




# Bilateral paresthesia associated with cardiovascular disease and COVID-19

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The coronavirus disease of 2019 (COVID-19) first appeared in Wuhan, China, in December 2019 and has now become a worldwide pandemic, as declared by the World Health Organization on March 11, 2020. The disease is caused by a severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), and the rapid spread of the virus, and its long incubation period and unspecific symptoms contributed to cause consequences on an international scale (Driggin et al., 2020).

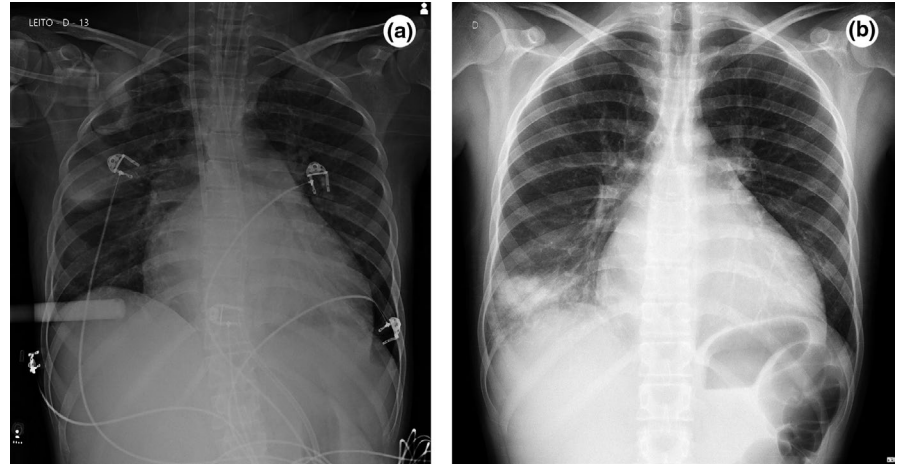
After infecting millions of people around the world in a short period of time, literature has been reporting day after day different manifestations related to COVID-19. The interaction of the virus with the nervous and cardiovascular systems has already been proven in the literature (Baig, 2020; Clerkin et al., 2020). Despite intra-oral manifestations, such as pain, desquamative gingivitis, ulcers, erythema, and blisters, were already related to COVID-19 infection (Martín Carreras-Presas, Amaro Sánchez, López-Sánchez, Jané-Salas, & Somacarrera Pérez, 2020; Vieira, 2020), neurological manifestations related to dentistry, as well as aspects highlighting the oral health and bacteremia in the aggravation of cardiac patients, have not been explored.

The present study demonstrates a case report in which dentistry has shown to play a key role in the evolution of the disease in a

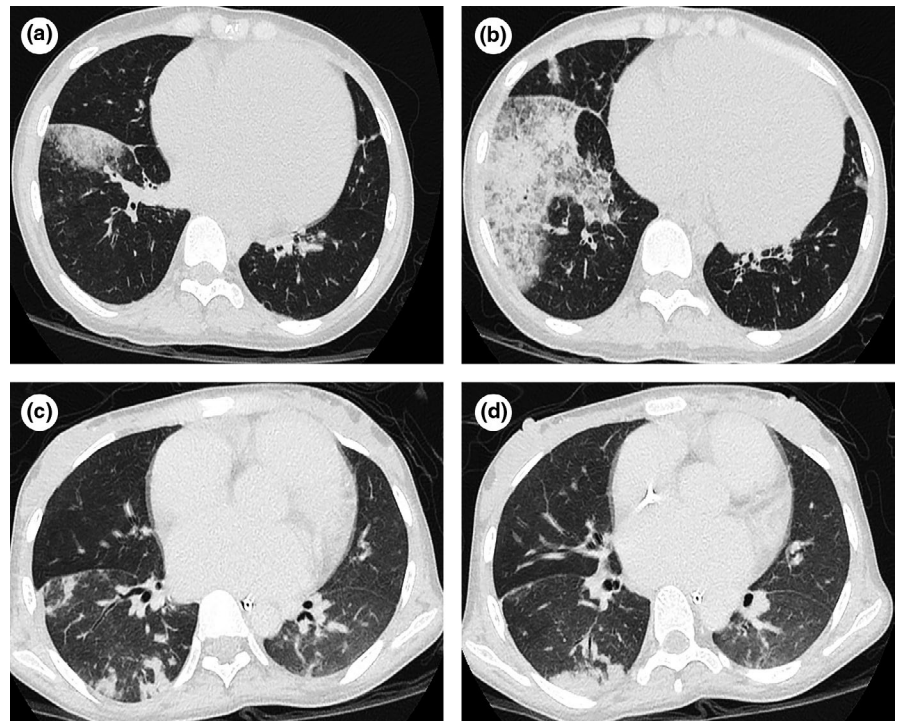
patient with both cardiovascular disease and COVID-19. The patient developed bacteremia of oral origin requiring dental treatment and developed bilateral paresthesia of the inferior alveolar nerve. There is no similar case in the literature. We aim at making a brief review of the literature to alert the dental and medical community about issues that cannot go unnoticed in this crisis we are currently facing.

This 19-year-old white female patient had a past medical history of idiopathic dilated cardiomyopathy and heart failure with reduced ejection fraction. On February 19, 2020, she presented to the emergency department (ED) at Heart Institute (InCor) of the Hospital das Clínicas from Medical School of the Universidade de São Paulo with a history of worsening dyspnoea on exertion, nausea, vomiting, and fever (38.4°C). The physical examination showed cold-wet heart failure. Ancillary tests confirmed the diagnosis of right basal pneumonia. A chest X-ray revealed a right basal opacity (Figure 1a,b), and the computed tomography (CT) (Figure 2a,b) showed areas of consolidation interspersed with ground-glass opacities in the same lung region. A diagnosis of acute decompensation of chronic heart failure precipitated by pulmonary infection was made. Antibiotic therapy for community-acquired pneumonia was initiated as well as inotropic and vasopressor therapy.

**FIGURE 1** X-ray done at admission revealed opacity on the right base (a, b)



**FIGURE 2** CT scan showed areas of consolidation interspersed with ground-glass opacities in the lung region (a, b). CT scan was also revealing a new pulmonary consolidation in addition to pulmonary embolism (c,d).



She was admitted to the intensive care unit with multiple organ dysfunction and developed overt mixed shock requiring escalating doses of vasoactive therapy, mechanical ventilation, and placement of a percutaneous mechanical circulatory assist device (intra-aortic balloon counterpulsation). The patient's overall clinical condition stabilized 10 days from admission. However, later on the course of her hospitalization, a rise of inflammatory markers was noted, prompting investigation of a possible new source of infection. Evidence of bloodstream infection due to *Streptococcus oralis* and *Streptococcus mitis* was recovered, raising suspicion of an oral source. A dental consultation was therefore requested.

She reported odontogenic pain in a focused interview. Oral cavity examination revealed extensive deep carious lesions with pulpal involvement of the mandibular right first and second molars as well as mandibular left first molar. There was no prospect for prosthetic

rehabilitation, and the affected teeth were extracted under standard protocol and minimally traumatic surgical technique without complications. Four days after the procedure, bilateral paresthesia of the lower lip arose as a new complaint shortly followed by respiratory symptoms, nausea, and transient blurred vision. No lesions of the oral mucosa were noticed during the dental consultation. Vascular neurological events were ruled out using brain magnetic resonance angiography. A chest CT scan was also performed revealing a new pulmonary consolidation in addition to pulmonary embolism (Figure 2c,d). Because of the deteriorating respiratory pattern, real-time polymerase reverse transcriptase chain reaction (PCR) testing for SARS-CoV-2 was considered mandatory. The results confirmed COVID-19. Despite receiving maximal supportive therapy, the patient developed refractory septic shock and died 2 days after the COVID-19 diagnosis.



Based on currently observed disease patterns, pre-existing cardiovascular disease may not only predispose to SARS-CoV-2 infection, but also increase the risk of adverse outcomes (Driggin et al., 2020). It has been reported that patients are also exhibiting neurological signs and symptoms that could be ongoing in the recent outbreak without getting noticed or associated with COVID-19 (Mao et al., 2020). The patient was admitted at the ED before the first case confirmed in Latin America (Brazil). The later suspicion by COVID-19 and SARS-CoV-2 test at that time led to a later confirmation of SARS-CoV-2 infection.

Respiratory viral infections may be underdiagnosed in patients with suspected sepsis. Our patient's clinical condition worsened despite the use of broad-spectrum antibiotics. This might have been because of the concomitant untreated viral infection. Other studies have demonstrated the interrelationship between viral coinfection and bacteria. These reports showed that bacterial infection occurred during or shortly after respiratory viral diseases and was associated with increased severity and need for hospitalization (Ljungström, Jacobsson, Claesson, Andersson, & Enroth, 2017; Stille, Pierce, & Crawford, 1961). Therefore, during the COVID-19 pandemic it is important that bacterial infection focus be controlled.

Cardiac patients must have intensive oral health care because of the inherent risk of bacteremia (Folwaczny, Bauer, & Grünberg, 2019). A complex microflora colonizes the oral cavity, which is considered an important source of bacteremia, since oral bacteria are often associated with infective endocarditis and sepsis (Holland et al., 2016). Oral diseases such as caries, apical periodontitis, and periodontitis have a high prevalence in the general population and are mainly caused by *Streptococcus* and *Actinomyces* pathogens (Folwaczny et al., 2019; Peres et al., 2019; Yokoyama et al., 2018). In odontogenic diseases, dysbiosis (shift in the amount of bacterial community) frequently underlies the transition from health to disease. Dysbiosis commonly occurs as a result of poor oral health practices (Rosier, De Jager, Zaura, & Krom, 2014).

The patient described in this case report had poor oral hygiene and a bloodstream infection due to two known oral pathogens. This highlights the importance of preventive measures in dental systems (Folwaczny et al., 2019) as well as not to postpone the dental and cardiac treatment of patients with cardiac diseases. Oral health care is difficult at this period, increasing the potential focus of oral infection. The patients remain intubated for a long period of time, and the maintenance of oral hygiene is therefore a key element in the care of mechanically ventilated patients. Dental procedures must be well planned, opting for non-invasive measures whenever possible and redoubling care during surgeries, if it is the only option. Dentistry must remain integrated with the other specialties (Watt et al., 2019).

In the reported clinical case, the patient with previous cardiac disease and undiagnosed COVID-19 developed bacteremia of oral origin that may have aggravated her systemic condition. An invasive dental procedure was necessary to contain this infection. As

a consequence, the patient developed bilateral paresthesia of the inferior alveolar nerve, which had a very negative impact on her quality of life. This complication was not expected for the teeth in question, and the fact that it occurred on both sides is extremely rare.

While the SARS-CoV-2 is primarily a respiratory pathogen, there are reports of neurological manifestations that may suggest a central and peripheral nervous system involvement (Desforges et al., 2019; Natoli, Oliveira, Calabresi, Maia, & Pisani, 2020). There are increasing reports in the literature describing neurological manifestations of COVID-19: mostly CNS involvement and, to a lesser degree, peripheral. Mao and colleagues analyzed neurological manifestations in hospitalized Chinese patients with COVID-19 and documented a CNS involvement rate of 25%. The peripheral nervous system was affected in 9% of cases (Mao et al., 2020).

This study suggests that the likelihood of developing neurologic symptoms is linked to disease severity (Mao et al., 2020), which concurs with our observations. In our case, the incidental finding of bilateral paresthesia of the inferior alveolar nerve during a dental examination performed to rule out a possible endocarditis source brought to consideration the possibility of SARS-CoV-2 neurological commitment. The patient also reported symptoms such as nausea, vomiting, headache, transient visual alteration (being unable to read small letters), and mental confusion. These symptoms have also been reported in previous studies that assessed the involvement of the nervous system in patients with COVID-19 (Mao et al., 2020).

The coronaviruses can enter the nervous system directly through blood circulation and neuronal pathways or via the olfactory nerve from where it progressively invades subcortical and cortical regions (Natoli et al., 2020). In the reported case, we suggest that the surgical procedure may have been an entry route for the coronaviruses or a trigger for symptomatological manifestation of an existing infection, resulting in the lower lip paresthesia. However, this hypothesis needs to be better studied, and the pathogenesis of virus is better understood.

The symptoms associated with COVID-19 are non-specific ranging from asymptomatic patients to severe cases including pneumonia and death. The identification of these symptoms can be even more challenging when the patient suffers from a heart disease and has several other comorbidities on top of a decompensated clinical condition. This was seen in our patient who presented to the ED before the first COVID-19 case was identified in Brazil.

Manifestations of the peripheral neurological system such as bilateral paresthesia of the inferior alveolar nerve on cardiac patients can be a predictive factor of COVID-19 and impair their quality of life. Oral care and preventive dental procedures are extremely important to avoid bacteremia in cardiac patients. During the COVID-19 pandemic, these measures can prevent co-infections that could aggravate the general condition. Also, clinical and biochemical data from COVID-19 can be partially masked by decompensated coexisting chronic diseases.



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## CONFLICT OF INTEREST

The authors have no conflicts of interest to disclose.

## AUTHOR CONTRIBUTION

**Maria Stella Moreira:** Conceptualization; Formal analysis; Writing-original draft; Writing-review & editing. **Itamara Lucia Itagiba Neves:** Conceptualization; Formal analysis; Writing-original draft; Writing-review & editing. **Claudia Yanet San Martin de Bernoche:** Conceptualization; Formal analysis; Writing original draft; Writing-review & editing. **Giovanna Sarra:** Formal analysis; Writing-original draft; Writing-review & editing. **Marcela Alves dos Santos-Paul:** Conceptualization; Formal analysis; Writing-original draft; Writing-review & editing. **Fernanda Campos-Neves:** Conceptualization; Formal analysis; Writing-original draft; Writing-review & editing. **Gabriella Torres Schröter:** Conceptualization; Formal analysis; Writing-original draft; Writing-review & editing. **Tânia Pedroso Montano:** Conceptualization; Formal analysis; Writing-original draft; Writing-review & editing. **Cíntia Maria Alencar Carvalho:** Conceptualization; Formal analysis; Writing-original draft; Writing-review & editing. **Ricardo Simões Neves:** Conceptualization; Formal analysis; Writing-original draft; Writing-review & editing.


## ETHICAL CONSIDERATIONS

Written consent for procedures and publication was obtained from the patient. The manuscript has been prepared in compliance with the appropriate EQUATOR guidelines (CARE).

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