Retained guidewire penetrating through the aorta into the thorax: an unusual cause of recurrent bilateral pneumothorax

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Abstract
Although numerous complications of the Seldinger technique have been reported in the literature, only a few complications are related to guidewires. We here report a case of a patient with a guidewire lost and retained in the aorta during vertebral artery stenting. Unfortunately, the guidewire in the aorta was not detected for 5 years, and it penetrated through the aorta into the left thorax, leading to recurrent left pneumothorax. No physician identified the wandering guidewire in the left thorax, and the recurrent left pneumothorax was only managed with closed thoracostomy drainage several times. After 4 months, the patient presented to our hospital with repeated severe chest pain, and newly developed right pneumothorax was diagnosed on chest X-rays. We meticulously evaluated the radiological findings of the other hospitals to identify the cause of the recurrent pneumothorax and discovered that the lost and wandering guidewire had crossed over from the left to the right thorax through the anterior mediastinum. The guidewire was identified as the cause of the recurrent bilateral pneumothorax, and the patient was successfully treated with video-assisted thoracoscopic surgery without any events.

Keywords: Pneumothorax • Video-assisted thoracoscopic surgery • Guidewire

INTRODUCTION
The Seldinger technique allows vascular intervention without a cutdown, and because relatively small diameter puncture needles are used, this technique results in minimal trauma to the surrounding tissue [1]. This technique is generally considered to be a very safe method. Most of the complications are mainly related to direct or indirect injury to the target vessels and the adjacent structures. Among these complications, a lost guidewire is the most serious because this complication is completely preventable if the surgeon meticulously performs catheter insertion [2].

CASE PRESENTATION
A 69-year-old male presented to the Thoracic and Cardiovascular Surgery Department after several days of chest pain and mild dyspnoea. Chest pain was repetitive, noted as fluctuating for several days. There were two remarkable past medical histories. First, he had undergone vertebral artery stenting for dizziness and syncope at a regional hospital 5 years before this presentation. At that time, he was diagnosed with hypertension and continued to take an antihypertensive calcium channel blocker and aspirin. Second, he had undergone closed thoracostomy in multiple sessions for recurrent left pneumothorax in another regional hospital 4 months before this presentation. Vital sign was stable, and laboratory test results were within the normal limits. Chest X-ray showed right pneumothorax and an indistinguishable thin linear lesion. Initially, this lesion was interpreted as an artefact; however, the linear lesion was continuously noted. Then, the medical records and the radiological imaging studies of the two regional hospitals were meticulously reviewed along with thorough history taking. The linear lesion was first noted on the X-rays taken during vertebral artery stenting 5 years earlier, which was thought to be a guidewire inserted during stent intervention. After that, the lesion had been continuously detected in all radiological imaging studies. On the initial chest series, the lost guidewire was retained in the aorta. Chest X-ray taken 4 months earlier in the second regional hospital due to pneumothorax revealed that a guidewire had penetrated through the aorta into the left thorax. Unfortunately, despite continuous check-ups and repeated admissions at the two regional hospitals, no physician recognized this complication until presented to our hospital. Contrast-enhanced computed tomography of the chest showed secondary bilateral pneumothorax with some adhesion and a guidewire in the thorax (Fig. 1). The guidewire that was initially located in the left thorax crossed the anterior mediastinum and penetrated into the right thorax, which was of omega shape. A closed thoracostomy was performed to control pneumothorax, which subsequently improved along with the chest pain. On the second admission day, video-assisted thoracoscopic surgery (VATS) was performed using the single-port technique under general anaesthesia with a double-lumen endotracheal tube.
intubated in the lateral position. The guidewire retained in the thoracic cavity was removed without difficulty. Measuring 80 cm in length, it was a 0.014-inch diameter stiff-type guidewire with a straight distal curve that was used during the vertebral artery stenting (Fig. 2). Two 8-Fr thoracic drains were inserted into the right thoracic cavity, after which bleeding was meticulously controlled. The postoperative course was uneventful. The chest tubes were removed on the fifth postoperative day, and radiological findings were normalized. The patient improved without any complications and was discharged from the hospital on the sixth postoperative day.

Figure 1: (A and B) An initial chest AP (anterior-posterior) view after vertebral stenting 5 years before the presentation to our hospital. (B) A magnified area of black box area in A. (C) Chest PA (posterior-anterior) view checked in a regional hospital 4 months before presentation showing left pneumothorax. (D) Chest PA view checked in our hospital. The black arrow heads indicate lost and missed guidewires, black arrows indicate the vertebral artery stent and the white arrows indicate a collapsed parietal pleura.

Figure 2: (A) Images taken under VATS, showing the lost and missed guidewire. The black arrows indicate the lost and missed guidewire. (B) Guidewire retrieved from the thoracic cavity under VATS. The two clamps are mosquito clamps. VATS: video-assisted thoracoscopic surgery.
There was no evidence of recurrence of pneumothorax on either side at 12 months of follow-up.

**DISCUSSION**

Since complications induced by missed and lost guidewires are relatively rare in clinical practice, surgeons should be alert to the symptoms caused by such lost guidewires [3, 4]. If a lost or missed guide wire is found in the surgical field, it can be removed immediately using a gooseneck snare, which can minimize serious sequelae. Most recent reports have suggested that the treatment of choice is radiological intervention, although a few have demonstrated that a surgical procedure is also needed [5]. Because most cases of lost guidewires rarely occur, it is extremely difficult to predict clinical outcomes after the retrieval of lost guidewires. In most cases, the lost guidewires can be retrieved without any events; only a few cases have shown complications, such as fragment embolization or thrombosis, at the guidewire site after the retrieval of the lost guidewire. The pathophysiology of this unusual case could be explained as follows. The guidewire lost in the aorta initially penetrated through the aorta, passed through the left parietal pleura-surfaced mediastinum and invaded the left thorax, causing recurrent injury to the left visceral pleura, which led to repetitive left pneumothorax. Afterwards, this stiff-type guidewire again penetrated through the left parietal pleura, passed through the retrosternal area of the anterior mediastinum, penetrated through the right parietal pleura-surfaced mediastinum and invaded the right thorax, subsequently causing injury to the right visceral pleura, which resulted in right pneumothorax.

Our case has clinical implications in some aspects. First, the lost guidewire was retained in the aorta for 5 years. Second, the guidewire penetrated through the aorta into the left thorax. Third, the guidewire crossed the anterior mediastinum to reach the right thoracic cavity, resulting in right pneumothorax. To the best of our knowledge, this is the first report of recurrent pneumothorax due to a missed guidewire that was successfully treated with VATS. Surgeons and interventionists should consider lost guidewires in the differential diagnosis of acute chest pain and pneumothorax.

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**REFERENCES**