



Iatrogenic Pneumothorax After Ventriculoperitoneal Shunt: An Unusual Complication and a Review of the Literature

Ventriküloperitoneal Şanttan Sonra İatrojenik Pnömotoraks: Olağandışı Komplikasyon ve Literatürün Gözden Geçirilmesi

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ABSTRACT

A patient received a ventriculoperitoneal shunt operation for hydrocephalus after subarachnoid hemorrhage. Postoperative computed tomography incidentally revealed asymptomatic pneumothorax caused by a shunt tube passing through the thoracic space. The patient was observed without removal of the tube or chest drainage, with the expectation of spontaneous recovery. However, the pneumothorax was not cured, and chest drainage was performed and eventually resolved the pneumothorax. The ventriculoperitoneal shunt worked well, and the patient recovered from consciousness disturbance. We discuss treatment strategies for this rare complication and how to avoid it. A review of the literature suggests that female or obese patients may be associated with this complication.

KEYWORDS: Chest drainage, Complication, Pneumothorax, Ventriculoperitoneal shunt

ÖZ

Bir hastaya subaraknoid kanamadan sonra hidrosefali için ventriküloperitoneal şant cerrahisi yapıldı. Postoperatif bilgisayarlı tomografi torasik boşluktan geçen bir şant tüpünün neden olduğu asemptomatik pnömotoraks tesadüfen ortaya koydu. Hasta göğüs drenajı veya tüp çıkarılmadan, kendiliğinden iyileşme beklenerek gözlemlendi. Ancak pnömotoraks böyle iyileşmedi ve göğüs drenajı yapılırca zamanla geçti. Ventriküloperitoneal şant iyi çalıştı ve hastanın bilinci tekrar açıldı. Bu nadir komplikasyon için tedavi stratejilerini ve bundan nasıl kaçınılacağını tartışıyoruz. Literatürün gözden geçirilmesi, kadın veya obez hastalarda bu komplikasyonun görülebileceğini düşündürmektedir.

ANAHTAR SÖZCÜKLER: Göğüs drenajı, Komplikasyon, Pnömotoraks, Ventriküloperitoneal şant

INTRODUCTION

We report a case of an iatrogenic pneumothorax after a ventriculoperitoneal (VP) shunt operation, which is a known but rare complication. To the best of our knowledge, there are only 4 previous case reports on this complication (1-4). We describe how we managed this complication and review the literature.

CASE REPORT

A 73-year-old woman presented with subarachnoid hemorrhage due to a ruptured aneurysm. Coil embolization was performed, and the patient was transferred to a rehabilitation hospital. The patient's consciousness deteriorated because of hydrocephalus after 6 months from the onset of subarachnoid hemorrhage. The patient was of medium build. We placed a VP shunt. One of the operators inserted a shunt passer from abdominal subcutaneous fat tissue to the supraclavicular portion. He palpated the tip of the shunt passer during its advancement, but could not palpate it underneath the patient's breast. The patient showed no change in vital

signs, including the respiratory system, during the operation and after extubation. Following the operation, abdominal computed tomography (CT) was performed because one of the operators had previously experienced a complication of migration of the tip of a shunt tube into the abdominal subcutaneous space. The upper slice of the abdominal CT incidentally revealed that the shunt tube had passed through the thoracic space and caused pneumothorax and subcutaneous emphysema (Figure 1A). The patient did not complain of respiratory distress, and respiratory conditions were stable. Three-dimensional (3D) thoracic CT revealed that the tube had passed underneath the 3rd to the 5th rib (Figure 1B). We consulted with a thoracic surgeon and decided to observe the patient carefully without removal of the shunt tube or chest drainage, with the expectation of spontaneous recovery of pneumothorax. This was because tension pneumothorax was not observed and we were concerned about shunt infection after chest drainage. Although the patient showed no symptoms for 1 week, thoracic CT showed slight enlargement of the pneumothorax. Chest drainage was performed after con-

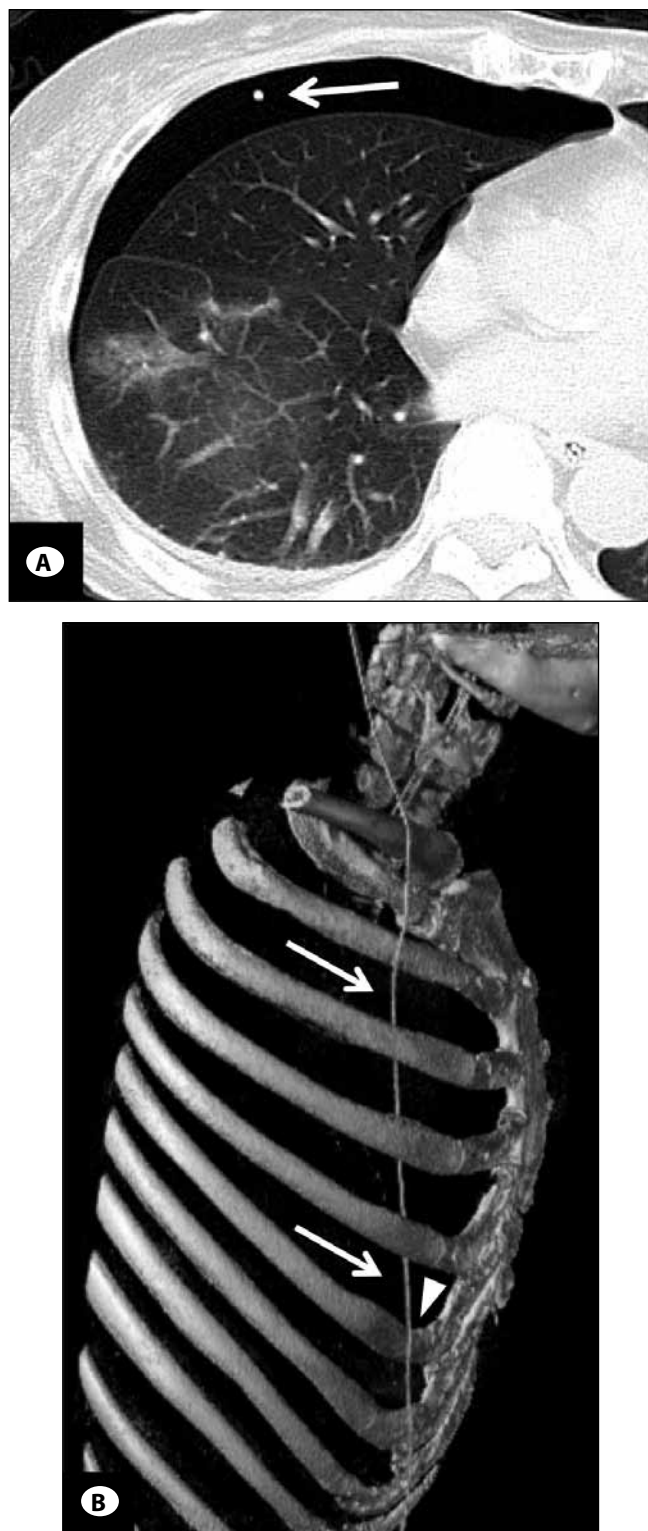


Figure 1: **A)** Thoracic computed tomography (CT) shows pneumothorax and a shunt tube passing through the thoracic space (arrow). **B)** Reconstructed three-dimensional CT shows the shunt tube passing underneath the 3rd to 5th ribs (arrows). CT also shows an indentation at the 6th rib at the tract of the shunt tube (arrow head), which might make the shunt passer likely to migrate underneath the 5th rib.

sulting the thoracic surgeon again. A chest drainage tube was inserted laterally between the 5th and 6th ribs apart from the VP shunt tube to decrease the risk of shunt infection. An antibiotic agent was used to prevent infection. The chest drainage tube was removed 1 week later. The pneumothorax was cured at this time. The VP shunt worked well, and the patient gradually recovered from consciousness disturbance and was transferred to a rehabilitation hospital.

DISCUSSION

Pneumothorax after a ventriculo- or subdural-peritoneal shunt is a known but rare complication. We could only find 4 cases with this complication in the literature, and these are summarized in Table I (1-4). In cases of tension pneumothorax, respiratory insufficiency will occur during or just after an operation (3, 4). In such a case, chest drainage must be performed immediately. In our case, the patient suffered from non-tension pneumothorax and showed no symptoms. Early postoperative CT incidentally revealed the pneumothorax. If we had not detected the pneumothorax, the patient might have showed respiratory insufficiency a few weeks after the operation.

To design a treatment strategy for the complication of pneumothorax, we considered a combination of 2 treatments: chest drainage and removal of a VP shunt tube. First, with regard to chest drainage, we were concerned about shunt infection if the VP shunt tube remained. During chest drainage, shunt infection might occur and then we would have to remove the VP shunt tube. The pneumothorax was not the tension type, and therefore we did not perform chest drainage at first because we expected spontaneous recovery of the pneumothorax without having this risk of shunt infection. A previous case of pneumothorax after a VP shunt operation was spontaneously resolved without chest drainage (1). Second, removal of a VP shunt tube can avoid the risk of shunt infection after chest drainage. However, shunt revision would be necessary later. We decided to leave the shunt tube in our patient because we considered that the risk of infection was not high with the use of antibiotics. We appreciate that our decision is controversial. The patient will have the shunt tube for life, and infection might occur in the future. The infection could cause not only meningitis and peritonitis but also pneumonia and thoracic empyema. However, in 2 cases among the 4 previously reported cases of pneumothorax after a ventriculo- or subdural-peritoneal shunt (Table I), the shunt tube was not removed after chest drainage, and no infections or other complications occurred. Therefore, it may be acceptable to leave the shunt tube even if chest drainage is performed.

To avoid this complication of pneumothorax after a VP shunt, the tip of a shunt passer should be palpated during its advancement, although it is sometimes difficult underneath a patient's breast or in obese patients. All 5 reported patients with pneumothorax after a ventriculo- or subdural-peritoneal shunt, including our case, are female (Table I). In 1 of these patients, the patient was described as obese (3). Being

Table 1: Review of the Literature on Pneumothorax After Ventriculo- or Subdural-Peritoneal Shunt

Literatures	Age Sex	Operation	Tension pneumothorax	Symptoms	When found	Chest drainage (timing)	Removal of the shunt tube	Further complications
Portnoy et al. (1973) (2)	66 Yr F	VP shunt	ND	Subcutaneous emphysema	Several hours after the operation	+ (immediately)	-	-
Menguy et al. (1986) (1)	4 Mo F	VP shunt	-	Respiratory distress	Just after extubation	- Reintubation only	-	-
Schul et al. (2010) (3)	74 Yr F	VP shunt	+	Respiratory insufficiency	Two hours after the operation	+ (immediately)	+	-
Solmaz et al. (2011) (4)	4 Mo F	SP shunt	+	Decrease in oxygen saturation, hypotension, bradycardia	During the operation	+ (immediately)	-	-
Current Case (2013)	73 Yr F	VP shunt	-	None (abdominal CT incidentally revealed pneumothorax)	Just after the operation	+ (one week later)	-	-

Mo: month; **Yr:** Year; **F:** female; **VP:** ventriculoperitoneal; **SP:** subdural-peritoneal; **ND:** not described

female or obese may be associated with the complication of pneumothorax after a VP shunt because it makes it difficult to palpate the tip of a shunt passer underneath a patient's breast. Therefore, neurosurgeons should be aware of this complication, especially for female or obese patients. Additionally, in our patient, the 6th rib had an indentation at the tract of the shunt tube, while the 5th rib did not (Figure 1B), which might make the shunt passer likely to migrate underneath the 5th rib. Although this is a rare complication, awareness of its possibility and treatment strategies may be helpful.

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