An 88-year-old woman required out-of-hospital cardio-pulmonary resuscitation (return of spontaneous circulation 2 minutes) for third-degree heart block and was admitted to our intensive care unit. The patient underwent urgent implantation of a dual-chamber pacemaker. Three hours later, she developed extensive emphysema of her face with crepitation over the entire thorax, neck, and face. Single-plane chest x-ray confirmed subcutaneous emphysema but failed to identify the underlying pathology (Figure 1A). Just a few minutes later, the patient worsened, and subcutaneous emphysema rapidly progressed to neck, midface, eyelids, and fingertips; the decision for whole-body CT was made. CT revealed left-sided ventral pneumothorax and mediastinal emphysema rapidly progressed to neck, midface, and ipsilateral multiple fragments of the clavicle. However, a direct lesion of the lungs, the large airways, or the esophagus as a potential main cause could be excluded.

Taking clinical findings into account, we discussed 3 possibilities for a pulmonary-subcutaneous air leakage: (1) posttraumatic pneumothorax after chest compression during cardiopulmonary resuscitation leading to fractures of ribs and sternum, (2) tracheal injury attributable to traumatic endotracheal intubation, or (3) iatrogenic pneumothorax in the course of pacemaker implantation using an intraclavicular approach for puncture of the subclavian vein.

To elucidate the origin of the leakage, a combination of a technetium (Tc)-99m-Technegas (Cyclomedica Germany GmbH, Salzgitter) single-photon emission CT (SPECT)-derived ventilation study and a low-dose CT scan were performed using a Symbia T2 hybrid SPECT-CT system (Siemens, Erlangen, Germany). A technically identical follow-up investigation was performed on day 8 (see online-only Data Supplement Movie II).

Using this diagnostic approach, we identified the source of the pneumothorax as a singular leakage at the lower part of the left clavicle, resulting in focal trapping of the Technegas particles. It was concluded that this was caused by traumatic injury of the lung during pacemaker implantation (Figure 2). With the knowledge of precise localization, 2 thoracic drains were placed using a m idclavicular (Monaldi) and a left lateral access.

During the further hospital stay, the emphysema slowly declined, and re-evaluation by ventilation SPECT/CT was performed on day 8 (see online-only Data Supplement Movie II). Focal air trapping suggesting pulmonary leakage was no longer detectable, and the emphysema was significantly reduced (Figure 2), so both drains were removed. This was interpreted...
as confirmation of the assumed underlying pathomechanism. During follow-up, the patient remained asymptomatic and was discharged from the hospital on day 14. On routine pacemaker follow-up after 1 month, the patient presented an excellent neurological outcome. Furthermore, no clinical signs of residual skin emphysema were present.

In conclusion, we suggest a benefit for the use of functional ventilation SPECT/CT in the detection, localization, and differentiation of potentially multifactorial airway injuries offering concerted treatment options.

Disclosures

None.

References


Key Words: subcutaneous emphysema ■ tomography, emission-computed, single-photon ■ tomography, X-ray computed
Localizing the Air Vents: Functional Imaging–Guided Diagnosis in Extensive Multilocal Subcutaneous Emphysema

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