abducens palsies.<sup>[4,9]</sup> In our case, the patient presented with peripheral facial paralysis. CT imaging of the brain showed air in the intraventricular and subarachnoid spaces, especially in the cistern of the cerebellopontine angle (CPA). In our case, facial nerve palsy was found to be caused by direct compression by air. In reviewing the literature, our case stands out as the first case of facial palsy associated with pneumocephalus after spinal surgery.

The facial paralysis in this group of patients could be caused by positional pressure. In patients undergoing spinal surgery in the prone position, facial paralysis is rarely reported in the literature. Yoshizawa *et al.* reported a case of facial palsy after posterior approach spinal surgery caused by direct pressure on a patient undergoing surgery in a prone position. Adequate protective support to prevent positional compression is crucial, especially in patients who are expected to undergo prolonged surgery.<sup>[9,10]</sup> In our patient who received adequate compression-preventing support, a CT scan of the brain

showed that air was compressing the facial nerve pathway in the cistern of the CPA, suggesting that Bell's palsy in our patient was likely due to air compression associated with pneumocephalus.

Pathologic and microsurgical studies have provided crucial insights into Bell's palsy, revealing significant edema in the facial nerve canal during the acute phase. Steroids are important for treatment due to their anti-inflammatory properties that reduce nerve swelling and improve blood circulation in the affected areas. The condition is often associated with viral infections, particularly herpes simplex virus (HSV), which has been detected in the endoneurial fluid of many patients, suggesting neuroinflammation as a result of HSV infection. Therefore, a combination of steroids and antiviral medications may be effective, with steroids reducing inflammation and swelling and antiviral medications targeting the possible viral cause. This dual approach addresses both the symptoms and the possible viral etiology of Bell's palsy. In selected cases, surgical decompression should be considered as a treatment option. However, the literature has limited information on the superiority of medical treatment over surgery.<sup>[2,5,6]</sup>

## CONCLUSION

Our case illustrates the unusual incidence of peripheral facial palsy due to pneumocephalus following spinal surgery. Although pneumocephalus is usually asymptomatic, it can occasionally lead to neurological deficits, including cranial nerve impairment. In our patient, the facial nerve palsy was attributed to direct compression by air in the CPA, as revealed by CT imaging. This case emphasizes the need to consider pneumocephalus in the differential diagnosis of cranial nerve deficits following spinal surgery. Our findings contribute to the literature by documenting the first reported case of facial palsy associated with pneumocephalus after spinal surgery, thereby expanding the understanding of potential complications and their management in postoperative patients.

**Authors' contributions:** AK and ZB: Summarized and discussed the clinical data; AK, ZB, IA: Performed the surgery.

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