

Otitis Media in COVID-19: A Case Series

Mahboobeh Karimi-Galougahi¹, Nasim Raad¹, Jahangir Ghorbani¹, Narges Mikaniki¹, and Sara Haseli¹

¹National Research Institute of Tuberculosis and Lung Disease

July 7, 2020

Abstract

Key points 1- We report otitis media in eight patients with coronavirus disease-2019 (COVID-19) and no background history of otologic problems. 2- Otitis media was the first manifestation of COVID-19 in the majority of patients in this case series. 3- Effusion in the middle ear was present in six patients, three patients had typical signs of acute otitis media, with one patient having tympanic membrane perforation. 4- Hearing loss was present in majority of patients, with conductive and mild sensory-neural loss at high frequency as the underlying mechanisms. 5- Our findings suggest that otitis media should be considered a possible manifestation of COVID-19 during the current pandemic.

Otitis Media in COVID-19: A Case Series

Word count: 1,322

Conflict of interest: the authors report no competing interests

Key points

1. We report otitis media in eight patients with coronavirus disease-2019 (COVID-19) and no background history of otologic problems.
2. Otitis media was the first manifestation of COVID-19 in the majority of patients in this case series.
3. Effusion in the middle ear was present in six patients, three patients had typical signs of acute otitis media, with one patient having tympanic membrane perforation.
4. Hearing loss was present in majority of patients, with conductive and mild sensory-neural loss at high frequency as the underlying mechanisms.
5. Our findings suggest that otitis media should be considered a possible manifestation of COVID-19 during the current pandemic.

Introduction:

Coronavirus disease-2019 (COVID-19) often manifests with a spectrum of symptoms, most commonly fever, cough, myalgia, fatigue, and shortness of breathe(1). Ear, nose, and throat symptoms, including sore throat, rhinorrhea, anosmia and dysgeusia, vertigo, and hearing loss have also been reported(1,2). In the current study, we present a series of patients with no background history of otologic problems who presented with otitis media and conductive hearing loss in the context of confirmed COVID-19.

Case Studies

Patient 1. A 38-year-old man with “the worst cold of his life for the past 2 weeks” presented with chronic nonproductive cough and mild dyspnea on exertion. Additionally, he complained of hearing loss and a sense of pressure in his ears. The physical exam revealed bilateral coarse crackle and wheezing on lung auscultation, and tympanic membrane bulging and purulent effusion on otoscopy. Bilateral consolidations

with bronchiolectasis in peripheral locations were identified in organizing pneumonia pattern on spiral non-contrast computed tomography (CT) of both lungs. Polymerase chain reaction (PCR) assay on sample from oropharyngeal swab was positive for COVID-19. He received outpatient treatment and all the symptoms resolved except for anosmia.

Patient 2. A 35-year-old woman presented with sudden-onset anosmia for the past 7 days. The head and neck exam revealed no sign of nasal congestion or discharge, however bilateral middle ear effusion was noted. There were coarse crackles on the upper left lung lobe, in the absence of any dyspnea. CT of the lungs revealed consolidation in the lingula. COVID-19 was confirmed on the PCR assay of nasopharyngeal swab.

Patient 3. A 35-year-old woman working in the laboratory of a COVID-19-designated hospital presented with chronic cough, moderate to severe respiratory distress and bilateral pulmonary changes characteristic of COVID-19 on CT, with COVID-19 confirmed with positive PCR assay. She complained of unilateral earache and hearing loss, and otoscopic exam showed a distinctly red tympanic membrane (Figure 1).

Patient 4. A 20-year-old woman presented with left-sided ear pain and hearing loss. Ear examination showed effusion in the left middle ear and air-fluid level. The tympanic membrane was severely bulged and predisposed to perforation (Figure 2). On coronal views of high-resolution CT (HRCT) of temporal bones, opacification of the left middle air cavity was noted (Figure 2). She had a recent close contact with a family member with COVID19 but reported no other symptoms, and physical exam was otherwise normal. CT chest was normal. She underwent myringotomy. PCR on samples from oropharyngeal swab was negative, nonetheless the PCR performed on the middle ear fluid was positive for COVID-19.

Patient 5. A 22-year-old woman presented with nonproductive cough, left-sided ear pain, aural fullness, hearing loss and sensation of ear popping. Otoloscopic exam showed decreased mobility of the left tympanic membrane with bulging contour and hypervascularity and purulent middle ear effusion. Audiogram revealed conductive hearing loss (15 dB) on the left side, with mild sensory-neural hearing loss at high frequency (Figure 3). Axial images on HRCT of the temporal bones revealed opacification of the left middle air cavity, suggestive of otitis media (Figure 3). PCR on oropharyngeal swab was negative but was positive for COVID-19 PCR on nasopharyngeal swab.

Patient 6. A 25-year-old woman with nonproductive cough for the past 3 weeks presented with right-sided hearing loss and otalgia. Otoloscopic exam showed serous otitis media with decreased tympanic membrane movement. There were mixed coarse and fine crackles on auscultation of the right lung. HRCT of the lungs confirmed right-sided foci of ground-glass opacity consistent with viral pneumonia. PCR assay performed on the oropharyngeal and nasopharyngeal swabs was positive for COVID-19.

Patient 7. A 22-year-old woman presented with sudden loss of smell and taste and left-sided otalgia and hearing loss for the past week. Otoloscopic exam shows typical signs of otitis media with effusion and air-fluid level. She had a unilateral C type tympanogram. Axial non-contrast CT of lungs showed patchy foci of ground-glass opacities in the right upper lobe. PCR assay performed on the oropharyngeal swab was positive for COVID-19.

Patient 8. A 45-year-old woman presented with severe acute otalgia, ear fullness and hearing loss. Ear examination revealed a new central perforation with purulent otorrhea (Figure 4). She had a mild cough but no dyspnea, with bilateral coarse crackles on auscultation of the lungs. Axial non-contrast CT chest revealed bilateral patchy ground-glass opacities in the peripheries of the lower lobes.

Discussion

In this case series, we report otitis media as a new manifestation of COVID-19. Otitis media or inflammation of the middle ear is a general term that is further categorized to acute otitis media (AOM), otitis media with effusion (OME), and chronic suppurative otitis media (CSOM)(3).

Our case series includes 8 patients presenting over a two-months period during the COVID-19 pandemic. Six out of the eight patients had otalgia, with seven patients having hearing loss. Effusion in the middle ear

was evident on otoscopic examination in six patients. Three patients had typical signs of AOM, with one patient having AOM with tympanic membrane perforation. Two patients had smell dysfunction. COVID-19 was confirmed by typical changes on CT chest and positive PCR assay on naso- or oropharyngeal swabs. Interestingly, in one patient, PCR assay was positive on middle ear effusion and negative on oropharyngeal swab.

We suggest that concomitant occurrence of otitis media in these patients could be a manifestation or complication of COVID-19. AOM and OME follow a seasonal pattern, with the incidence being the highest during the fall and winter and lowest during spring and summer in parallel to the incidence of upper respiratory infections(3). Our patients presented with otitis media in the second and third months of spring when of a low incidence of otitis media is expected. In addition, AOM and OME are most common in the young children(3), while all patients in this case series were adults without any pathology in the nasopharynx.

Viruses, including respiratory syncytial virus, rhinovirus, adenovirus, coronavirus, bocavirus, influenza virus, parainfluenza virus, enterovirus and human metapneumovirus, are known causes of upper respiratory infections and can induce AOM(3). Viruses can be the sole infective cause of AOM or play a role as co-infection with bacteria and, rarely, with other viruses(4). Viral infections can disrupt immune function and reduce the normal mucociliary clearance of mucosal cells by changing the properties of the nasopharyngeal mucus and the Eustachian tube leading to negative middle ear pressure(3). Negative middle ear pressure in turn predisposes the middle ear to effusion formation or secondary bacterial or viral infection(4).

Angiotensin-converting enzyme-2 (ACE2) receptor is the cellular entry route for SARS-CoV-2. High levels of ACE2 receptors are expressed in the nasal respiratory epithelium goblet, basal and ciliated cells(5). Because of the enriched populations of the ciliated cells, glands and goblet cells in the inferior part of the Eustachian tube(6), we suggest that this portion of the tube can be a route for SARSCoV-2 infection of the middle ear.

Conclusions

To the best of our knowledge, only a single case of otitis media in the setting of COVID-19 has thus-far been reported(7). The current study presents the largest series of patients with otitis media in COVID-19. Interestingly, with the exception of one patient, otitis media was the first manifestation of COVID-19 in this case series. Thus, we recommend that during the current pandemic, presence of otitis media should alert the clinicians to the possibility of COVID-19.

References

1. Chen N, Zhou M, Dong X, Qu J, Gong F, Han Y, Qiu Y, Wang J, Liu Y, Wei Y, Yu T. Epidemiological and clinical characteristics of 99 cases of 2019 novel coronavirus pneumonia in Wuhan, China: a descriptive study. *The Lancet*. 2020 Feb 15;395(10223):507-13.
2. Karimi-Galougahi M, Naini AS, Raad N, Mikaniki N, Ghorbani J. Vertigo and hearing loss during the COVID-19 pandemic-is there an association?. *ACTA Otorhinolaryngologica Italica*. 2020 Jun 10.
3. Schilder AG, Chonmaitree T, Cripps AW, Rosenfeld RM, Casselbrant ML, Haggard MP, Venekamp RP. Otitis media. *Nature Reviews Disease Primers*. 2016 Sep 8;2(1):1-8.
4. Buchman CA, Brinson GM. Viral otitis media. *Current allergy and asthma reports*. 2003 Aug 1;3(4):335-40.
5. Sungnak W, Huang N, Bécavin C, Berg M, Network HC. SARS-CoV-2 entry genes are most highly expressed in nasal goblet and ciliated cells within human airways. *arXiv preprint arXiv:2003.06122*. 2020 Mar 13.
6. Sando I, Aoki H, Takahashi H, Matsune S. Mucosal folds in human eustachian tube: a hypothesis regarding functional localization in the tube. *Annals of Otology, Rhinology & Laryngology*. 1993 Jan;102(1):47-51.
7. Fidan V. New type of corona virus induced acute otitis media in adult. *American Journal of Otolaryngology*. 2020 Apr 16:102487.

Figures

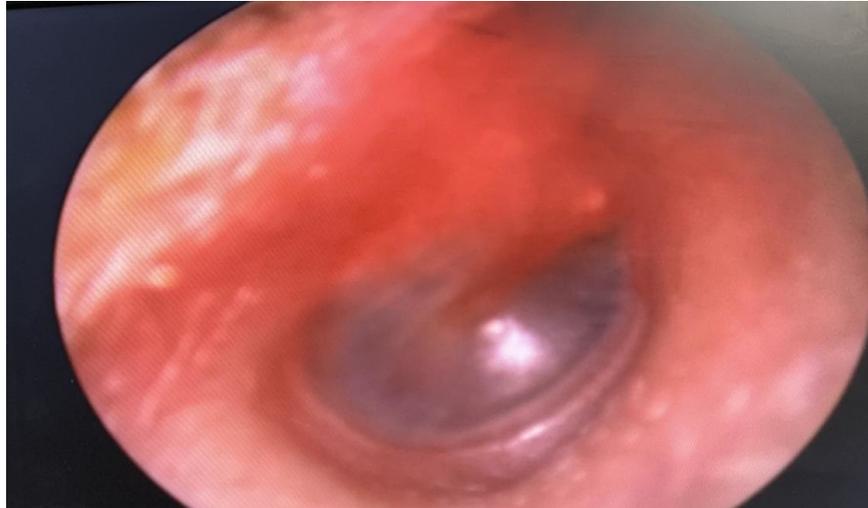


Figure 1. Erythema of the tympanic membrane in a 35-year-old woman with COVID-19.



Figure 2. A. Effusion in middle ear on otoscopy. B. Opacification of the left middle air cavity (arrow) coronal images on HRCT of the temporal bones. PCR assay of the middle ear fluid was positive for COVID-19.

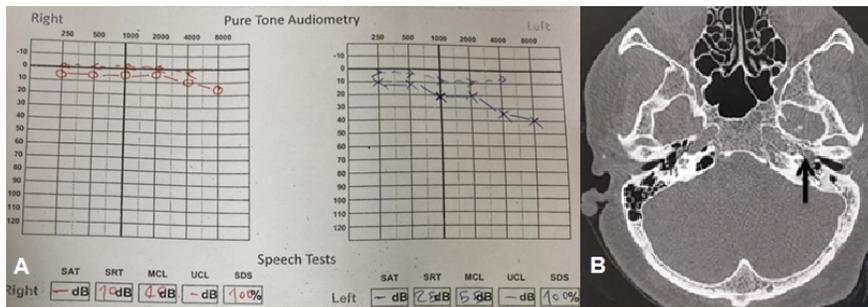


Figure 3. A. Audiogram revealing left-sided conductive hearing loss, with mild sensory-neural loss at high frequency. B- Axial HRCT of temporal bones revealed opacification of the left

middle air cavity (arrow), indicating otitis media. PCR assay of nasopharyngeal swab was positive for COVID-19.

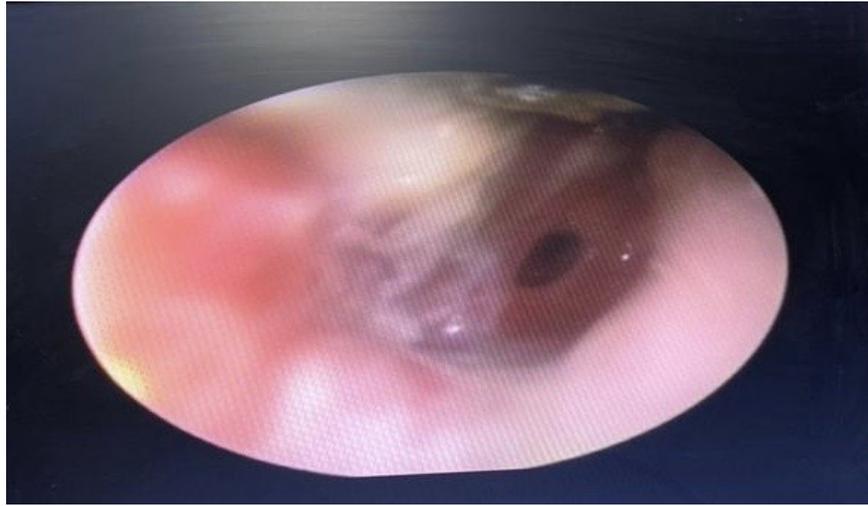


Figure 4. Acute otitis media with central tympanic membrane perforation in a 45-year-old woman with COVID-19.

Hosted file

Figures.docx available at <https://authorea.com/users/340083/articles/467204-otitis-media-in-covid-19-a-case-series>