Since January 2020 Elsevier has created a COVID-19 resource centre with free information in English and Mandarin on the novel coronavirus COVID-19. The COVID-19 resource centre is hosted on Elsevier Connect, the company's public news and information website.

Elsevier hereby grants permission to make all its COVID-19-related research that is available on the COVID-19 resource centre - including this research content - immediately available in PubMed Central and other publicly funded repositories, such as the WHO COVID database with rights for unrestricted research re-use and analyses in any form or by any means with acknowledgement of the original source. These permissions are granted for free by Elsevier for as long as the COVID-19 resource centre remains active.
COVID-19 and transtympanic injections for sudden sensorineural hearing loss

Jason K. Adams, John P. Marinelli, Travis, R. Newberry, Samuel A. Spear, Isaac D. Erbele *

Brooke Army Medical Center, San Antonio, TX, United States of America
Uniformed Services University of the Health Sciences, Bethesda, MD, United States of America

ARTICLE INFO

Keywords:
COVID
Sudden sensorineural hearing loss
Population-based
United States

ABSTRACT

Background: Multiple reports have linked COVID-19 infection with sudden sensorineural hearing loss (SSNHL), although other studies have failed to demonstrate this association. The current study was conceived to examine the rates of SSNHL across a large, principally national, population by characterizing the rate of transtympanic injections for SSNHL during the pandemic.

Methods: Retrospective review of all patients that underwent transtympanic injection from 2019 to 2020.

Results: Covering a unique beneficiary population of 9.6 million individuals of all ages in the United States, a statistically significant decrease in transtympanic injections for SSNHL was performed from 2019 to 2020 (p = 0.04, IRR = 0.91, 95 % CI = 0.84-0.99). No patient receiving a transtympanic injection also had a COVID-19 diagnosis.

Conclusions: These findings support the idea that COVID-19 infections do not clinically significantly increase patients' risk of developing SSNHL. In fact, the decreased exposure through social isolation to other common viruses implicated in causing SSNHL may have actually led to a lower rate of SSNHL during the pandemic.

1. Introduction

Sudden sensorineural hearing loss (SSNHL) is an otologic emergency requiring aggressive, timely intervention to prevent permanent hearing loss. Early in the COVID-19 pandemic, reports surfaced linking SSNHL to COVID-19 infections [1,2]. Multiple other limited reports have since suggested COVID-19 infection may place patients at increased risk for SSNHL [3], although several other studies have failed to demonstrate an association [4–6]. Since many of the conflicting reports surrounding COVID-19 and SSNHL extend from smaller studies from single institutions, the current study was conceived to examine the rates of SSNHL across a large, principally national, population by characterizing the rate of transtympanic injections for SSNHL during the pandemic.

2. Methods

This study was approved by the local Institutional Review Board (IRB #C.2022.002n).

Within an insurance beneficiary population of 9.6 million (Tricare), a comprehensive beneficiary database was queried for patients undergoing transtympanic injections (Current Procedural Terminology (CPT) 69801). This database included patients of all ages treated at national and international military treatment facilities, as well as those procedures for which Tricare paid to have performed at civilian centers outside the military health system. Patients with an International Classification of Disease-10 (ICD10) code for SSNHL (H91.2, H91.21, H91.22) were included. Within this population, the ICD10 codes given at the time of injection was also queried for COVID-19 infection (U0.71, B34.2, B97.29). ICD10 codes for a personal history of COVID-19 infection (Z86.16) and a suspected exposure to COVID-19 (Z20.822) were not included, since these were added January 2021.

The procedures performed were compared by year using an incidence rate ratio (IRR). Analysis was performed with R version 3.5.3 (R Foundation for Statistical Computing; Vienna, Austria) and RStudio version 1.1.463 (RStudio, Inc.; Boston, USA), with the additional packages “tidyverse” version 1.2.1 [7] and “fmsb” version 0.7.3 [8].

Abbreviations: SSNHL, Sudden Sensorineural Hearing Loss; CPT, Current Procedural Terminology; ICD10, International Classification of Disease, Tenth Revision; IRR, Incidence Rate Ratio.

* Corresponding author at: 3551 Roger Brooke Dr., Department of Otolaryngology-Head and Neck Surgery, San Antonio Uniformed Services Health Education Consortium, JBSA-Ft Sam Houston, TX 78234, United States of America.
E-mail address: isaac.d.erbele.mil@health.mil (I.D. Erbele).

https://doi.org/10.1016/j.amjoto.2022.103718
Received 15 September 2022;
Available online 30 November 2022
0196-0709/Published by Elsevier Inc.
3. Results

A total of 2129 transtympanic injections were performed in 946 patients with a diagnosis of SSNHL. There were 496 patients who received 1110 injections in 2019, and 473 patients received 1019 injections in 2020. Twenty-three patients had injections in both 2019 and 2020, likely representing a series of injections started in 2019. There was a statistically significant decrease in injections performed from 2019 to 2020 ($p = 0.04$, IRR = 0.91, 95% CI = 0.84–0.99) (Fig. 1), however, there was no statistically significant difference in the number of patients who received injections ($p = 0.41$, IRR = 0.95, 95% CI = 0.84–1.08). No patient receiving a transtympanic injection also had a COVID-19 diagnosis at the time of injection.

4. Discussion

Across a large national patient population in the United States, the current study demonstrates a decline in transtympanic injections performed for SSNHL in 2020. Despite covering a population of 9.6 million subjects, no patients who received a transtympanic injection also had a diagnosis of COVID-19 infection. These findings support the idea that COVID-19 infections do not clinically significantly increase patients’ risk of developing SSNHL. This work reinforces findings in studies from Israel and Massachusetts on ICD10 codes [5,6], survey data of otolaryngologists on the perception of COVID-19’s effect on SSNHL [9], and a study testing for COVID-19 in patients presenting for SSNHL [4]. Interestingly, similar to the current work, other reports have also observed a decrease in rates of SSNHL during the pandemic, perhaps secondary to decreased exposure to common viruses that actually cause SSNHL [10].

The absence of patients receiving a transtympanic injection for SSNHL with a co-diagnosis of COVID-19 is notable, particularly in the setting of an increased concern for the relationship between COVID-19 and SSNHL. It may be influenced by a potential lack of surgeon awareness of the ICD10 code added in April 2020, or that it was not added because symptomatic patients were not seeing otolaryngologists.
Notable limitations of this analysis include that the pandemic prevented some patients from pursuing care. As alluded to previously, miscoding is possible, especially with regards to a COVID-19 diagnosis. Additionally, this study does not explore a possibly salient relationship between COVID-19 and Meniere’s.

5. Conclusion

Based on transtympanic injections from this large patient population, there was not a clinically significant increase in SSNHL. These data support the mounting evidence that COVID-19 infection does not increase patients’ risk of developing SSNHL.

Funding source

None.

Prior presentation

This material has not been previously presented or published.

Department of defense disclosure

The views expressed herein are those of the authors and do not reflect the official policy of position of Brooke Army Medical Center, the U.S. Army Medical Department, the U.S. Army Office of the Surgeon General, the Department of the Army, the Department of the Air Force, the Department of Defense, or the U.S. Government.

CRediT authorship contribution statement

Jason K. Adams: ethics approval, data analysis and interpretation, manuscript drafting and review, final approval, accountability for all aspects of the work; John P. Marinelli: data analysis and interpretation, manuscript drafting and review, final approval, accountability for all aspects of the work; Travis R. Newberry: data analysis and interpretation, manuscript drafting and review, final approval, accountability for all aspects of the work; Samuel A. Spear: data analysis and interpretation, manuscript drafting and review, final approval, accountability for all aspects of the work; Isaac D. Erbele: study design, ethics approval, data collection, data analysis and interpretation, manuscript drafting and review, final approval, accountability for all aspects of the work.

Declaration of competing interest

None.

Acknowledgements

The authors wish to thank Ms. Stacy Leonard, Ms. Sandra Walker, Ms. Rincy Varughese, and Ms. Elsa Granato of the Department of Defense Hearing Center of Excellence for their support in data extraction.

References

[1] Kilic O, Kalcioglu MT, Cag Y, et al. Could sudden sensorineural hearing loss be the sole manifestation of COVID-19? An investigation into SARS-COV-2 in the etiology of sudden sensorineural hearing loss. Int J Infect Dis 2020;97:208-11.
[2] Kalyyappan K, Chen YC, Krishnan Murthiiah VP. Vestibular Cochlear manifestations in COVID-19 cases. Front Neurol 2022;13:850337.
[3] Meng X, Wang J, Sun J, Zhu K. COVID-19 and sudden sensorineural hearing loss: a systematic review. Front Neurol 2022;13:883746.
[4] van Rijssen LB, Dersks W, Hoffmans R, et al. No COVID-19 in patients with sudden sensorineural hearing loss (SSNHL). Otol Neurotol 2022;43(2):170–3.
[5] Doweer I, Yanir Y, Najjar-Debiny R, Shibli R, Saliba W. Sudden sensorineural hearing loss during the COVID-19 pandemic. JAMA Otolaryngol Head Neck Surg 2022;148(4):373–5.
[6] Chari DA, Parikh A, Kozin ED, Reed M, Jung DH. Impact of COVID-19 on presentation of sudden sensorineural hearing loss at a single institution. Otolaryngol Head Neck Surg 2021;165(1):163–5.
[7] Wickham H, Averick M, Bryan J, et al. Welcome to the tidyverse. J Open Source Softw 2019;4:1686–92.
[8] Nakazawa M. fmsb: functions for medical statistics book with some demographic data. 2022.
[9] Pool C, King TS, Pradhan S, Isildak H. Sudden sensorineural hearing loss and COVID-19. J Laryngol Otol 2022;1–15.
[10] Parrino D, Frosolini A, Toninato D, Matarazzo A, Marioni G, de Filippis C. Sudden hearing loss and vestibular disorders during and before COVID-19 pandemic: an audiology tertiary referral Centre experience. Am J Otolaryngol 2022;43(1):103241.