

Respiratory failure after pulmonary aspiration

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INTRODUCTION

The aspiration of gastric contents and inhalation of pharyngeal secretions during and after intubation is associated with pulmonary morbidity and higher mortality [1]. Furthermore, emergency intubation is associated with a high risk of aspirating gastric contents or laryngeal fluids [2].

SITUATION

After operative evacuation and debridement of multiple neck abscesses, a 38 year old female was mechanically ventilated for 20 hours postoperatively on the ICU. After positive spontaneous breathing trial, the patient was extubated. Right after extubation the patient presented with considerable respiratory insufficiency - possibly due to laryngeal obstruction. Emergency reintubation proved difficult but successful. Mechanical ventilation was possible only at high inspiratory pressures since the right hemithorax did not show any expansion with inspiration. Airway resistance was high and oxygenation severely impaired.

EIT-GUIDED TREATMENT

In an attempt to explain the altered respiratory mechanics and progressive desaturation Swisstom BB² was applied to obtain insights into the regional distribution of ventilation.

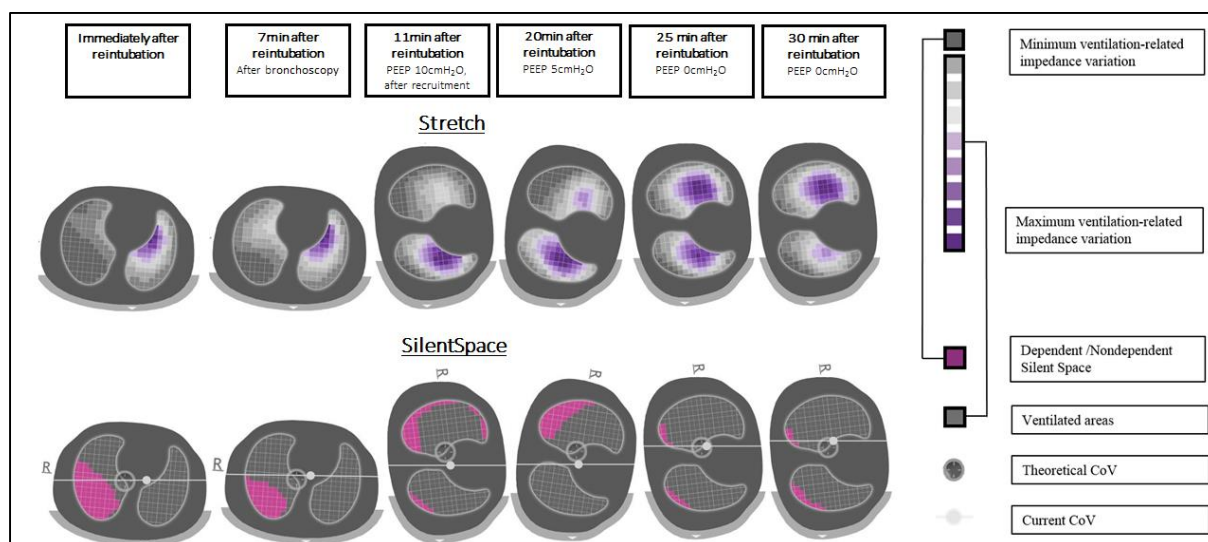


Figure 1: Image courtesy of Dr. Giorgio Iotti, Fondazione IRCCS Policlinico San Matteo, Pavia, Italy

Right after applying the SensorBelt and starting Swisstom BB² it became obvious that ventilation was mainly distributed towards the left lung while the right lung showed reduced ventilation and a huge SilentSpace in the right lower lung (Figure 1, immediately after reintubation). At this time, the patient was haemodynamically stable, but a pneumothorax, which could explain the missing unilateral ventilation, had to be excluded. Ultrasound scan of the right thorax showed no evidence for a pneumothorax. Only hyperechoic structures, indicative of atelectasis were seen.

In view of the high likelihood of a bronchial aspiration due to laryngeal dysfunction a bronchoscopy was performed revealing the complete obstruction of the right main bronchus by thick mucus. Thus, the patient was diagnosed to suffer from right lung atelectasis due the aspiration of pharyngeal secretions. After bronchial toilet, ventilation of the right lung improved slightly (Figure 1, 7min after re-intubation).

Following the principle “down with the good lung”, the patient was rotated to the left side [3]. In this position, the patient’s right lung was recruited and both lungs ventilated with a positive end expiratory pressure (PEEP) of 10cmH₂O. EIT-images, however, showed that overall ventilation did not improve most likely due to the overdistension of the non-dependent newly recruited right lung. (Figure 1, 11min after re-intubation)

Therefore PEEP was reduced from 10 to 5 cmH₂O leading to more ventilation of the right lung and movement of the centre of ventilation (CoV) towards its theoretically ideal position (Figure 1, 20min after re-intubation).

PEEP was set to zero, which resulted in an even more homogenous distribution of ventilation (Figure 1, 25min after reintubation).

However, only minutes after PEEP removal, EIT monitoring showed a progressively reduced ventilation of the left lung and increasing SilentSpaces as the lack of PEEP and the lateral position may have contributed to the formation of atelectasis in the dependent lung. (Figure 1, 30min after reintubation).

Subsequently, the patient was turned on her back, ventilated at PEEP 5 while lung function fully recovered as witnessed by EIT images, lung mechanics and blood gases. After thorough surgical revision of neck and tracheostomy the patient fully recovered and did not develop pneumonia.

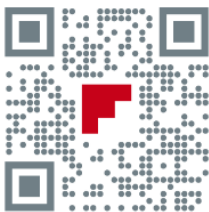
CONCLUSION

Within less than one hour a full re-expansion of the collapsed right lung could be achieved. EIT was successfully used to rapidly identify the cause of the patient’s acute respiratory insufficiency and to guide diagnostic and treatment efforts.

Thanks to EIT, lung overdistension by excessive PEEP as well as lung collapse due to insufficient PEEP could be identified breath by breath even under different body positions. Specifically in this case lung ultrasound was the ideal companion of bedside EIT to provide diagnostic information right at the point-of-care.

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