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International Registry of Otolaryngologist - Head and Neck Surgeons with COVID-19

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ABSTRACT

BACKGROUND

It has become clear that healthcare workers are at high risk, and otolaryngology has been theorized to be among the highest risk specialties for COVID-19. The purpose of this study is to detail the international impact of COVID-19 among otolaryngologists, and to identify instructional cases.

METHODS

Country representatives of the Young Otolaryngologists - International Federation of Otolaryngologic Societies (YO-IFOS) surveyed otolaryngologists through various channels. Nationwide surveys were distributed in 19 countries. The grey literature and social media channels were searched to identify reported deaths of otolaryngologists from COVID-19.

RESULTS

A total of 361 otolaryngologists were identified to have had COVID-19, and data for 325 surgeons was available for analysis. The age range was 25 to 84, with half under the age of 44. There were 24 deaths in the study period, with 83% over age 55. Source of infection was likely clinical activity in 175 (54%) cases. Prolonged exposure to a colleague was the source for 37 (11%) surgeons.

Six instructional cases were identified where infections occurred during the performance of aerosol-generating operations (tracheostomy, mastoidectomy, epistaxis control, dacryocystorhinostomy and translabyrinthine resection). In three of these cases, multiple operating room attendees were infected, and in two, the surgeon succumbed to complications of COVID-19.

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CONCLUSIONS

The etiology of reported cases within the otolaryngology community appear to stem equally from clinical activity and community spread. Multiple procedures performed by otolaryngologists are aerosol generating procedures (AGPs) and great care should be taken to protect the surgical team before, during, and after these operations.

Introduction

Beginning in December 2019, the Coronavirus disease 2019 (COVID-19) pandemic has spread rapidly to touch almost every country in the world, and continues to expand on a broad curve in particular countries. Pandemic waves have placed overwhelming pressure on healthcare infrastructure, human, and personal protective equipment resources. During these crucial moments, protection of healthcare workers (HCWs) is paramount to preserve capacity, limit community and nosocomial spread, and to minimize morbidity. Given the close proximity to acutely ill patients, it is not surprising that healthcare work likely poses a higher risk of infection. Chou et al performed a rapid review and found that HCWs accounted for a significantly higher proportion of cases early in the outbreak, ranging from 3.8% - 45% of cases[1]. Conversely, Lai et al reported on a cohort of 110 HCWs afflicted by COVID-19 and found that only 0.55% of those working in high risk 'hot zones' were infected versus 1.65% among those working in low risk areas, in spite of similar training and protocols[2]. It has been postulated that a higher prevalence of N95 respirator use in high risk areas, compared to surgical masks in the low risk wards, indirectly supports a pattern of opportunistic airborne transmission[3]. Recent work comparing the seroprevalence of SARS-CoV-2 in HCWs compared to community seroprevalence showed it may actually be lower in HCW compare to community, when HCWs have access to appropriate PPE, and are therefore better protected.[4] There is also some suggestion that a higher initial infectious dose could lead to a more severe course of disease, but this has not been confirmed with SARS-CoV-2[5].

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There has been particular concern theorized that, as a specialty, otolaryngology - head and neck surgery may be at higher risk. Both the close patient proximity during examination and frequent instrumentation in areas of the upper respiratory tract could potentially increase the risk from each patient encounter. Reports from Wuhan and Italy suggested that otolaryngologists were infected at higher rates than colleagues in the same hospitals[5], and the first reported physician mortality in both China and the United Kingdom was an otolaryngologist[7,8]. Indeed, early reports of multi-person peri-operative outbreak events occurring with endonasal skull base surgery in China have generated significant concern that contagious aerosol may be generated in those procedures[9,10]. Coupling this with the fact that anosmia was not initially recognized or screened for as an early presenting symptom of COVID-19, the potential for unexpected exposure for the otolaryngologist is significant[6].

The purpose of this international registry and review was to identify cases of otolaryngologist - head and neck surgeons infected with COVID-19 and to highlight any critical transmission incidents during the work performed by our specialty. Our aim was not to establish prevalence or relative risk. Our aim was to shed more light via real data on the potential risk for our specialty, which procedures may be higher risk, and which PPE may or may not be protective.

Methods

An initial call for participation was sent out to all regional members of the Young Otolaryngologists - International Federation of Otolaryngologic Societies (YO-IFOS) to act as representatives for their respective countries. Contacts were further expanded via the country representatives of IFOS to include the 30 countries with the highest incidence of COVID-19 as of April 20, 2020. Representatives were tasked with survey distribution based on their local requirements, languages, and engagement with their national societies. All otolaryngologists were eligible for participation in the survey and case details were reviewed by the respective country representatives to ensure that there was no duplication of data. Data was collected through either email survey or

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anonymous questionnaire and included age, gender, city, country, sub-specialty, COVID-19 PCR or antibody positivity, date of diagnosis, need for hospitalization or intensive care admission, mortality, likely source of infection (if known), concurrent co-worker infection, details around the incident, and PPE used at the time of exposure. Based on differences in organizational structure in the participating countries, the method of getting this survey to the otolaryngology population differed, but the questions and reporting structure remained the same.

Argentina, Australia, Belgium, Brazil, Canada, Chile, France, India, Italy, Germany, Lebanon, Mexico, Norway, Portugal, South Africa, Turkey, and the United Kingdom have had engagement of their respective national societies for distribution, with representatives actively monitoring for any cases for inclusion. Distribution in the United States was accomplished through four different sub-specialty organizations, as well as through direct contact with chairs and program directors across the country and entered into a REDCap database hosted at the University of Miami. Ethics approval for surveying the US otolaryngology population was received from Stanford University School of Medicine Internal Review Board, with ethical approval or waivers in other countries as indicated. Distribution in Russia was done via email contacts of the local representative. The Spanish representative and the representative from the Netherlands were able to find the details of a number of cases through direct contact with members across the country. Representatives from China and Iran provided case numbers and some additional anecdotal data but were unable to provide comprehensive or detailed demographic data about all reported cases.

The grey literature and social media channels were searched for any references to otolaryngologists succumbing to COVID-19, and an extensive online published list of deceased healthcare workers, as of May 2020, was also scanned for cases of otolaryngologists and confirmed via public record to be cross-referenced with reported cases[9].

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Results

A total of 361 otolaryngologists were reported to have contracted COVID-19 as of May 2020, of which 325 had individual data available for analysis. Iran reported 20 hospitalized cases confirmed with PCR testing, and 20 additional suspected mild cases that were diagnosed on exposure and symptomatology. Data about mortalities in Iran were available and included. Further specific data from Iran for the remaining cases was not forthcoming, and these cases were otherwise excluded from sub-set analysis. The countries with the most registry-recorded cases were Brazil, the United Kingdom, Germany and the United States, with case totals and confirmed diagnoses for all countries in Table 1. Four countries participating with nationwide registries had no cases to report (Argentina, Australia, Lebanon, South Africa). Just over two thirds of those that reported their gender were male (190, 65%) and the age range of cases is shown in Figure 1, with the majority under the age of 44.

The sub-specialties for those afflicted by COVID-19 are outlined in Figure 2; some respondents reported two sub-specialties and both were included for those individuals. After those practicing general otolaryngology (89 cases) or not specifying a specialty (73 cases), the sub-specialties with the highest reported cases were rhinology (36 cases) and otology (28 cases); 34 trainees were also infected. Date of diagnosis was reported for 260 cases. Case distribution followed the pandemic wave as would be expected globally, with 154 cases diagnosed in the last two weeks of March and first two weeks of April. For those where the source of infection was highly suspected, 175 cases believed their exposure was directly related to clinical activity. A known community exposure was the etiology in 43 cases; the remaining one-third of respondents did not have a clear causative exposure. For those with clinical activity exposure, the reported location of patient exposure was clinic in 67 cases, hospital-based care in 19 cases, and operative care in 12 cases. 40 respondents did not specify a location for their clinical exposure. Interestingly, 37 (11%) of the respondents who were exposed during clinical activity had a clear and prolonged exposure to an infected colleague identified as the likely etiology of infection. Of note, nine respondents reported assessing a patient for anosmia within

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the immediate period preceding diagnosis. The reported PPE worn during the incident clinical activity was an N95 mask in 39 cases, a surgical mask in 48 cases and none in 31 cases. Many of the exposures in ambulatory care were without any PPE worn early in the pandemic.

A total of 273 (84%) cases were mild and did not require hospitalization. Of those that required hospitalization, 8 required an ICU stay with subsequent recovery. Sadly, this survey identified a total of 24 deaths - 20 of which were over the age of 55 and 96% were male. Four deaths occurred in Iran, three in both the United States and Italy, two in Spain, Mexico and Indonesia, and one each in Ecuador, China, Kuwait, Cameroon, the United Kingdom, Pakistan, Russia and India. The youngest reported death was a resident in Iran in his 30s, and the oldest surgeon was 82. Of these deaths, SARS-CoV-2 was presumed to have been acquired during clinical activity in 10 cases, in the community in 4 cases, and was unknown in the remainder.

Six examples of instructional cases are noted below.

Incident #1:

A combined otolaryngology/ophthalmology joint list was performed in Mid-March. Powered instruments were used, with a high-speed DCR burr and integrated suction. Standard scrub precautions were used with a thicker surgical mask intended for laser surgery, but an N95 mask was not used as the prevalence of COVID-19 in the community was not fully recognized; this occurred prior to the introduction of both national healthcare and specialty guidelines for PPE use. Both surgeons developed symptoms around 7 days following the OR and followed a similar clinical course. Neither required hospitalization. No other attendees at the case were known to have developed COVID-19 afterwards.

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Emergent/routine case: Routine

Subspecialty affected: Rhinology/Ophthalmology

Known/unknown COVID+ patient: Unknown prior, known post-operatively.

PPE used: Laser surgical mask (Not N95)

Outcomes of those exposed: Two co-surgeons turned positive, both with mild outpatient clinical course

Takeaway lesson: Laser surgical mask does not appear effective at preventing transmission of COVID-19 in this type of procedure.

Incident #2:

A combined neuro-otology case was performed in mid-March with standard precautions prior to an awareness of case prevalence in Europe. The patient had a CPA tumour with progressive cranial neuropathies and deterioration. During subsequent metastatic work-up, the patient had a chest CT scan 7 days after surgery with clear evidence of COVID-19 pneumonitis. The initial swab was negative, but retested positive 11 days after his surgery. Based on the CT findings, the surgical team self-isolated. The neurosurgeon, the neurotologist, and the clinical fellow present during the case developed symptoms 7-10 days after the surgery. No other healthcare workers present at the time of the surgery are known to have developed COVID-19, and those affected had mild symptoms not requiring hospitalization.

Emergent/routine case: Routine

Subspecialty affected: Otology

Known/unknown COVID+ patient: Unknown prior, known post-operatively.

PPE used: Standard surgical mask (Not N95)

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Outcomes of those exposed: Two co-surgeons and one surgical trainee turned positive, all with mild outpatient clinical course

Takeaway lesson: Standard surgical mask does not appear effective at preventing transmission of COVID-19 in this type of procedure.

Incident #3:

An epistaxis patient needed emergent cautery and ligation in the operating room and was taken before the COVID-19 PCR test result was released, due to urgent need to control bleeding. This incident occurred after the risk of COVID-19 transmission within the otolaryngology community was known, and thus the surgeon wore a fit-tested N95 mask. The patient's test result came back positive after the case, and shortly thereafter the surgeon developed symptoms and also tested positive, in spite of having worn an N95 mask. The patient later noted they had been actively symptomatic prior to the emergency epistaxis brought them to the emergency department. The surgeon required hospitalization and ICU admission with ventilation, but eventually recovered.

Emergent/routine case: Emergent

Subspecialty affected: General ENT

Known/unknown COVID+ patient: Unknown prior, known post-operatively.

PPE used: Fit-tested N95 mask

Outcomes of those exposed: Surgeon turned positive, required hospitalization and ventilation but eventually recovered.

Takeaway lesson: N95 mask may not be enough for preventing transmission of COVID-19 in an actively symptomatic positive patient in this type of procedure, and PAPR or CAPR is

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recommended if positive status is known beforehand or there is not enough time to wait for result.

Incident #4:

A mastoidectomy and facial nerve decompression was performed for a patient with chronic serous otitis media after the patient developed a facial nerve palsy during chemotherapy for non-Hodgkins lymphoma. Preoperative testing was performed, and PCR testing for COVID-19 was negative. Given the negative testing, the surgery proceeded with standard precautions. Three days following the operation, the surgeon developed symptoms and was swab positive on PCR. The patient was retested at that time and was subsequently positive. The surgeon had multiple co-morbidities including diabetes and ischemic heart disease with a history of angioplasty. He rapidly deteriorated and required admission to hospital, the ICU and ultimately succumbed to multi-organ failure 16 days after the OR. The patient has recovered uneventfully from both COVID-19 and his facial palsy.

Emergent/routine case: Routine

Subspecialty affected: Otology

Known/unknown COVID+ patient: Unknown prior, known post-operatively

PPE used: Standard surgical mask (Not N95)

Outcomes of those exposed: Surgeon exposed, hospitalized, ventilated, passed away.

Takeaway lesson: Negative pre-operative testing is not enough to guarantee the patient is negative for COVID-19, at least with current population prevalence, and appropriate higher level PPE still should be utilized during potentially high risk AGPs like this one.

Incident #5:

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A patient with tracheal stenosis had been self-isolating at home. One week prior to presentation, they were assessed at a different hospital and potentially were exposed to SARS-CoV-2 during that trip to the hospital. The patient developed significant respiratory symptoms with COVID-19 and presented in acute distress, requiring a tracheostomy for decompensated tracheal stenosis. Three ENT surgeons and five nurses in the operating room subsequently developed COVID-19. Two of the surgeons had a mild course of disease and one required hospitalization, but subsequently recovered. One of the five nurses also required hospitalization. All surgeons were wearing FFP3 respirator masks, glasses, visor, disposable surgical gown, and 2 pairs of gloves.

Emergent/routine case: Emergent

Subspecialty affected: General ENT

Known/unknown COVID+ patient: Unknown prior, known post-operatively.

PPE used: Fit-tested FFP3 (equivalent or better to N95) masks, glasses, visors, double gloves

Outcomes of those exposed: Three surgeons and five nurses turned positive, one surgeon and one nurse required hospitalization, all eventually recovered.

Takeaway lesson: FFP3 mask may not be enough for preventing transmission of COVID-19 in an actively symptomatic positive patient in this type of procedure, and PAPR or CAPR is recommended if positive status is known beforehand or there is not enough time to wait for result.

Incident #6:

A 54 year old male surgeon was working in a public institution. It was well known in the country and community that there was insufficient personal protective equipment at that hospital. Two tracheostomies were performed at the end of March for prolonged intubation from atypical pneumonia that was subsequently established as COVID-19. The surgeon tested positive for COVID-

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19 within a week after performing the tracheostomies, was subsequently intubated and passed away 4 weeks later.

Emergent/routine case: Routine

Subspecialty affected: General ENT

Known/unknown COVID+ patient: Known prior

PPE used: Standard surgical mask (Not N95)

Outcomes of those exposed: Surgeon exposed, hospitalized, ventilated, passed away.

Takeaway lesson: All possible measures should be taken to ensure all HCWs performing high risk AGPs have access to appropriate PPE in order to prevent infection and subsequent potential morbidity and mortality.

Discussion

This international effort of the YO-IFOS group has attempted to capture an early global experience with COVID-19 in otolaryngology - head and neck surgery. For the cases reported, the vast majority have had a relatively mild clinical course, however clinical activity appears to be a real and significant risk for the specialty. To again emphasize, this data set was not collected to establish prevalence within our specialty or relative risk comparing our specialty to others, as an anonymous self-reporting tool is not able to accomplish those aims. But it has given us a larger dataset to establish which types of procedures and level of PPE can be considered as higher risk.

The evident infectiousness of SARS-CoV-2 suggests that significant precautions must be taken when there is active community spread. Given that exposures were thought to have occurred during clinical activities for half of the respondents, with another third unsure of the exact exposure, it is clear that a heightened awareness is needed as long as active cases are present in our population. While clear causative transmission is impossible to establish with the reported critical events, the timeline and

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case details around these specific events are supportive of association. Previous anecdotal reports had suggested there might be an elevated risk of severe disease and hospitalization for our specialty[9,11,12]. Assessment of whether increased viral infective dose correlates with more severe disease is difficult to confirm, but there does not appear to be evidence of such within our reported cases. There continues to be a lack of data regarding this for SARS-CoV-2, but a 2003 study examining the course of illness in SARS did not find any relationship between proximity to an index case and severity of disease[5].

There are several limitations involved in a study with this methodology and design. Given that the data was collected via survey and voluntary reporting, there is a bias towards collecting data from those with mild versus severe symptoms, as those hospitalized at the time of the survey was sent out may not have been physically able to respond. We tried to mitigate this as much as possible by sending out surveys several weeks after the initial pandemic wave. A number of countries had created their own physician registry and participation was either refused or not possible. We were not able to capture data from all countries within the top 30 countries affected by COVID-19, and there are very likely COVID-19 positive individuals within the reporting countries who did not want to self-report for a variety of reasons. However, in a small field like otolaryngology, news of critical transmission events or ICU admissions are often quickly communicated and respective country representatives would likely be aware of these cases. Regardless, the reported numbers are very likely an underestimation of the true burden of COVID-19 on otolaryngologists.

Capturing this data in the midst of the pandemic creates a bit of a moving goal post, and there will undoubtedly be more cases reported moving forward. Fear of repercussions and political consequences unfortunately affected the ability to collect data from some countries and may have resulted in individual surgeons not reporting their own data in others. We had to withdraw data (10 cases, including 6 mortalities) from an unnamed country secondary to fear of reprisal, including incarceration, for the representative. We have reported the data as anonymously as possible, but participant identification is always a concern. Certain specific case data or critical events could

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ultimately be identifying in nature and this may have acted as a deterrent to reporting as well. It is also not possible to know how many otolaryngologists never received the survey via email or public forums, especially in non-academic practices, and thus did not have the opportunity to report.

When caring for acutely ill patients, proper personal protective equipment is paramount. In many of the cases reported, either no personal protective equipment (PPE) or standard equipment was used. In COVID-19 positive patients, a fit-tested N95 mask may not be enough to protect the provider if the procedure is a high risk AGP. Consideration should be given to delaying the case or using a powered air purifying respirator (PAPR) or controlled air purifying respirator (CAPR) for cases that cannot be delayed. It is impossible to say with certainty that the above six critical incident cases were aerosol-related, but all five surgery types are known to be potentially aerosol generating procedures (AGPs). Early in the pandemic Patel et al reported two anterior skull base surgery cases from Wuhan where significant transmission was reported[9]. Although initial refutation of these cases surfaced, deeper investigation led the authors to stand by their statements.[11] Our data collected via this systematic survey appears to confirm the potential for that type of operative or perioperative spread when AGPs are involved. Two cadaveric studies have confirmed significant droplet and aerosol generation with the use of endonasal high-powered instrumentation even with suction in the nasal cavity[13,14]. Mastoidectomy has been shown previously to scatter aerosolized blood and bone dust up to 3.5 feet in all directions[15]. Given the presence of respiratory mucosa in the temporal bone, the amount of drilling required and the lack of a contained compartment as with the nasal cavity, it is not surprising that otologic surgery may carry even greater risk; two of the critical events identified in this survey would support that assumption. Chen et al recently demonstrated that the simple use of a barrier tent around the microscope can significantly reduce the particle dispersion seen with mastoidectomy, creating a simple intervention to help reduce the risk to otologists[16].

As the pandemic continues, and increasing fatigue associated with constant vigilance and the discomfort of many forms of PPE may lead to a decreased attention to safety measures, this registry

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serves as an important reminder to us all to continue protecting ourselves, our patients and our colleagues.

Conclusion

This registry is not designed to establish prevalence within our specialty or relative risk compared to other specialties, but it does confirm a significant incidence of COVID-19 within our field. This information may also be of use to other fields in which AGPs are common. The etiology of cases within the otolaryngology community appears to be equally divided between clinical activity and community spread. Multiple procedures performed by otolaryngologists have been identified as aerosol generating procedures (AGPs), and great care should be taken to screen patients preoperatively, as well as to ensure appropriate personal protective equipment (PPE) is worn by the entire operative team.

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Surgery, Société Française d'ORL et de Chirurgie Cervico-faciale (SFORL), Federacion Mexicana de Otorrinolaringologia (FESORMEX), Sociedad Mexicana de Otorrinolaringologia (SMORLCCC), Royal Belgian Society of Otorhinolaryngology - Head and Neck Surgery, Sociedade Portuguesa de Otorrinolaringologia e Cirurgia da Cabeça e Pescoço (SPORL), the Turkish Otolaryngology Head and Neck Surgery Society, and Sociedad Chilena de Otorrinolaringología - Medicina y Cirugía de Cabeza y Cuello. Also a special thanks should be given to the International Federation of Otolaryngologic Surgeons for supporting the YO-IFOS group.

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Figure 1 - Age Distribution of Otolaryngologists With COVID-19

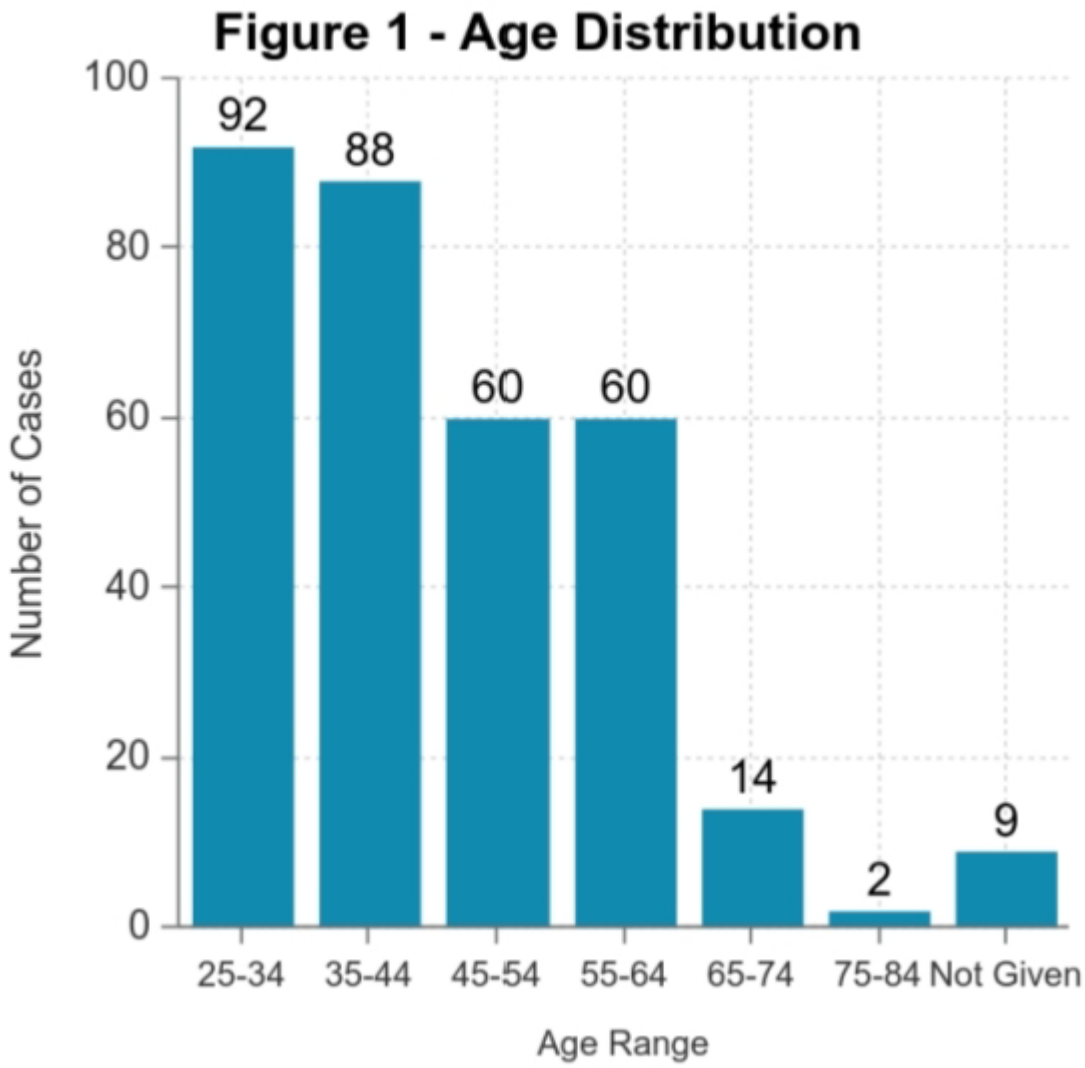

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Figure 2 - Subspecialty Designation of Otolaryngologists With COVID-19

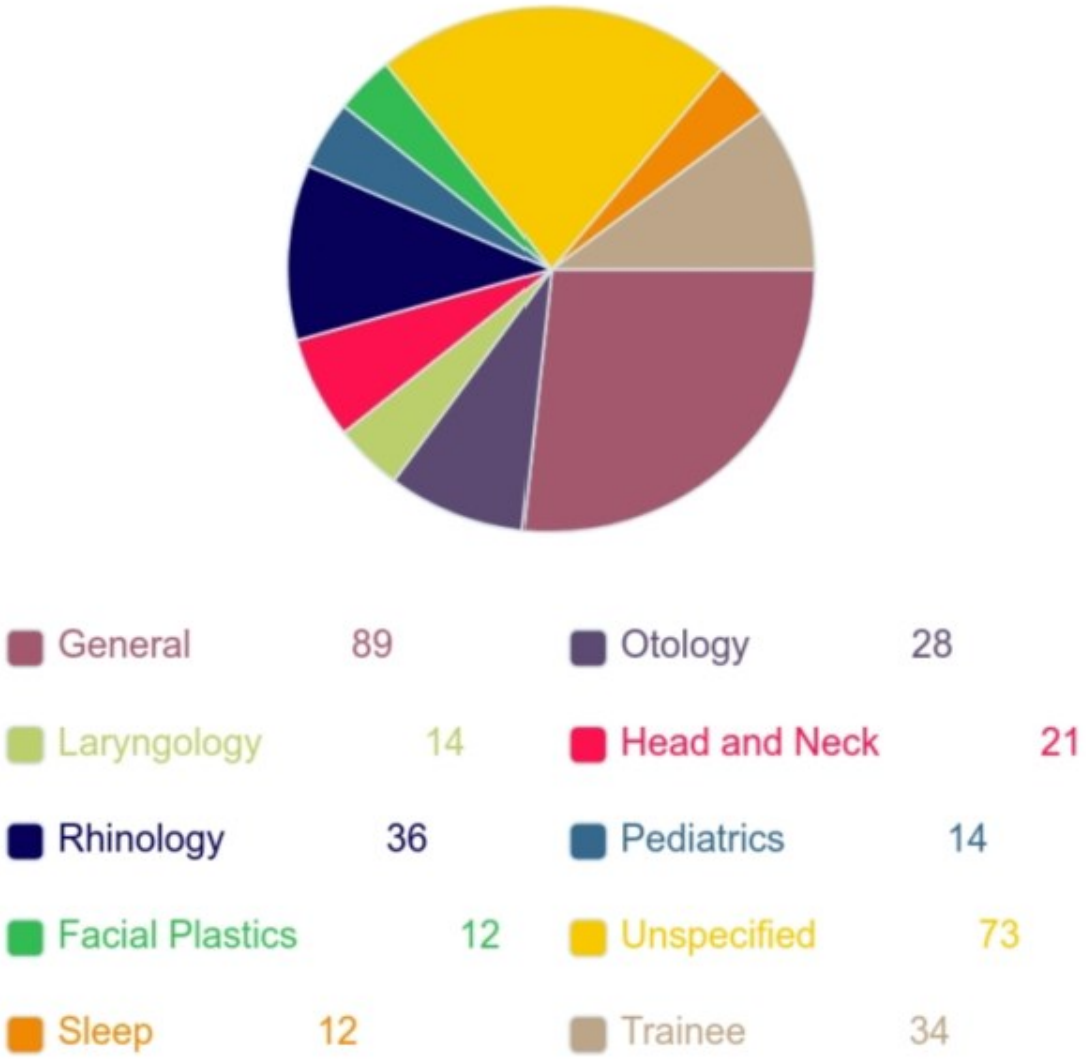

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Table 1 - Country distribution (as of May 2020)				
Country	**Case Total**	**Combined PCR/IG Positive**	**Presumed**	**Test + (%)**
Brazil	66	41	25	62
United Kingdom	53	20	33	38
Iran	40	20	20	50
Germany	35	35	0	100
USA	33	31	2	94
Mexico	19	14	5	74
Italy	17	14	3	82
Chile	16	16	0	100
Turkey	15	13	2	87
Belgium	13	7	6	54
Spain	11	11	0	100
Netherlands	8	8	0	100
Russia	7	5	2	71
Portugal	6	6	0	100
France	5	5	0	100
Norway	4	4	0	100
Canada	3	1	2	33
Indonesia	2	1	1	50
Burkina-Faso	1	0	1	0
Kuwait	1	0	1	0

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Cameroon	1	0	1	0
China	1	0	1	0
Ecuador	1	0	1	0
Pakistan	1	0	1	0
India	1	1	0	100
Bolivia	1	1	0	100
South Africa	0	0	0	0
Australia	0	0	0	0
Argentina	0	0	0	0
Lebanon	0	0	0	0
Totals	**361**	**255**	**106**	

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