

Parkinsonism Due to Tension Pneumocephalus Complicating Vestibular Schwannoma Surgery: Case Report

Vestibüler Schwannoma Cerrahisini Komplike Hale Getiren Tansiyon Pnömocefalus Nedenli Parkinsonizm

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ABSTRACT Patients undergoing posterior fossa surgery in sitting position have been reported to suffer from venous air embolism, hemodynamic instability, spinal cord and lower brainstem infarctions, and pneumocephalus. Although parkinsonism has been presented secondary to subdural hematoma or effusion, there are no reports about parkinsonism related to tension pneumocephalus and subdural effusion following to surgical removal of the vestibular schwannoma. Herein, we present two patients with acute onset parkinsonism symptoms that appeared after vestibular schwannoma surgery performed in sitting position. Both patients had no extrapyramidal signs and symptoms on preoperative examination. Our first case had frontal subdural pneumocephalus and effusion, and second one similarly had tension pneumocephalus in the ventricular space. In both cases, the compression of the intracranial air on the frontobasal circuit (frontocortical-striatal-pallidal-thalamic-cortical loop) caused to parkinsonism. We concluded that secondary parkinsonism could occur with dysfunction of the circuits linking the frontobasal pathway resulting in compressive effect of tension pneumocephalus.

Key Words: Neuroma, acoustic; parkinson disease, secondary; neurosurgery; pneumocephalus; basal ganglia diseases

ÖZET Oturur pozisyonda arka fossa cerrahisi uygulanan hastalarda venöz hava embolisi, hemodinamik instabilite, spinal kord ve beyin sapı enfarktleri ve pnömocefali geliştiği bildirilmiştir. Subdural hematoma veya efüzyona bağlı parkinsonizm sunulmuş olmasına karşın vestibüler schwannomanın cerrahi olarak çıkartılmasını takiben tansiyon pnömocefali ve subdural efüzyon gelişimi ile ilişkisi henüz bildirilmemiştir. Biz oturur pozisyonda yapılan schwannoma cerrahisini takiben akut başlangıçlı parkinsonizm semptomları ortaya çıkan iki hasta sunuyoruz. Her iki hasta da operasyon öncesi incelemede ekstrapiramidal bulgu ve semptomlara sahip değildi. İlk olgu frontal subdural pnömocefali ve efüzyona sahipti, ve ikinci olgunun benzer olarak ventriküler boşlukta tansiyon pnömocefali vardı. Her iki olguda intrakraniyal havanın frontobazal çevrim (frontokortikal-striatal-pallidal-talamik-kortikal döngü) üzerindeki baskısı parkinsonizme neden oldu. Biz sekonder parkinsonizmin tansiyon pnömocefalinin kompresif etkileri ile sonuçlanan frontobazal yolak ile bağlantılı çevrimlerin disfonksiyonu ile oluşabileceği sonucuna vardık.

Anahtar Kelimeler: Nöroma, akustik; parkinson hastalığı, ikincil; sinir cerrahisi; pnömocefalus; bazal gangliyon hastalıkları

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Secondary parkinsonism, a disorder with symptoms similar to Parkinson's disease, can be caused by stroke, encephalitis, the use of dopamine receptor antagonists and rarely by intracranial neoplasms.¹⁻³ Venous air embolism, hemodynamic instability, spinal cord and lower brainstem infarctions have been reported in a number of patients who had undergone posterior fossa surgery in sitting position.^{4,5} Harders et al.⁶ reported post-

operative pneumocephalus mainly located in frontal subdural and interhemispheric fissure on cranial tomography in early phase of postoperative period.

Pneumocephalus is defined as the presence of air in the cranium. It is critical to distinguish it from tension pneumocephalus where the air is under the pressure. Air can be located in different compartments such as epidural, subdural, subarachnoid spaces and intraparenchymal and intraventricular areas in pneumocephalus. Patients with tension pneumocephalus can present with headache, nausea, vomiting and obtundation. Furthermore, tension pneumocephalus can cause signs and symptoms of focal deficit or increase intracranial pressure relevant to mass effect. Pneumocephalus is very common after surgery performed in the sitting position, but tension or symptomatic pneumocephalus rarely occur.⁷

To the best of our knowledge, there has been no report about parkinsonism due to pneumocephalus and effusion subsequent to cerebellopontine angle (CPA) tumor operations in the sitting position.

CASE REPORTS

CASE 1

A 67-year-old female patient was admitted to our neurosurgery clinic with complaints of vertigo and numbness on the right side of her face. She had suffered from progressive unilateral right side hearing loss for 15 years. She had the diagnosis of trigeminal neuralgia established by a neurologist due to persistent pain on the right side of her face two years ago and she was on carbamazepine (800 mg/day) and gabapentine (1800 mg/day) treatment since then. She complained of increasing pain along the distributions of V1-V2-V3 divisions of trigeminal nerve. Her neurological examination revealed decreased sensation in the area innervated by right fifth cranial nerve, hearing loss in the right ear, ataxic gait, cerebellar instability, dysmetria, and disidiadokokinesis. Cranial magnetic resonance (MR) imaging demonstrated a CPA tumor (3 x 3 x 3 cm) with contrast enhancement on the right side (Figure 1 A, B).

She underwent surgery in the sitting position for the tumor originated from eighth cranial nerve

compressing and extending to the fifth cranial nerve, on its lateral and superior edges. The tumor was totally removed and was a vestibular schwannoma. During the postoperative period, House-Brackmann grade 3 facial palsy developed on the right side. Furthermore, she suffered from obtundation with facial hypomimia, bradykinesia, and bilateral rigidity prominent in the right wrist in the third day following the operation. According to unified parkinson disease rating scale (UPDRS), motor score was 25. On fifth day following the operation, her rigidity, bradykinesia, and bradimimi increased gradually and tremor appeared at the right hand. Cranial tomography (CT) and MR images showed bilateral subdural frontal tension pneumocephalus and effusion (Figure 1 C, D). No familial history of parkinsonism was present. She was video-typed and levodopa, carbidopa and catechol-O-methyltransferase inhibitor (50 mg q.i.d) were administered. On the following days, her extrapyramidal symptoms resolved gradually. Control cranial MR imaging revealed decreased air and effusion in the bilateral frontal subdural spaces.

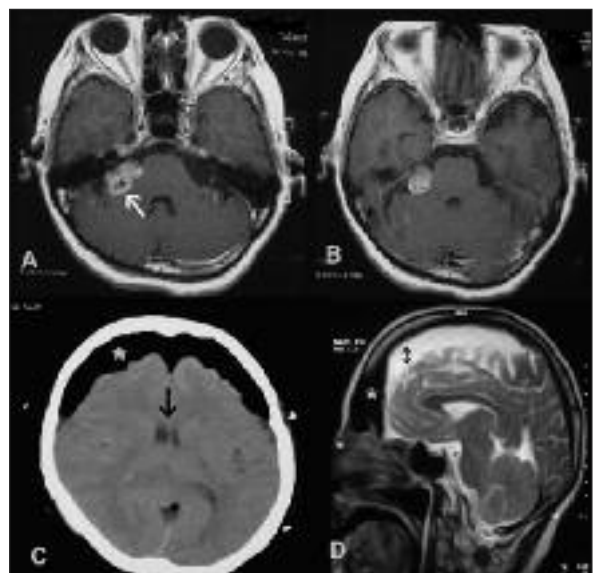


FIGURE 1: Axial T1 weighted cranial MR images (A, B) show right CPA tumor (3 x 3 x 3 cm) with contrast enhancement (white arrow), axial CT image (C) reveals bilateral frontal subdural tension of pneumocephalus (white star) and compression of frontal lobe that indicates tensile or compressive effects of tension pneumocephalus (black arrow). Sagittal MR image (D) manifests to decrease in frontal subdural tension of pneumocephalus (white star) and frontal subdural effusion (black arrow).

CASE 2

A 72-year-old male had been suffering from tinnitus and progressive left unilateral hearing loss for 18 months. He admitted to department of neurosurgery for his progressive vertigo. His neurological examination was normal except for hearing loss at the left ear and imbalance.

Constructive interference steady state-sequence (CISS) and T1 weighted cranial MR imaging showed a CPA tumor (1 x 1 x 1 cm) (Figure 2 A, B). Left paramedian suboccipital retrosigmoid approach was performed in sitting position and the tumor was removed in total which was a vestibular schwannoma. Postoperative CT scan showed bilateral frontal subdural air consistent with tension pneumocephalus (Figure 2 C). Nine days after the surgery, he began to suffer from obtundation with bradymimia as well as neck stiffness, bradykinesia, bilateral rigidity prominent on the left side and bilateral postural tremor. UPDRS motor score was 26. Due to these progressive symptoms, levodopa/benserazide (62.5 mg q.i.d) were initiated. His symptoms and extrapyramidal signs improved gradually. Cranial MR imaging revealed a decrease in size of intraventricular air and frontal pneumocephalus (Figure 2 D).

DISCUSSION

The sitting position is used for posterior fossa surgery in many neurosurgical units. It is also preferred to supine position for CPA surgery due to good surgical access to the lesion. However, in sitting position, air can get into the subdural, intraventricular, cisternal and subarachnoidal spaces.⁹ The postoperative pneumocephalus may increase the risk of tension pneumocephalus.¹⁰ It usually does not require treatment, however it is critical to discriminate benign pneumocephalus and tension pneumocephalus which needs to be evacuated if becomes seriously symptomatic or is refractory to medical treatment. In both of our cases, symptoms regressed with medical treatment and conservative precautions. For this reason, surgical intervention such as burr hole puncture was not necessary. It could be difficult to distinguish and make a decision for surgery in both conditions, but tension pneu-

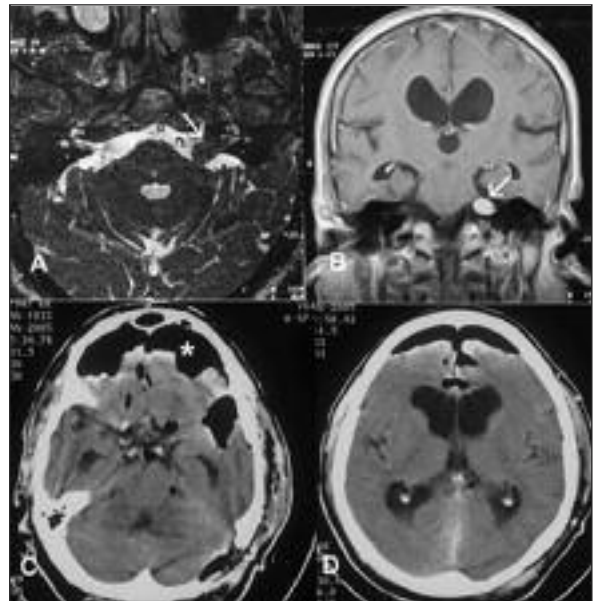


FIGURE 2: Axial CISS sequence MR (A) and coronal T1 weighted MR images (B) indicate a CPA tumor (1 x 1 x 1 cm) with contrast enhancement (white arrow). Axial CT images (C-D) reveal early stage bilateral frontal subdural air consistent with tension pneumocephalus (white star) and decreased pneumocephalus in subacute stage.

mocephalus usually causes compression on the brain which is obvious on CT and MR images (Figures 1C, 2C). Tension or symptomatic pneumocephalus after surgery performed in the sitting position has already been reported.^{7,9,11} Parkinsonism, which is secondary to the intracranial hematoma and neoplasm, particularly brainstem cystic astrocytoma, frontal meningioma and large supratentorial tumor with or without compression and distortion on the basal ganglia, has been reported before as well.^{1,2,12-14} But parkinsonism due to CPA tumor operation performed in sitting position has not been reported yet.

In our cases, secondary parkinsonism could be associated with tension pneumocephalus relevant to impairment of the blood flow secondary to compressive or tensile effect on the basal ganglia, which creates low perfusion in the striatopallidal region and compression or distortion on frontobasal circuit.^{14,15} Consequently, pneumocephalus and its tensile effect could play an important part in compression and impairment of regional cerebral blood perfusion of the basal ganglia.

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