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Case report

Pulmonary scintigraphy as a method to investigate gastrobronchial communication in tracheostomized patients



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ABSTRACT

Amyotrophic Lateral Sclerosis (ALS) is a degeneration of somatic motor neurons extending from upper motor cortical pyramidal neurons to lower motor neurons of the brainstem and cord. During the course of the disease patients require invasive procedures for nutrition and ventilation. Percutaneous Endoscopic Gastrostomy (PEG), performed in patients with impaired swallowing, is a safe procedure for the administration of Enteral Nutrition (EN). In the advanced stages of the disease patients develop a ventilatory failure due to muscular weakness in these case they need a permanent tracheal tube with mechanical ventilation. Here we reported a case of a patient with Amyotrophic Lateral Sclerosis (ALS) who developed an increased gastric endocavitary pressure after a Percutaneous Endoscopic Gastrostomy (PEG).

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Amyotrophic Lateral Sclerosis (ALS) is a degeneration of somatic motor neurons extending from upper motor cortical pyramidal neurons to lower motor neurons of the brainstem and cord. During the course of the disease patients require invasive procedures for nutrition and ventilation. Percutaneous endoscopic gastrostomy (PEG), performed in patients with impaired swallowing, is a safe procedure for the administration of enteral nutrition (EN). In the advanced stages of the disease patients develop a ventilatory failure due to muscular weakness in these case they need a permanent tracheal tube with mechanical ventilation. We describe a case of a man 65 years old with Amyotrophic Lateral Sclerosis (ALS) and Percutaneous Endoscopic Gastrostomy (PEG) who developed gastric distension due to an increased endocavitary pressure. The diagnosis of ALS was done at the Neurological Department of Siena University and he was admitted to an experimental trial with Eritropoietin and Riluzole. One year after the diagnosis he started a non invasive ventilation because he had the nocturnal signs of respiratory failure. Four months later, PEG was implanted because the patient had a progressive weight loss due to his nutritionable inability. Initially he received only 500 ml of enteral feeding at no more than 50 ml/h, with a total caloric amount of 500 Kcal/day. In

December 2012 he was admitted to our Hospital because of oliguria, arterial hypotension and radiological signs of right basal pneumonia. At the admission his mental status was normal, skin was cold and hypoperfused. The vital signs were following: Blood Pressure (BP) 70/40 mmHg, pulse rate 110 beats/min, oxygen saturation on room air 90%, temperature 38,5 °C. He received parenteral fluids and dopamine to improve the perfusive status. Blood chemistry results revealed an increased level of creatinine, C Reactive Protein and white blood cells. During the first day of hospital stay he developed acute dyspnea and severe hypoxemia; a tracheal tube was inserted and the he was transferred to Intensive Care Unit (ICU) where he underwent to mechanical ventilation.

Thereafter a tracheostomic tube was adopted to allow an Enteral Nutrition (EN) by PEG, but the infusion rate did not exceeded 30 ml/h because he had vomiting and abdominal iperdistension. Therefore EN was replaced by Parenteral Nutrition (PN). After an hemodinamical stabilization he was transferred to the Internal Medicine Department (IMD) where he continued the mechanical ventilation by tracheostomic tube and an EN with the infusion rate of 35 ml/h was reintroduced. A spontaneous disconnection of EN tube from PEG due to an high gastric pressure occurred during the first day and so EN was stopped again. A gastroscopic investigation excluded gastro-duodenal lesions or PEG tube dislocation, even if it was unusually placed in the last part of gastric fundus. Thoracic and

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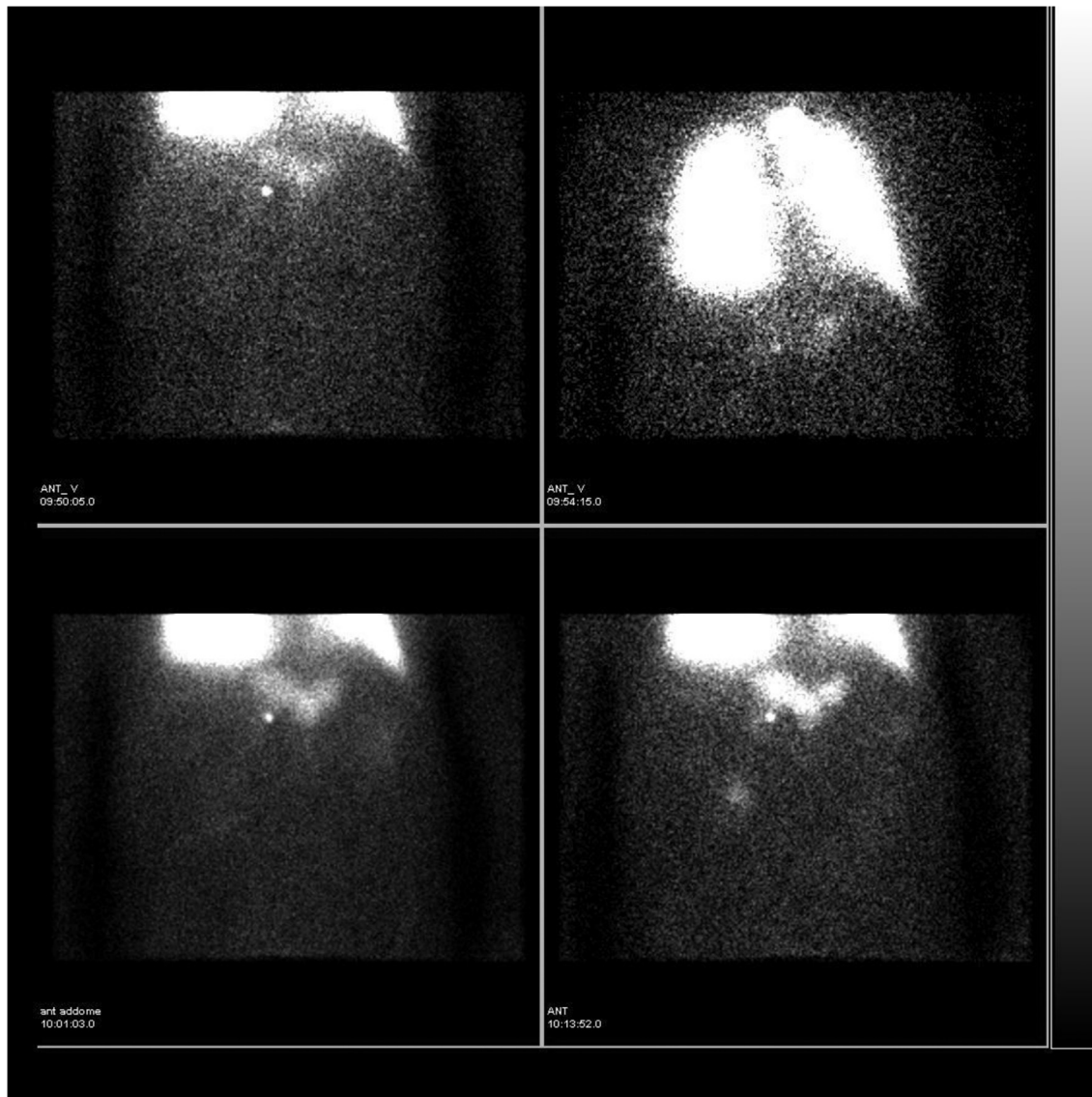


Fig. 1. Pulmonary scintigraphy demonstrated radiolabelled air in the stomach.

Abdominal Computed Tomography performed with the administration of contrast material did not demonstrate any significant lesions and a bronchoscopy excluded any macroscopic bronchial fistula. In a second gastroscopy was introduced a naso-jejunal tube, which surmounted gastric cavity allowing dedicated low rate EN in duodenum. After the first day of EN patient experienced new episodes of gastric distention and vomiting. Hypothesizing a role for the ventilation, ventilator setting had been modified with a reduction of pressure values: Pressure Support (PS) from 20 to 16 cm of water and PEEP from 6 to 4 cm of water. Nevertheless the PEG tube had been opened in order to reduce the gastric pressure and limit the vomiting episodes. We suspected a passage of air from the lungs and bronchial tree to the digestive system and pulmonary ventilation scan was used to demonstrate this hypothesis. For this investigation was used a ventilatory scan with a special circuit for tracheostomized patients (Technegas generator cyclopharma laboratories Biopole Clermont-Limagne) where the radiolabelled air was pushed into the airways by a manual balloon, because the patient hadn't got a spontaneous respiratory activity. Before the examination the tracheostomic cannula was controlled in order to

prevent air-leaks. Patient was disconnected from the ventilator and connected to the scan circuit, that was isolated from the digestive system by the cuffed tracheostomy. For the image of ventilation an ultrafine carbon-labeled nanoparticle (99m-Tc Technegas) was used that is an ideal agent for ventilation SPECT because its small particle size (30–60 nm), resulting in greater alveolar penetration and less central deposition. Planar images in anterior and posterior projection was acquired after a dose of 30–50 MBq. Dual detector hybrid SPECT/CT was used because the CT scan provide patient-specific anatomic information. A total imaging time 30 min was required to complete the SPECT/CT scan.

Typical acquisition and processing parameter was utilized (3° steps over 360° – acquisition time for projection 25 s – collimator Low-energy, High resolution – matrix 128 × 128). A significant amount of radiolabelled air was into the gastric cavity in two different observations (4 h from one to another), that apparently came from the right lung (Figs. 1 and 2). No lesion was discovered in a further bronchoscopy. Since the clinical condition did not allow more invasive investigation, in order to reduce the gastric distension and start a regular enteral feeding a jejunal PEG tube was

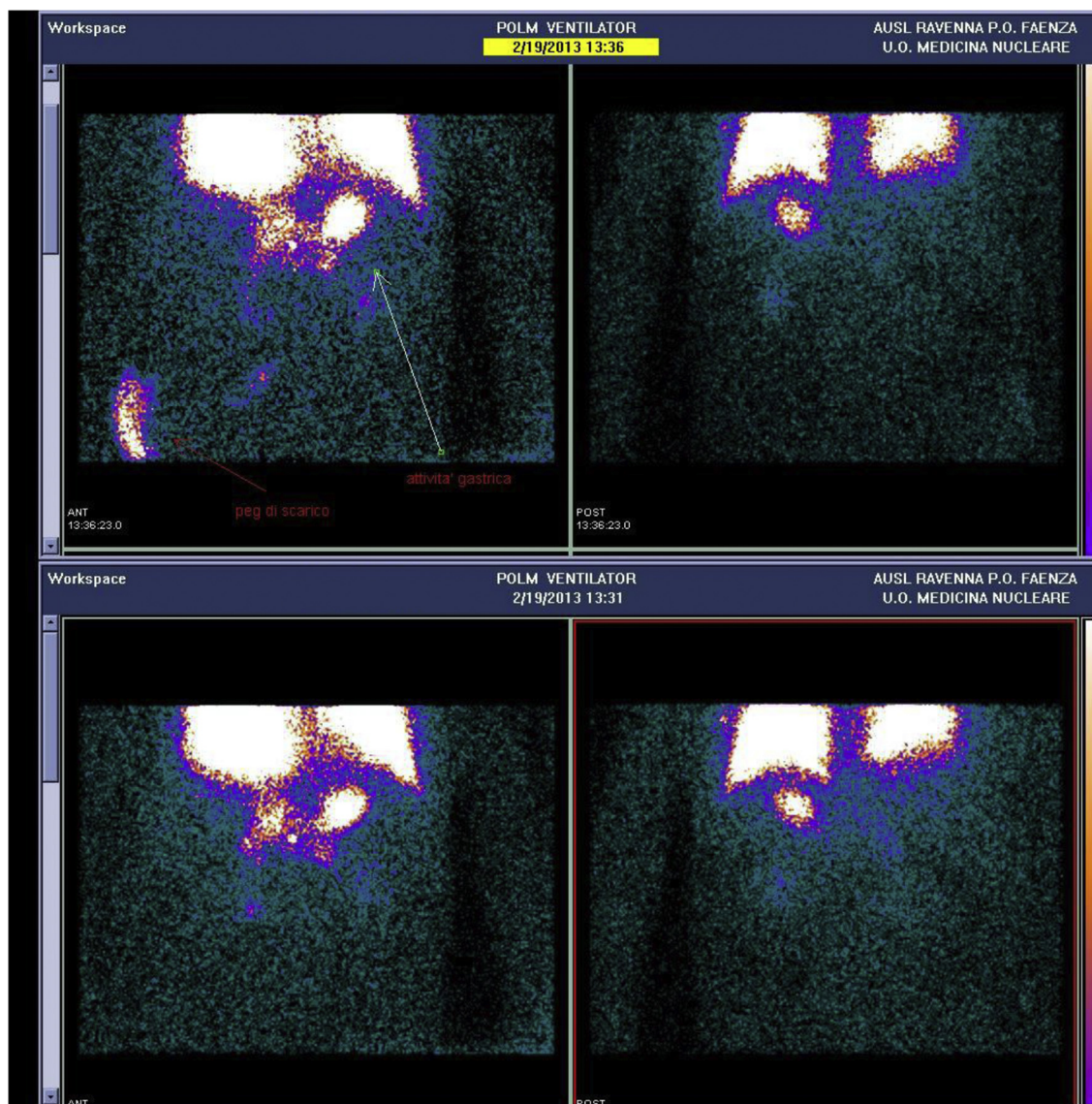


Fig. 2. SPECT/CT demonstrated a possible passage of radiolabelled air from right lung to the stomach.

placed. It is constituted by two tubes: one for the jejunal feeding and the other one for the gastric air discharge. After the placement of this device the patient's conditions improved and he was discharged. In adult patients, gastro-bronchial fistula (GBF) is rare complication following surgery, neoplasm, abdominal trauma, or, as reported by some authors, following pneumonia [1,2]. The abnormal communication is documented by radiological examination with barium esophagogram and thoracic CT scan or by oesophageal and bronchial fibroscopy [3,4]. In tracheostomized and ventilated patient the airways are isolated from the digestive system and during the inspiratory phase all the air flow was directed into the lungs. We described a case of a tracheostomized ALS patient with PEG who developed high gastric pressure when the mechanical ventilation was started and air was pushed from lungs to the digestive system. In these patient, a minimal passage of air was probably created by a previous right basal pneumonia as described by some authors in a patient with pneumonia and gastro-bronchial communication [5]. Since CT thoracic scan and endoscopic investigation failed to demonstrate macroscopic lesions, patient underwent a pulmonary ventilatory scan that showed

radiolabelled air in the stomach. To the best of our knowledge this is the first case where pulmonary ventilatory scan has been used for this purpose and we think that the application of this instrumental examination could be useful in tracheostomized patients where a communication between the respiratory and the gastro-intestinal system is suspected before performing invasive procedures.

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