

# Diagnostic difficulties with COVID-19 in a patient after total laryngectomy

## Trudności diagnostyczne w rozpoznaniu COVID-19 u pacjenta po laryngektomii całkowitej

### Authors' Contribution:

A – Study Design  
B – Data Collection  
C – Statistical Analysis  
D – Manuscript Preparation  
E – Literature Search  
F – Funds Collection

Joanna Czech<sup>DEF</sup>, Paweł Burduk<sup>EF</sup>, Małgorzata Wierchowska<sup>EF</sup>

Department of Otolaryngology, Phoniatics and Audiology, Collegium Medicum, Nicolaus Copernicus University in Bydgoszcz, Poland; Head: prof. Paweł Burduk MD PhDk

### Article history:

Received: 26.04.2021 Accepted: 26.05.2021 Published: 27.05.2021

### ABSTRACT:

**Introduction:** Coronavirus disease (COVID-19) is caused by the SARS-CoV-2 virus and often presents with flu-like symptoms that can have varying degrees, which may subsequently lead to acute respiratory distress (ARDS). The genetic material of the virus in samples of respiratory secretions is identified by way of basic diagnostic tests. Due to the altered course of the respiratory tract, patients after total laryngectomy require special attention in the diagnosis of SARS-CoV-2 infection.

**Case report:** We present a case of a patient after laryngectomy who obtained different results of COVID-19 tests depending on the site of sampling.

### KEYWORDS:

COVID-19, laryngectomy, lower respiratory tract, SARS-CoV-2, upper respiratory tract

### STRESZCZENIE:

**Wstęp:** Choroba COVID-19 wywoływana jest przez wirusa SARS-CoV-2 i często manifestuje się objawami grypopodobnymi, które mogą przebiegać z różnym nasileniem. W dalszej kolejności może prowadzić do ostrej niewydolności oddechowej (ARDS). Podstawowe testy diagnostyczne identyfikują materiał genetyczny wirusa w próbkach wydzielin z dróg oddechowych. Chorzy po laryngektomii całkowitej, z uwagi na zmieniony przebieg dróg oddechowych, wymagają szczególnej uwagi pod względem diagnostyki w kierunku zakażenia SARS-CoV-2.

**Opis przypadku:** W naszej pracy przedstawiamy przypadek pacjenta po laryngektomii, u którego uzyskano różne wyniki testów w kierunku COVID-19 w zależności od miejsca pobrania próbek.

### SŁOWA KLUCZOWE:

COVID-19, dolne drogi oddechowe, górne drogi oddechowe, laryngektomia, SARS-CoV-2

## ABBREVIATIONS

**ARDS** – acute respiratory distress

**COVID-19** – Coronavirus disease

**HRCT** – high resolution computed tomography

**SARS-CoV-2** – Severe Acute Respiratory Syndrome – Coronavirus-2

## INTRODUCTION

On March 11, 2020 the World Health Organization declared COVID-19 a pandemic caused by SARS-CoV-2 (Severe Acute Respiratory Syndrome – Coronavirus-2) [1, 2]. In the light of this decision, it became essential to conduct reliable diagnostic tests in order to reduce infections and implement appropriate treatment. The current diagnostic standard are RT-PCR tests which identify the genetic material of the virus in samples of airway secretions taken

from patients. [3]. The most common sampling sites are the mouth, oropharynx and nose [1]. However, patients after laryngectomy or with a tracheostomy require particular attention due to the altered anatomy of the respiratory system. It would therefore be advisable to consider sampling from both the upper and lower respiratory tract [2, 4]. Reaffirming the purposefulness of this observation, we would like to describe the course of diagnosis for COVID-19 in a patient after total laryngectomy.

## CASE REPORT

A 67-year-old patient after total laryngectomy performed in November 2018, complementary radiotherapy completed in March 2019, and secondary implantation of the Provox Vega voice prosthesis in September 2020 reported to the Outpatient Laryngology Clinic due to a leak around the voice prosthesis. We placed a circular suture on the tracheoesophageal fistula and a nasogastric tube to contract the

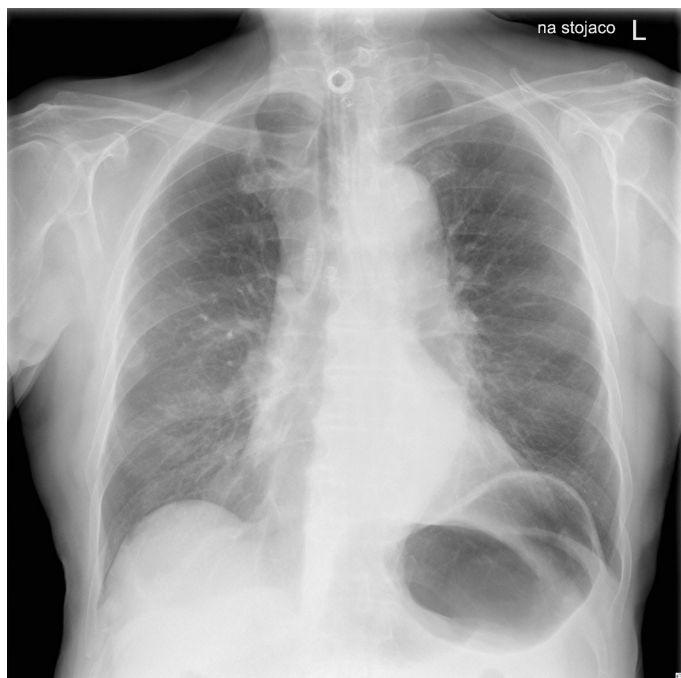


Fig. 1. Chest X-ray (lung fields without increased density of lung parenchyma).

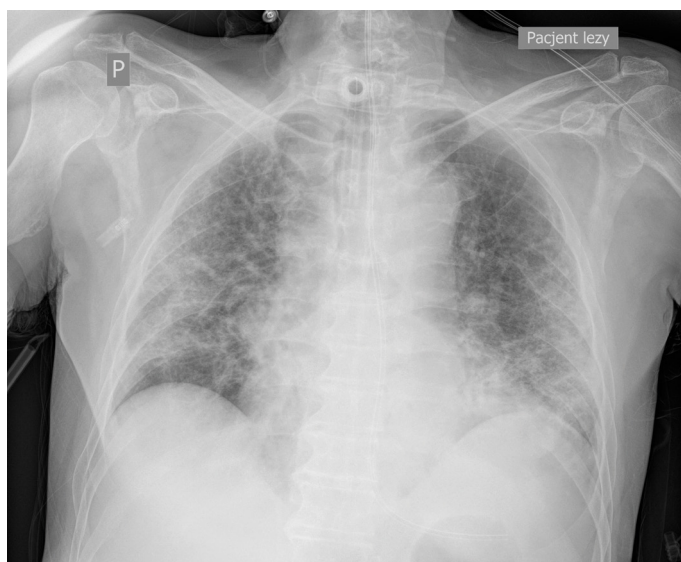


Fig. 2. Supine chest X-ray (bilateral interstitial densities, most pronounced in the lateral parts).

fistula and repair the leak. Due to an elevated body temperature and increased secretion from the respiratory tract, we performed a test for SARS-CoV-2 infection in a primary healthcare setting. Negative nasopharyngeal and pharyngeal samples were collected. Due to fatigue and 4-day leak of stomach contents around the voice prosthesis, the patient was admitted to the Department of Otolaryngology at Dr Jan Biziel University Hospital No 2 in Bydgoszcz. On the day of admission, the patient had a follow-up chest X-ray (Fig. 1.) which revealed no inflammatory changes. He was started on empirical antibiotic therapy with Cefuroxime, fluid therapy, and fed through a Flocare nasogastric tube and a tracheostomy tube with a seal cuff. Due to the inflammation around the tracheoesophageal fistula and its poor contraction, the voice prosthesis was removed on the 4th day of hospitalization. In the morning on the 5th day of

hospitalization, the patient developed tachypnea, SpO<sub>2</sub> desaturation 79–80%. The patient required passive oxygenation with an oxygen flow of 5 l/min, which increased SpO<sub>2</sub> to 88%. Auscultation over pulmonary fields revealed single basal crackles and high-pitched vesicular murmur. Laboratory diagnostics was implemented and the patient was provided internal medicine consultation; antibiotic treatment was modified, and ceftriaxone and metronidazole were used. At the same time, it was decided to re-test for SARS-CoV-2 infection. Nasopharyngeal and pharyngeal swabs were collected, the result was negative again. Control chest X-ray (Fig. 2.) revealed bilateral increased density of lung parenchyma.

Laboratory tests showed lymphopenia, elevated levels of alanine and aspartate aminotransferase. The patient had an increased level of C-reactive protein with normal procalcitonin. Additionally, a slight increase in the troponin level and high levels of D-dimers and ferritin were observed, and the arterial blood gas test revealed respiratory alkalosis (Tab. I.).

In view of these test results suggesting the COVID-19 disease, and after an internist consultation, it was decided to re-test for SARS-CoV-2 infection. The swab was taken from the trachea by tracheostomy; the result was positive. Due to increasing respiratory failure, the patient was transferred to the Intensive Care Unit dedicated to treating patients with COVID-19. It had been 11 days between the onset of the first symptoms (i.e., elevated body temperature and increased secretion in the respiratory tract) and the onset of dyspnea and desaturation. During this time, the patient underwent 3 tests for SARS-CoV-2 infection (5 days after the first symptoms, then 10 and 11). Prolonged diagnostics in the patient after laryngectomy resulted from the initial collection of swabs only from the upper respiratory tract. After stabilization of the general condition and termination of ventilator therapy (lasting 8 days), the patient was transferred to a third-level center for patients infected by SARS-CoV-2, i.e., to the Grudziądz Hospital. On the 2<sup>nd</sup> and 4<sup>th</sup> day of hospitalization, the patient obtained two negative results from swabs taken from the lower respiratory tract, and was returned to the Department of Otolaryngology at Dr. Jan Biziel University Hospital No. 2 in Bydgoszcz in an average condition. During hospitalization the patient had further leakage through the tracheoesophageal fistula, raised inflammatory markers and deterioration of general condition. Due to the developing respiratory and circulatory failure, he was transferred to the Intensive Care Unit. Despite treatment, the patient's condition deteriorated and he developed septic shock, as well as developed post-covid thromboembolic complications and acute limb ischemia. He was qualified for mid-thigh amputation of both lower limbs, which was performed on the 14th day of hospitalization at the ICU. The patient's condition was described as poor. His cardiovascular dynamics were unstable. Due to renal failure, renal replacement therapy was initiated. A percutaneous endoscopic gastrostomy was employed as part of nutritional therapy. Due to the infection with *Klebsiella pneumoniae* ESBL NDM, a sanitary regime was applied. During a 3-month hospitalization in the ICU, the patient was repeatedly consulted in laryngology, thoracic surgery, and neurology, and remained under constant psychiatric and psychological care. The general condition of the patient improved gradually, and after the elimination of *Klebsiella* New Delhi, he could be transferred to the mother ward. For the purpose of further conservative

Tab. I. Selected results in the consecutive days of the patient's hospitalization.

Day of hospitalization	30.10.2020 POZ	31.10	1.11	2.11	3.11	4.11	5.11/OIOM
SARS-CoV-2	negative					negative	positive
CRP [mg/l]		59.1			42.2	58.7	
Procalcitonin [ng/ml]						0.317	0.242
Lymphocytes [G/l]		0.73				0.62	0.86
ASPAT							73
D-dimers						2948	
Ferritin							2336
Troponin T						0.025	
SatO <sub>2</sub>						87.8	87.2/95
pCO <sub>2</sub>						28.8	31.3/34.1
pH						7.499	7.503/7.45
pO <sub>2</sub>						54.2	52.8/70.3

treatment, the patient was transferred to the Department of Otolaryngology on April 1, 2021. Due to shrinkage of the tracheoesophageal fistula, a Provox Vega size 6 voice prosthesis was inserted, and after four days an additional sealing suture was placed. The patient was transferred to the Department of Otolaryngology on April 1, 2021 for further conservative treatment. His local and general condition improved, and he started to move in a wheelchair at the ward. On April 21, 2021, the patient was discharged home and remains under the care of an ENT clinic.

## DISCUSSION

Diagnosis of SARS-CoV-2 involves three types of tests: genetic, serological and antigenic. The most effective and so far, preferred test is RT-PCR, which detects the genetic material of the virus in the human body. In Poland, from November 2020 there has been an antigen test that detects viral proteins which can also be used to report a confirmed case of COVID-19 in symptomatic patients. However, it is only used in the initial symptom period and it is recommended to confirm test results with a PCR test [5, 6]. Serological tests are used to assess the humoral response and therefore cannot be applied in the diagnosis of SARS-CoV-2 infection [5]. It can be considered as testing the immune response of convalescents, people after contact with infected people or after vaccination [6]. At the beginning of the pandemic, in many medical centers the performance of the PCR test was associated with a very long waiting time for test results. Cases when an infection was suspected involved the use of imaging tests such as chest X-ray and HRCT used for the purpose of initial diagnosis. These tests showed the degree of advancement of interstitial lung lesions. However, the final diagnosis of COVID-19 requires confirmation in an RT-PCR test.

RT-PCR is a diagnostic test that can be performed using both a nasopharyngeal swab, a tracheal swab, or a bronchoalveolar lavage

swab. Currently, the primary and preferred method of sampling is done by taking a swab from the upper respiratory tract (nasal and oropharyngeal). However, in case of doubtful diagnosis we must consider sampling from the lower respiratory tract, especially in patients with anatomical differences in the upper respiratory tract [2, 3]. It has been found so far that SARS-CoV-2 is primarily transmitted via droplets. Therefore, in patients with total laryngectomy or tracheostomy who do not produce a significant flow of air in the upper airways, nasopharyngeal and pharyngeal tests may be negative [3]. Such results in patients after total laryngectomy cannot clearly rule out SARS-CoV-2 infection. The above description highlights the case of a patient after total laryngectomy who obtained two negative results of the SARS-CoV-2 test on nasopharyngeal swabs, and finally positive tracheal swabs obtained by tracheostomy. It should be emphasized that reliability of the research results is significantly influenced by the type of biological material and the method of collection [7]. In the described case, the diagnosis was established only on the 11th day after the onset of the first symptoms. Typically, viral RNA appears in biological material before the onset of the first clinical symptoms. It is estimated that positive results are obtained about 5-7 days after infection with the virus [7, 8].

The available literature describes a case of a patient in which, in contrast to the above, nasopharyngeal results were positive, and tracheal aspirate results were negative [3, 4]. It seems therefore logical that the best approach in the diagnosis of COVID-19 in patients after total laryngectomy should be sampling from both the upper respiratory tract (nasopharynx, pharynx) and the lower respiratory tract (tracheostomy) [2, 4, 9].

## CONCLUSIONS

The key element in quick and effective diagnosis of SARS-CoV-2 infection is appropriate biological material collected in a proper

manner. In patients who have an altered airway (after laryngectomy and intubated), it is logical to collect swabs simultaneously from the upper and lower airways. Excluding one of these variants may lead to

false test results and extended diagnostics. It should also be borne in mind that despite of all imaginable precautions taken during sampling, a negative test result does not entirely exclude COVID-19 disease.

## References

1. Pascarella G., Strumia A., Pilięo C. et al.: COVID-19 diagnosis and management: a comprehensive review. *J Intern Med.*, 2020; 288(2): 192–206. doi: 10.1111/joim.13091.
2. Hennessy M., Bann D.V., Patel V.A. et al.: Commentary on the management of total laryngectomy patients during the COVID-19 pandemic. *Head Neck.* 2020; 42(6): 1137–1143. doi: 10.1002/hed.26183.
3. Patel T.R., Teitcher J.E., Tajudeen B.A., Revenaugh P.C.: Disparate Nasopharyngeal and Tracheal COVID-19 Diagnostic Test Results in a Patient with a Total Laryngectomy. *Otolaryngol Head Neck Surg.*, 2020; 163(4): 710–711. doi: 10.1177/0194599820933605.
4. Vigneshwar N.G., Krause M., Bartels K.: Positive tracheal SARS-CoV-2 RNA-test after three negative SARS-CoV-2 RNA tests in a patient with COVID-19. *Can J Anaesth.*, 2020; 67(11): 1663–1664. doi: 10.1007/s12630-020-01742-0.
5. Flisiak R., Parczewski M., Horban A. et al.: Zalecenia diagnostyki i terapii zakażeń SARS-CoV-2 Polskiego Towarzystwa Epidemiologów i Lekarzy Chorób Zakaźnych z dnia 13 października 2020 roku. Aneks 2 do rekomendacji z 31 marca 2020 roku. *Med. Prakt.*, 2020; 11: 51–69.
6. Agencja Oceny Technologii Medycznych i Taryfikacji, Diagnostyka laboratoryjna SARS-CoV-2 – aktualizacja zaleceń (wersja 2.0, 07.04.2021 r.).
7. Dzierżanowska-Fangrat K., Ozorowski T., Burdynowski K. et al.: Zasady pobierania i transportu materiału do badań metodami molekularnymi RT-PCR w kierunku SARS-CoV-2 (14.04.2020 r.)
8. Grabarczyk P., Sulkowska E., Kopacz A. et al.: SARS-CoV-2 molecular diagnostics. *J Transf Med.*, 2021; 14(1): 10–18. doi: 10.5603/JTM.2021.0001.
9. Gallo O., Trotta M., Orlando P. et al.: SARS-CoV-2 in upper and lower airway-samples of a laryngectomized patient: New insights and many lessons. *Oral Oncol.*, 2020; 107: 104841. doi: 10.1016/j.oraloncology.2020.104841.


Word count: 2161 Tables: 1 Figures: 2 References: 9


Access the article online: DOI: 10.5604/01.3001.0014.9012

Table of content: <https://otorhinolaryngologypl.com/issue/13832>

Some right reserved: Polish Society of Otorhinolaryngologists Head and Neck Surgeons. Published by Index Copernicus Sp. z o.o.

Competing interests: The authors declare that they have no competing interests.

 The content of the journal „Polish Society of Otorhinolaryngologists Head and Neck Surgeons” is circulated on the basis of the Open Access which means free and limitless access to scientific data.

 This material is available under the Creative Commons – Attribution-NonCommercial 4.0 International (CC BY-NC 4.0). The full terms of this license are available on: <https://creativecommons.org/licenses/by-nc/4.0/legalcode>

Corresponding author: Joanna Czech MD, Department of Otolaryngology, Phoniatics and Audiology, Collegium Medicum, Nicolaus Copernicus University in Bydgoszcz, Ujejskiego street 75, 85-168 Bydgoszcz, Poland; Phone: +48 52 3655 799; E-mail: [jczech90@gmail.com](mailto:jczech90@gmail.com)

Cite this article as: Czech J., Burduk P., Wierzychowska M.: Diagnostic difficulties with COVID-19 in a patient after total laryngectomy; *Pol Otorhino Rev* 2021; 10 (2): 44-47