Emergency Technology at Our Reach Might Make a Change - Instead of an Editorial

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A recent study published in the *Chest* showed that often enough community-acquired pneumonia was associated with a clear chest radiograph (1). In 3% of the case, the clinical profile of these patients with CT-only pneumonia did not differ from those with pulmonary infiltrates on chest radiograph also in terms of comorbidities, vital signs, and length of stay, etiology, mechanical ventilation and admission in the Intensive Care Unit (ICU), septic shock or inhospital mortality. Often enough critically ill patients need CT scans for diagnostic purposes or reassessments. To comply with the indications for CT scans, the patients must be transported in remote locations, or several floors down. Transport of the critically ill is by no means a trifle, for it could jeopardize the outcome. When the risks associated with transportation overcome the benefits, alternative methods of diagnoses, equally efficient need to be used. Technology helps a lot. Thoracic bioimpedance CT scans at the bedside may be the answer for patients who cannot wait for time-consuming investigations, who need a better monitoring of their respiration at the bedside, who could benefit from in depth monitoring of their respiratory pressions, an assessment of their work of breathing (WOB), or a change of their treatment.

We report the case of a patient – an eighty-four years old frail woman (weighting 45 kg), admitted in a critical condition in the ICU, who needed mechanical ventilation for seven days. The admission diagnosis was: Ischemic stroke; Atelectasis of the right inferior lobe; Congestive heart failure.

Blood gas analysis revealed hypoxemia corrected by oxygen administration on facial mask during transportation from Neurology, followed by invasive mechanical ventilation in the ICU. The patient was edentulous, her GCS was 6, an appropriate interface to allow for noninvasive ventilation was not available.

A radiograph revealed atelectasis of the right inferior lobe, and bronchoscopy subsequently unplugged the right and medium inferior bronchi (Fig. 1 and 2). The radiograph showed reexpansion of the right lung, but a certain amount of fluid remained in the right pleura, not enough to need drainage according to the surgeons (Fig. 3).

Three days after this, clinical examination of the thorax revealed a deadened tone of the right inferior half. We suspected a large fluid collection in the right pleural space.

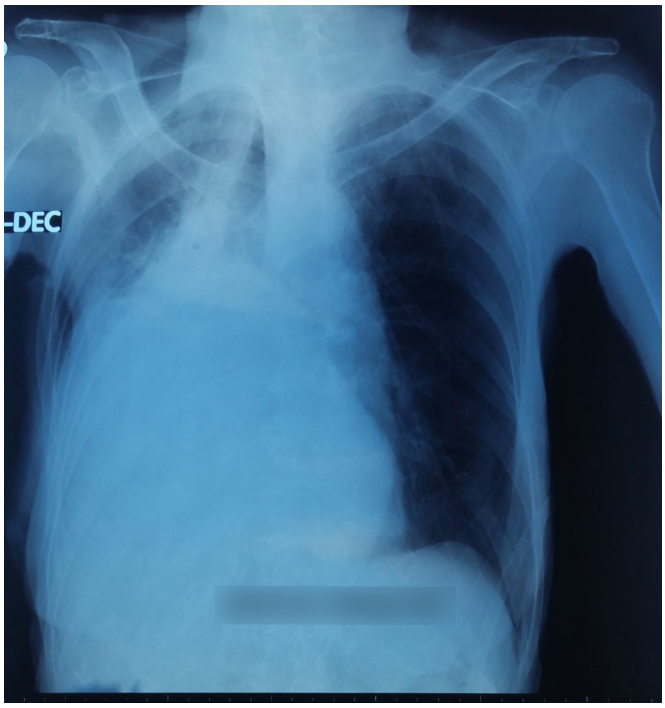

Fig. 1. Atelectasis of the right inferior lobe at admission.

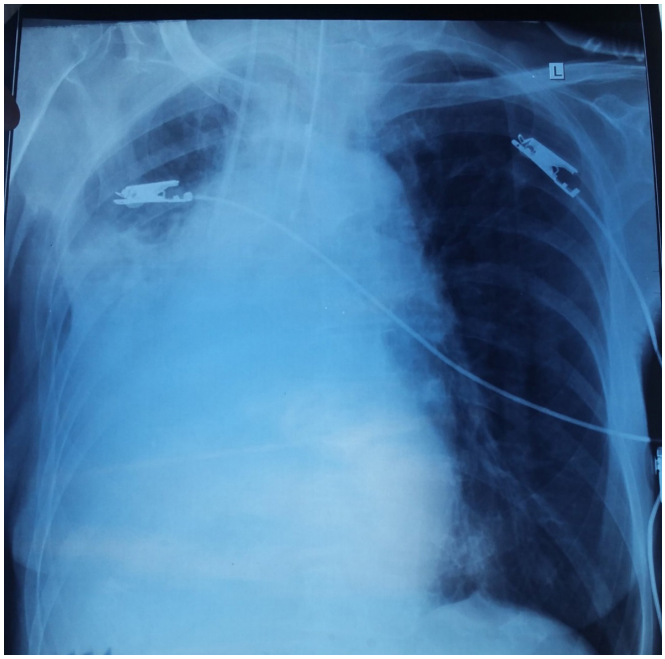

Fig. 2. Intubated and monitored in the ICU, a central venous catheter is visible in the right internal jugular vein

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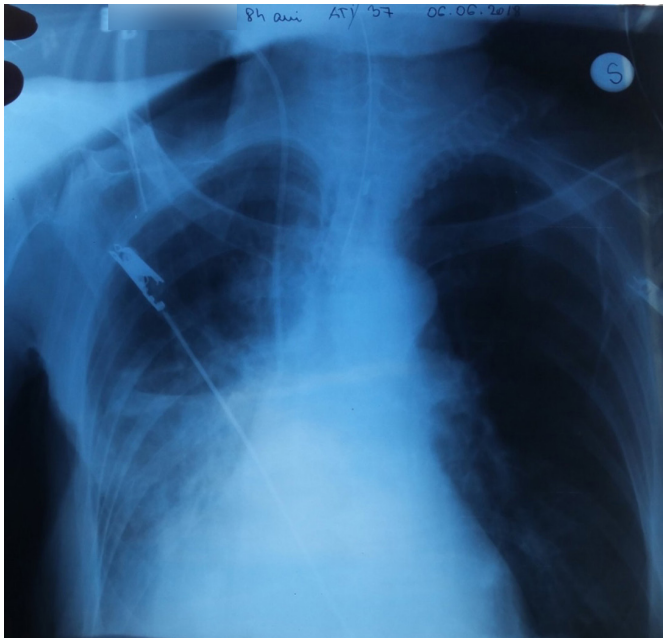

Fig. 3. Radiograph of the thorax after bronchoscopy. The medium and inferior right lobes are visible once the bronchial plugs removed and the lungs inflated by mechanical ventilation (recruitment of atelectatic alveoli). Still the basis of the right thorax is flowed by liquid.

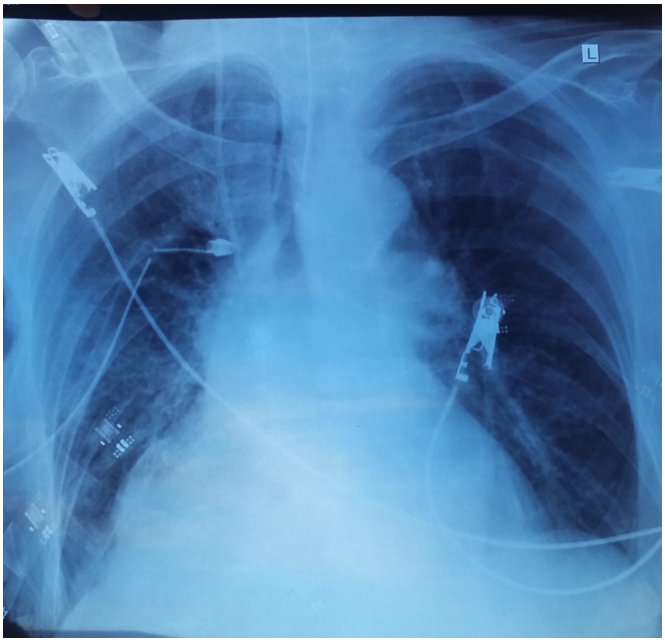

Fig. 4. The lungs cleared immediately after right pleural drainage. The drain is visible in the right pleural space.

The surgeon requested a new CT scan, but we negotiated with him to drain the thorax, based on the clinical examination and the image of the thoracic electrical bioimpedance monitor screen, we had the opportunity to use for a limited period of time (Fig 5 and 6). We used an Elisa 800 VIT ventilator manufactured by Heinen + Lowenstein (2).

The subsequent puncture of the pleura allowed for the drainage of 300cc of exudate, with the immediate improvement of oxygenation, as reflected by both pulseoximetry and blood gas analysis. It may not appear to be an important amount of fluid, but considering the weight of the patient and the enlarged heart, draining this fluid allowed for the dependent lung to reexpand, a condition that appeared clearly on the ventilator's screen (Fig.4).

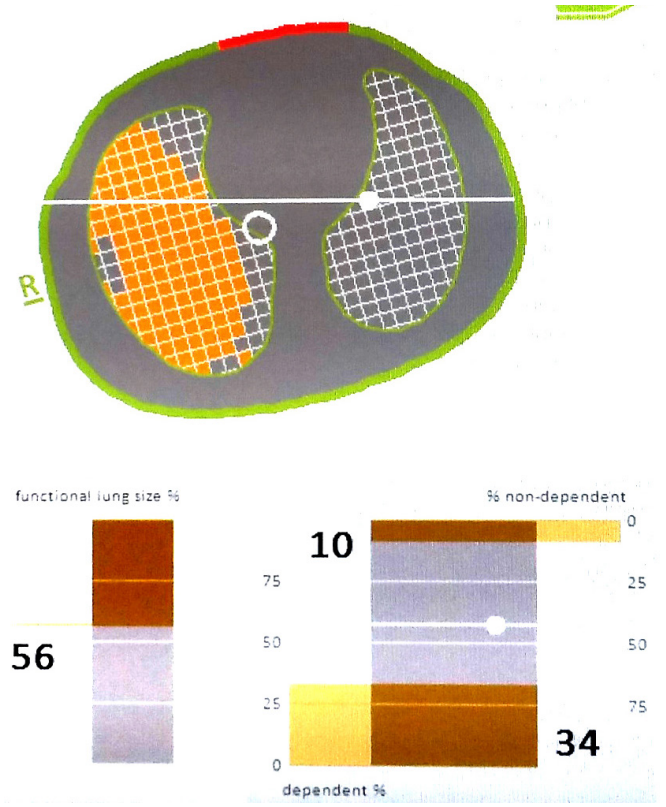

Fig. 5. EIT before drainage, corresponding to radiograph in figure 2.

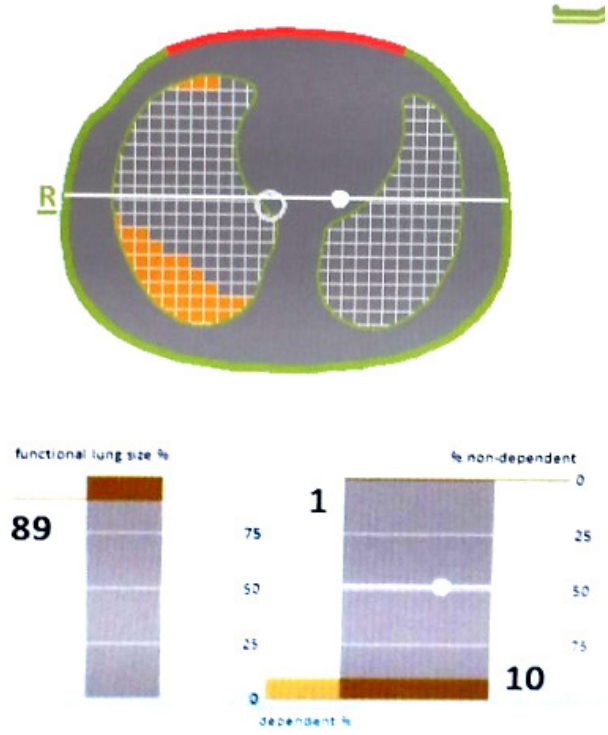

Fig. 6. EIT after drainage. Recruitment of the functional residual capacity (FRC) is visible on the therapeutic screen.

The patient was thus spared the ordeal of a new transportation to the Radiology Department for another CT.

We cannot run respiratory tests at the bedside, specially on critically ill. However, thorough monitoring of the respiratory function is essential. Electrical impedance tomography allows for functional monitoring of the lungs. The technology is not unique on the market, but just emerging in Romanian ICUs. Other companies are focusing on similar parameters (3).

Although still new in the monitoring arsenal, thoracic electrical bioimpedance bares the hope for better clinical outcomes and savings in terms of human resources and money. It does not require a radiologist to interpret the results and there is a therapeutic screen allowing for treatment adjustments. Moreover, the recruitable volume is visible.

In our case clinical judgement prevailed over established technology and led to an improvement of the respiratory function by urging insertion of a drain.

Emerging technology at the reach of our hands already make a change in contemporary ICUs, thus relieving to some extent the organizational stress of undue transportation and contribute to patient safety.

Conflict of interest

The authors report no conflict of interest as to this subject.

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