Localizing the Air Vents

Functional Imaging–Guided Diagnosis in Extensive Multilocal Subcutaneous Emphysema

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A 88-year-old woman required out-of-hospital cardiopulmonary 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 spreading over cervical structures into both arms (Figure 1B). Furthermore, on the contralateral side, CT showed fractures of the fourth and fifth ribs 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 infracavicular 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 at the time of patient discharge.

Tc-99m-Technegas is an ultrafine aerosol of Tc-99m–labeled macroaggregated albumin. 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 midclavicular (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
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*Circ Cardiovasc Imaging, 2013;6:1115-1116
doi: 10.1161/CIRCIMAGING.113.000592

Circulation: Cardiovascular Imaging is published by the American Heart Association, 7272 Greenville Avenue, Dallas, TX 75231
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Print ISSN: 1941-9651. Online ISSN: 1942-0080

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