



# Otological Manifestations in COVID-19: Case Reports

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## Abstract

**Objectives:** To warn of possible otological manifestations in cases resulting from infection by SARS-CoV-2 (Severe Acute Respiratory Syndrome, Coronavirus).

**Methods:** Two cases of otological involvement were reported at the Clinical Hospital, Marília Medical School, through reports with medical records and literature review.

**Results:** The patients presented serous otitis media after infection by SARS-CoV-2 and different therapeutic outcomes: Surgical and clinical.

**Conclusion:** The pathogenesis of the development of complications in the auditory system associated with COVID-19 is still not well established. However, it deserves attention, thinking not only about acute affections, but also about its consequences chronically to the population, in view of the growing resumption of cases of infection by the virus in Brazil.

**Keywords:** Coronavirus; Serous otitis media; Myringotomy

## Introduction

SARS-CoV, from the *Coronaviridae* family, is a single-stranded RNA virus belonging to the *Betacoronavirus* genus, group 2 [1]. From December 2019 onwards, there was the transmission of a new coronavirus (SARS-CoV-2), which was identified in Wuhan-China and caused COVID-19, being then disseminated and transmitted among humans through droplets respiratory or contact. Until mid-April 2021, Brazil had 13,900,091 confirmed cases, among which 371,678 died [2].

COVID-19 has a clinical spectrum ranging from asymptomatic infections to severe conditions. According to the World Health Organization, the majority (approximately 80%) of patients with this disease may be asymptomatic or oligosymptomatic and approximately 20% of detected cases require hospital care due to respiratory distress, of which approximately 5% may need of ventilatory support [3]. The main symptoms related to the disease are: Fever, dyspnea and fatigue [4].

SARS-CoV-2 showed varying degrees of neurotropism, generating oxidative stress, neuroinflammation, vasodilation and thrombotic events in the nervous system. Then, the emergence of neurophthalmological diseases was observed, as well as hearing loss [5].

Hearing loss associated with viral infections is typically sensorineural, although conductive and mixed losses have been documented [5]. The pathogenesis of virus-induced hearing loss is varied and ranges from direct damage to inner ear structures to immune-mediated damage. COVID-19 infection can have deleterious effects on cochlear hair cell functions, despite being asymptomatic and, occasionally, hearing recovery after these infections can occur spontaneously. However, auditory complications are rare manifestations.

Indeed, viral infections of the upper respiratory tract have been causally associated with new cases of otitis media. Unusual presentations of the disease, including tinnitus and hearing loss, are appearing in the literature [5].

In this perspective, it is possible to observe that the pathogenesis of the development of complications in the auditory system associated with COVID-19 is still not well established, in addition to the existing literature considering them as uncommon. Thus, it is relevant to describe the design of two cases seen at this service and who attended with otological involvement.

## Objectives

Through the report of clinical cases, warn about possible otological manifestations in conditions resulting from SARS-CoV-2 infection.

## OPEN ACCESS

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**Method**

Review of medical records, interviews with patients, photographic records of diagnostic tests to which patients were submitted and literature review. Patients authorized the presentation of their cases by signing the Informed Consent Form (FICF).

**Case Series**

**Case 1**

ISF, 19 years old, she was seen on 01/20/21, complaining of ear fullness in the right ear, after testing positive for COVID-19 on 12/24/20. After 10 days, he developed otalgia and ipsilateral aural fullness. Denied other otolaryngological complaints.

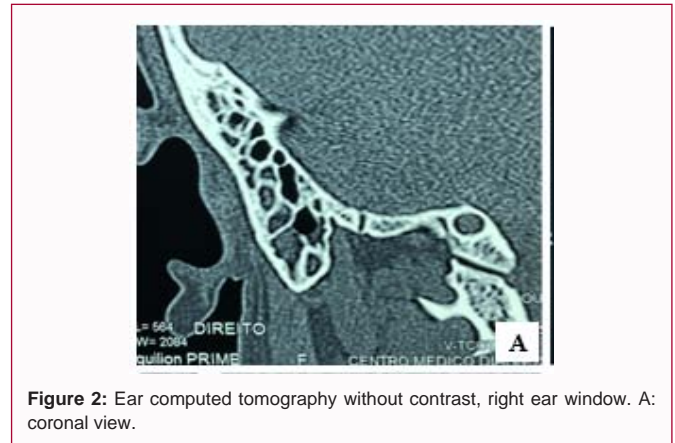
Background: Allergic rhinitis and asthma.

Otoscopy: Bilaterally integral and opaque tympanic membrane, with central hyperemia on the right.

At anterior rhinoscopy: pale mucosa. Oroscopy: grade 2+/4+ hypertrophic pharyngeal tonsils.

After anamnesis and physical examination, serous otitis media was hypothesized. Amoxicillin with clavulanate was prescribed for 10 days, intranasal mometasone, and additional tests were requested-pure tone and vocal Audiometry with Immittance testing (A+I), Brainstem Auditory Evoked Potential (BAEP), Otoacoustic Emissions (OEA) and nasofibroscopy. With worsening of otalgia after 7 days, the prescription of a depot corticosteroid (intramuscular betamethasone) was added to the procedure.

In the OEA exam, the right ear did not present distortion product-evoked otoacoustic emissions in the frequencies of 357 Hz to 5649 Hz, with absence of responses in 3 low, 3 medium and 3 high frequencies. Left ear did not present distortion product-evoked otoacoustic



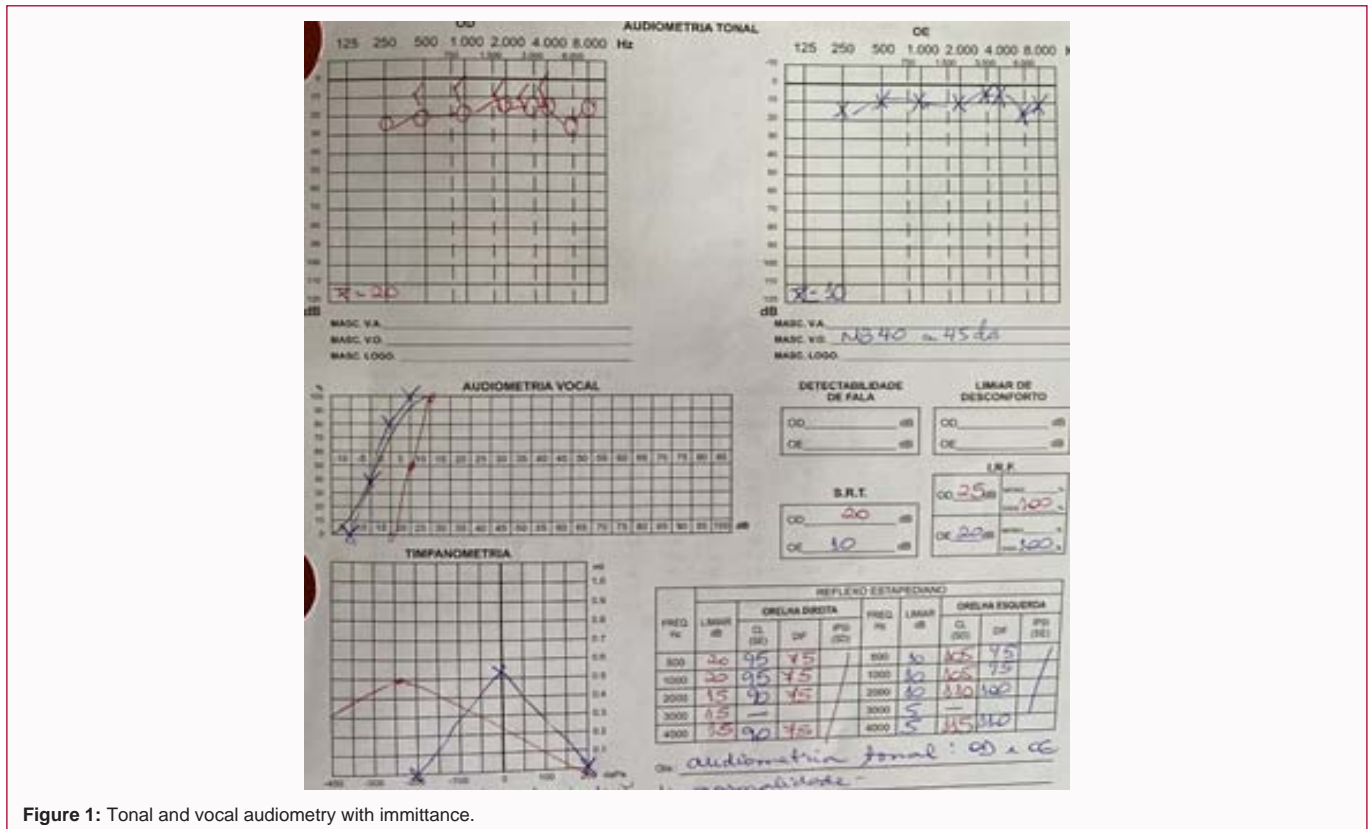
**Figure 2:** Ear computed tomography without contrast, right ear window. A: coronal view.

emissions in the frequencies of 2000 Hz, 3991 Hz and 5649 Hz, with absence of responses in 1 medium and 2 high frequencies. Finally, at nasofibroscopy, the nasal mucosa was pale, with no other findings; concluding a chronic rhinopathy.

As a final procedure, antibiotics were changed to axetil-cefuroxime and a computed tomography of the ears was requested, with maintenance of fever, ear pain and ear fullness after 6 days.

On Computed Tomography (CT) examination of the ears (Figure 2), a small amount of material with soft tissue density is noted in some mastoid cells on the right and in the meso and ipsilateral hypotympanum, suggesting otomastoiditis.

The antibiotic was exchanged for ceftriaxone and reassessed within 72 h. Three days later, the patient returns with pain to swallow and yawn combined with ear fullness. At otoscopy, he maintained central hyperemia in the right ear (Figure 3).



**Figure 1:** Tonal and vocal audiometry with immittance.



Figure 3: Right ear video-otoscopy.

As a management, intravenous ceftriaxone 2 g/day was maintained associated with clindamycin 300 mg and prednisolone 10 mg for 5 days.

Sixteen days after the first consultation, there was no clinical improvement, maintaining the physical examination, opting for myringotomy and placement of a Ventilation Tube (TV) in the operating room.

During the surgical procedure, there was an outflow of mucoid secretion (Figure 4). Thirteen days later, the patient had improved fullness, still with less intense otalgia. After thirty days, he returns with a well-positioned TV, without fullness. Patient denies pain complaints.

**Case 2**

DGZ, 37 years old, female, hypothyroid, started flu on 12/31/2020 testing positive for COVID-19 on 01/07/2021, presenting moderate pulmonary involvement and ophthalmological evolution (fly flies) on the tenth day of the condition, in addition to otorhinolaryngological conditions (anosmia, ageusia and otalgia with ear fullness). Since the beginning, he has used oral antibiotics (axetil-cefuroxime and azithromycin) and topical (ciprofloxacin), in addition to oral and intranasal corticosteroids.

On 02/11/2021, he attended the otorhinolaryngology service for the first time due to mild-moderate otalgia (more intense on the right), of a persistent nature, associated with hearing loss and bilateral aural fullness. Tonal and vocal audiometry with thresholds within the normal range, but with a tendency to conductive alteration, suspected of bilateral serous otitis media (Figure 5). Otoscopy: Serous content with retrotympenic air bubbles on the right and retracted tympanic membrane on the left. Initially prescribed 3% topical nasal hypertonic solution and olfactory training.

A new control audiometry was performed on 03/10/2021 (Figure 6), with hearing within normal limits, with only a left ear curve shift in the right ear in tympanometry and absence of bilateral stapedial reflex.

She returned to otorhinolaryngology on 03/11/2021, reporting that he had improved otological complaints, without using analgesics. She reported a return of approximately 70% of her sense of smell, as well as a total improvement in her dysgeusia. On physical examination, absence of right retrotympenic serous content and retracted tympanic membrane. Nasal topical 9% sodium citrate was prescribed for 90 days and olfactory training was maintained. Awaiting return in 2 months for reassessment.

**Discussion**

Viral infections of the upper respiratory tract have been causally associated with new cases of otitis media. There is some controversy regarding the importance of individual viral species, but human Coronavirus has been isolated from middle ear fluid and related to otitis media in children. Most patients affected by SARS-CoV-2 are asymptomatic or have mild symptoms. Common symptoms, including fever, cough, fatigue, and gastrointestinal disturbances, have been well documented [4].

Classically, respiratory, cardiac and gastrointestinal symptoms are considered as main focuses, however olfactory and gustatory symptoms, as well as auditory and vestibular symptoms, have also been recently noticed, making possible a neurotropy and neuroinvasion of SARS-CoV-2 that justifies the manifestations in the Peripheral Nervous System (PNS) [1,5,6].

Unusual presentations of the disease as otologic cases, including tinnitus and hearing loss, are increasingly appearing in the literature. Viral infections have been implicated in cases of congenital and acquired hearing loss, which can be unilateral or bilateral [4].

There is currently no evidence to support the presence of SARS-CoV-2 in the middle ear, but the documented findings implicate the virus as a potential source of otologic disorders. Confirming the presence of SARS-CoV-2 is important to fully elucidate the clinical presentations of COVID-19 and to recognize that viral particles can shed during examination and surgical procedures in this area, creating potential risks of infection [4].

There is growing evidence to suggest that ear disorders, specifically hearing loss, may be part of the clinical spectrum of COVID-19 and may, in some cases, signal the onset of the disease [4].

Since WHO is an inflammatory disease, a response to treatment with corticosteroids is assumed. Its use with or without an association



Figure 4: Intraoperative video-otoscopy of the right ear.

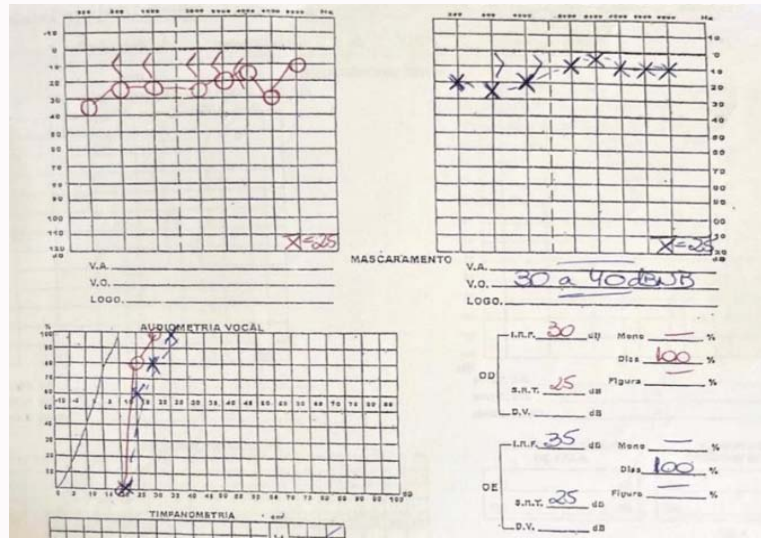


Figure 5: Tonal and vocal audiometry.

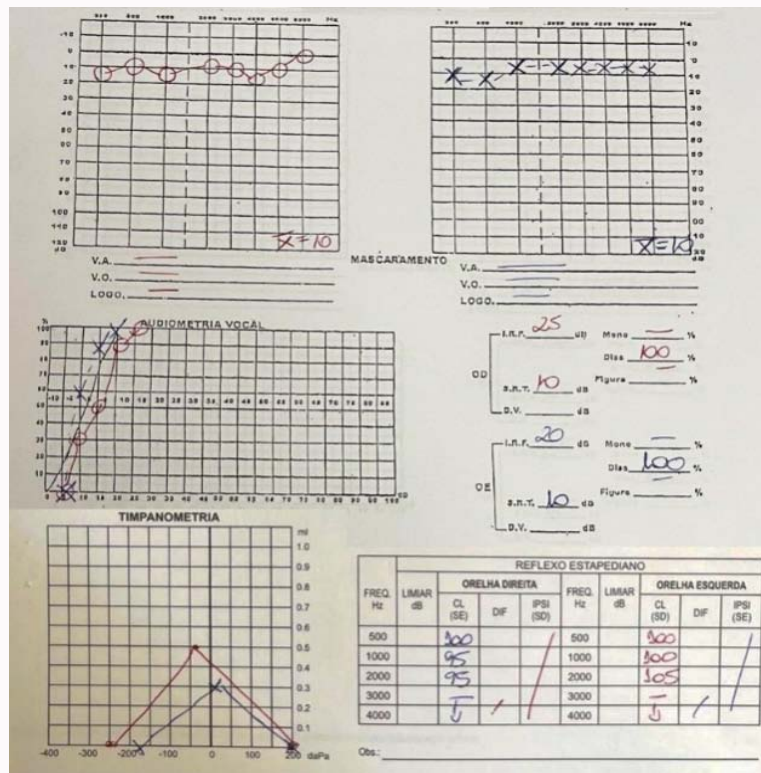


Figure 6: Tonal and vocal audiometry with immittance.

of antibiotics lead to a faster resolution of WHO secretion in the short term. However, over the long term, there is no evidence of benefit over placebo [7]. Its use for a period of seven to 10 days, in most cases, does not require a decreasing dose [8]. When deciding on surgery, tympanotomy/myringotomy for insertion of a Ventilation Tube (VT) is the procedure of choice. The TV stays for an average of 8 to 14 months [7].

In our patients in the reports, the findings for WHO had different outcomes: with the first patient not responding to clinical treatment with corticosteroids (intranasal and systemic) associated with oral antibiotics, maintaining important symptoms requiring

myringotomy and VT insertion with complete resolution of the picture 44 days after the surgical approach; while the second, due to ophthalmological findings that contraindicated corticosteroids, evolved with good resolution only with topical nasal treatment with 3% intranasal hypertonic solution with progressive improvement after the 6<sup>th</sup> day of use, maintaining the treatment for 28 days until complete resolution of the condition.

### Conclusion

Infection by SARS-CoV-2 can present otological manifestations, such as serous otitis media and otomastoiditis, associated or not with some degree of impairment of the auditory function. Therefore,

follow-up of these patients is necessary to assess the permanence or resolution of hearing loss, in addition to seeking treatment alternatives including surgical that can minimize its impacts, in addition to trying to avoid its complications. Complementary tests, such as computed tomography, tonal and vocal audiometry, in addition to immitanciometry can help in the diagnostic investigation and in an adequate therapeutic approach. The evolutionary control of these patients is essential, as there is still no evidence in the literature about the emergence of late findings.

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