Case Report

COVID-19 and Total Laryngectomy —A Report of Two Cases

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Abstract

Objective: To date, no cases have been reported on the effects of COVID-19 in laryngectomees.

Case Presentation: We herein presented two clinical cases of laryngectomized patients affected by COVID-19, detailing their clinical course and complications.

Discussion: In our experience, permanent tracheostomy did not significantly affect the choice of treatment. However, dedicated devices and repeated tracheal toilettes may be needed to deal with oxygen-therapy-related tracheal crusting.

Conclusion: In conclusion, laryngectomees should be considered a vulnerable population that may be at risk for worse outcomes of COVID-19 due to anatomical changes in their airways. The role of the ENT specialist is to guide airway management and inform the support-staff regarding specific needs of these patients.

Keywords

COVID-19, coronavirus, SARS-CoV-2, laryngectomy, management

Introduction

To date, the effects of COVID-19 on laryngectomized patients is unknown, with no cases reported so far. After total laryngectomy, the upper and lower airways remain permanently separated with a consequent loss of physiological nasal functions.[1] The direct passage of air through the stoma without nasal warming and humidification leads to impairment of mucociliary clearance with a consequent status of chronic bronchopathy. These changes can potentially expose the individual to a higher risk of severe respiratory infections.[2]

Case 1

On March 9, a 79-year old man was referred to the Emergency Room of our Institute (ASST Spedali Civili, Brescia) with high fever, cough, and dyspnea lasting 3 days. In 2014, the patient had undergone a total laryngectomy, bilateral neck dissection, placement of a speech prosthesis, and postoperative adjuvant chemoradiation for a pT4aN1 laryngeal squamous cell carcinoma (SCC). He was a former smoker (70 pack/year) and suffered from hypertension and chronic obstructive pulmonary disease. He was previously hospitalized from January 25, 2019 to January 31 for Streptococcus pneumoniae and sepsis.

At admission (March 9, 2020), the most relevant clinical findings included severe oxygen desaturation (76%), tachypnea, cyanosis, lymphocytopenia, and C reactive protein (CRP; 185 mg/L). Arterial blood analysis demonstrated hypoxemic respiratory failure: Sat O_2 70.1%, pO_2 33 mmHg, pCO_2 32 mmHg, and pH 7.48. Bubble-humidified oxygen was administered with a mask applied over the permanent tracheostoma at 12 to 15 L/min, and oxygen saturation increased to 84%. COVID-19 was confirmed with a nasopharyngeal swab (reverse transcriptase-polymerase chain reaction [RT-PCR]).

The chest radiograph is shown in Figure 1A. The patient was admitted to a COVID-19 isolation ward, and started hydroxychloroquine, lopinavir/ritonavir, antibiotic therapy (ceftriaxone and azithromycin), and corticosteroids. Tracheal cannula positioning was poorly tolerated due to

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tracheal inflammation. Bubble-humidified oxygen was provided via mask over the tracheostoma at 15 L/min flow rate for 24 hours a day. No other humidification devices were utilized at the time of treatment. In particular, conventional heat- and moisture-exchangers (HME) were not suitable due to the high oxygen flow and external humidification, while HME with dedicated attachments for oxygen therapy were not available. In consideration of the patient's comorbidities, general status, age, and in the light of the severe shortage of Intensive Care Unit admission capacity, no indication was given for intubation and invasive ventilation.

At day 3 from admission, the patient experienced further worsening of respiratory status with severe dyspnea and significant compromise of his general conditions. The Sat O_2 reached its lowest value (55%, oxygen therapy at 15 L/min flow rate). Intravenous corticosteroids were administrated with partial improvement of Sat O_2 (82%). The next day, the patient underwent ENT evaluation due to the presence of tracheal dried secretions and crusting. A tracheal toilette was performed using Weil-Blakesley forceps to remove major crusting and sterile saline boluses. At day 4, chest radiogram showed progression of the infection (Figure 1B); the same day, the patient underwent bronchoscopic aspiration of secretions. The average Sat O_2 was 70% to 74% at 15 L/min oxygen flow rate. Despite all treatments, general conditions and respiratory performance progressively deteriorated, and 8 days after hospitalization the patient died.

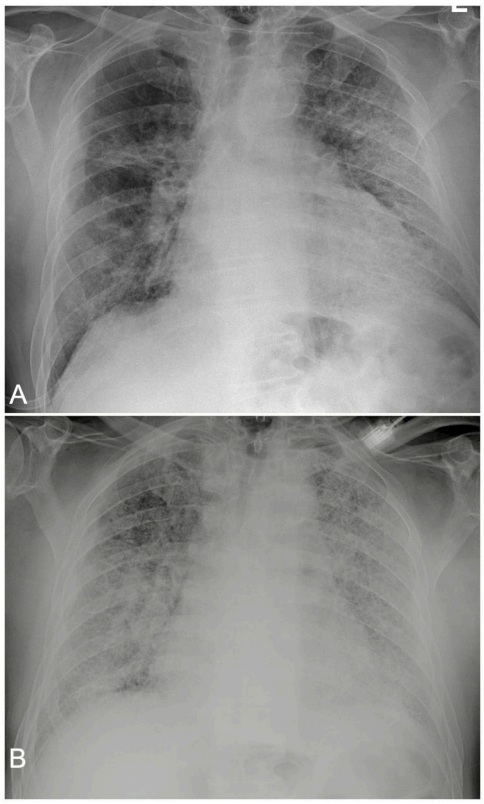

Figure 1. (A) Chest radiograph performed on March 9, 2020 (day of admission): diffuse interstitial-alveolar infiltrates merging into multiple parenchymal thickenings involving the entire left lung and inferior and medium lobe of the right lung. (B) Chest radiograph performed on March 13, 2020 (day 4): progression and worsening of bilateral interstitial pulmonary infiltrates.

Case 2

On March 11, a 68-year old man presented to the Emergency Room of our Institute with high fever and mild dyspnea lasting last 3 days. He was a former smoker and had concurrent hypertension, diabetes, and carotid stenosis. In 2000, he had received radiotherapy for an oropharyngeal SCC, and in 2015, he underwent total pharyngolaryngectomy, bilateral neck dissection, and reconstruction with anterolateral thigh free flap for a SCC of the left pyriform sinus (pT4N0) and synchronous oropharyngeal SCC (pT1). In 2017, recurrence occurred at the level of the neopharynx, and the patient underwent further surgical excision and remained free from disease.

Nasopharyngeal swab was positive for SARS-CoV-2 (RT-PCR). At clinical evaluation and arterial blood analysis, he presented an oxygen saturation of 88% and pO2 of 54 mmHg, pCO2 of 32 mmHg, pH of 7.50. Chest radiogram is shown in Figure 2A. The patient was admitted to the Pneumology Department and started hydroxychloroquine, and antibiotic therapy (azithromycin + ceftriaxone). Antiretroviral therapy was not administered since it was conflicting with domiciliary therapy. Bubble-humidified oxygen was provided via mask over the permanent tracheostoma at 4 L/min flow rate for 24 hours a day with an increase of Sat O_2 (94%). No other humidification devices specific for permanent tracheostomy were available.

During the following days, his clinical condition and radiological picture remained stable. On day 7 after admission the clinical condition worsened: Sat O_2 86% at 6 L/min flow rate, T° 38.5°. A chest radiogram was repeated (Figure 2B). Bubble-humidified oxygen therapy was increased at 15 L/min flow rate reaching Sat O_2 91%. The patient required two ENT evaluations for tracheal crusting from dried secretions. The tracheal toilette was performed with Weil-Blakesley forceps and sterile saline boluses. On day 12 after admission, Sat O_2 was 98% at 12 L/min flow rate.

During the following week, the patient progressively improved with resolution of fever, reduction of inflammatory indices, and symptoms and Sat O_2 (96% at 2 L/min flow rate). On day 19, the chest radiogram showed significant improvement (Figure 2C). On day 23 after admission oxygen therapy was stopped (Sat O_2 94%). The patient was dismissed on April 2 after 24 days of hospitalization.

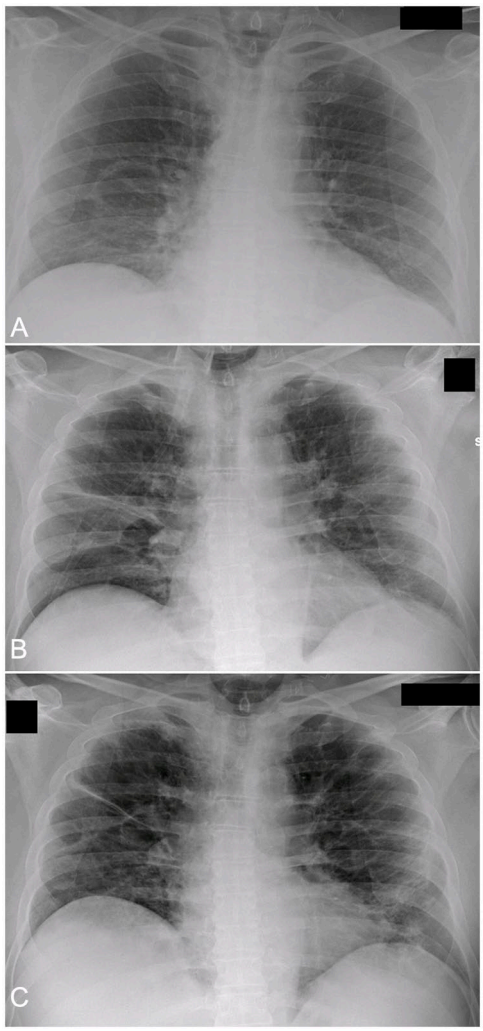

Figure 2. (A) Chest radiograph performed on March 11, 2020 (day of admission): interstitial-alveolar infiltrates involving the right basal segment and the left parahilar area. (B) Chest radiograph performed on March 18, 2020 (day 7): bilateral involvement of the middle lung fields. (C) Chest radiograph performed on March 30, 2020 (day 19): improvement with reduction of medio-basal infiltrates on the right lung.

Discussion

Currently, no information is available about COVID-19 pneumonia in laryngectomized patients. In retrospective studies,[3,4] the incidence of lower respiratory tract infections in laryngectomees was considerably higher compared to that of adults of the same age. Moreover, laryngectomized patients with pre-existing lung disease show an even higher occurrence of pulmonary infections than those without lung disease.[2] In fact, after total laryngectomy, the nasal cavities are excluded from respiration and thus cannot carry out their physiological functions, such as air filtering, heating, and moistening. The "unconditioned" inspired air may induce chronic inflammation of trachea and bronchi, with cough, excessive secretions, and crusting.[1] This issue is worsened when high-flow oxygen therapy is required due to its low level of humidification. In particular considering that water-vapor output in bubble humidifiers decreases as the oxygen flowrate increases, reducing their effectiveness when oxygen flows over 6 L/min are needed.[5]

In these patients, permanent tracheostoma did not significantly affect the choice of treatment, neither the way the oxygen therapy was administrated. However, a stable access to the airways did not improve management, as could have been hypothesized. During hospitalization, both patients presented significant tracheal crusting, which is related to a combination of airway inflammation, secretions, and oxygen therapy-related dryness.

Laryngectomy patients frequently wear a plaster, tube, or button with a protective filter. In a study by Retèl et al,[6] HME represented the best treatment for tracheal crusting. Dedicated devices can also be applied on the plaster, tube, or button for oxygen administration, and the oxygen tube may be attached to the protruding component. This expedient can be associated with tracheal washings using 2cc saline solution, which can be performed independently by patients in stable medical conditions. However, HME with a dedicated attachment for oxygen therapy are not readily available, especially in the setting of a national healthcare crisis. In this view, a pre-emptive supply should be available for each laryngectomized patient at a high-risk for respiratory infections.

We found that repeated tracheal toilettes may be routinely needed to deal with the crusting during high-flow oxygen therapy, even when administered with bubble humidifiers. In case of minor involvement, this could be managed by the support-staff by means of sterile saline boluses after guidance from the ENT specialist. This approach may also be considered as a useful pre-emptive procedure before formation of major dryness and crusting. However, since this is a high-risk maneuver in terms of personnel infection, personal protective equipment and precautions similar to those required for surgical tracheostomy should be employed.

In conclusion, laryngectomees with COVID-19 should be considered as potentially at a higher risk for worse outcomes of this disease due to anatomical changes in their airways. They can present specific tracheal complications, which require careful management.

Declaration of Conflicting Interests

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