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Review Article

Suggestions on the prevention of COVID-19 for health care workers in department of otorhinolaryngology head and neck surgery

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Abstract The epidemic of the Coronavirus Disease 2019 (COVID-19) has presented as a grim and complex situation recently. More than 77,000 cases of COVID-19 has been confirmed in China until February 25th, 2020, which are causing great impact on economy and society, as well as seriously interfering with ordinary medical practice in the department of otorhinolaryngology head and neck surgery. This article discussed medical precautions required in the clinic, inpatient ward and operation room of otorhinolaryngology head and neck department, which aims to protect health care workers from COVID-19.

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Severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) overview

SARS-CoV-2 has been identified as the pathogen causing the outbreak of Coronavirus Disease 2019 (COVID-19) that started in Wuhan, China, since December 2019. SARS-CoV-2, formerly known as the 2019 novel coronavirus (2019-nCoV), is an enveloped, positive-sense, single-stranded RNA virus, with a diameter between 60 and 140 nm. It is considered to be a new type of coronavirus, belonging to the genus of betacoronavirus.¹ A study shows that SARS-CoV-2 has 86.9% homology with bat SARS-like coronavirus

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(bat-SL-CoVZC45, MG772933.1).² The host is generally considered to be a *Rhinolophus sinicus*; whether an intermediate host is required has not been proved.¹ Some studies claimed that pangolin or snake might play the role of intermediate host.^{3,4} However, the main source of infection comes from COVID-19 pneumonia patients currently. According to current knowledge, SARS-CoV-2 is heat-sensitive and can be inactivated at 56 °C for 30 min.¹ Ultraviolet radiation, and lipid solvents (such as ether, 75% ethanol, chlorine disinfectant, peroxyacetic acid and chloroform et al.), can also effectively inactivate the SARS-CoV-2, while chlorhexidine is insufficient to inactivate the virus.¹

SARS-CoV-2 has human-to-human transmission ability and universally contagious to all populations.¹ The main transmission patterns are respiratory droplets transmission and contact transmission.^{5,6} The elders and those with underlying diseases usually show more severe symptoms after SARS-CoV-2 infection. On contrast, the symptoms of infected children and infants are relatively mild.⁶ Loss of cilia in human respiratory epithelial cells can be found 96 h after infected with SARS-CoV-2.² At present, the underlying mechanism of how SARS-CoV-2 infects epithelial cells is not clear. It has been speculated that SARS-CoV-2, which has a close similarity to SARS-CoV, using human angiotensin-converting enzyme 2 as the binding receptor to invade host cells and then replicates in the host cells.

It is reported that the mean incubation period for COVID-19 was 5.2 days (95% confidence interval, 4.1 to 7.0), with the 95th percentile of the distribution at 12.5 days.⁵ Compared to SARS, COVID-19 is more contagious, and has a longer incubation period, both of which make it more difficult to prevent and control.^{5,7}

Management of fever patients in otorhinolaryngology head and neck surgery clinics

With the spread of COVID-19 in general population, over 3300 health care workers have been infected in China. Of the initial 425 COVID-19 patients, 15 were health care workers.⁵ Health care workers in ENT clinic usually have close contact with patients, as well as other medical personnel, leading them susceptible to hospital-related transmission and infection. Therefore, how to reduce the SARS-CoV-2 infection rate in health care workers, including those in the department of otorhinolaryngology head and neck surgery, has become an urgent issue in China.

Fever is a common symptom in the outpatient department of otorhinolaryngology head and neck surgery. Upper respiratory tract infection diseases, such as influenza, acute tonsillitis, acute sinusitis and acute otitis media, usually initiate with a symptom of fever. In addition, patients with nasal or tonsil lymphoma also manifest with repeated or persistent fever. At present, in COVID-19 epidemic areas, these patients with fever are usually assigned to the fever clinic. Once these patients are excluded from COVID-19, they may return to the ENT clinic. However, they may have been potentially infected at the fever clinic, or been contaminated with SARS-CoV-2 on their skin or clothing. Therefore, fever patients, regardless

of whether they have been diagnosed as COVID-19 patients or not, should be treated by adequate protected health care workers.

According to the current definition of graded airborne precautions,⁸ standard precautions are defined as wearing work clothes, disposable surgical masks, and latex gloves when necessary. Grade I precautions include wearing work clothes, waterproof medical cap, surgical masks, gowns and latex gloves. Grade II precautions contain wearing waterproof medical caps, medical protective masks (N95 or N99), protective clothing, work suit, anti-penetration isolation gown, latex gloves, shoe covers, and anti-fog protective goggles or protective face shield when necessary. Grade III precautions mean that besides all Grade II personal protective equipment (PPE) listed above, wearing a comprehensive protective face shield or a powered air-purifying respirators (PAPR) is required.⁹ We recommend that Grade II precautions are needed for fever patients in COVID-19 epidemic areas, and that Grade III precautions should be used for COVID-19 suspected or confirmed cases when necessary.^{9–11}

The medical precautions refer to COVID-19 patients' clinic examinations

Health care workers in otorhinolaryngology head and neck surgery clinics need to provide physical examinations on patients' nasal cavity, pharynx, and larynx. The typical COVID-19 symptoms are fever (83%), cough (82%), runny nose (4%), sore throat (5%),¹² nasal congestion and sneezing,^{6,13} all of which are common symptoms in ENT-related diseases. A familial cluster study of COVID-19 suggests that of six COVID-19 patients, five patients' nasopharyngeal swab samples showed SARS-CoV-2 positive. Of the four throat swab samples, three showed SARS-CoV-2 positive. Meanwhile, One of two serum samples showed SARS-CoV-2 positive.⁶ Patients may feel uncomfortable and induce pharyngeal reflex under ENT physical examination, leading to the production of SARS-CoV-2 viral droplets or aerosols. This scenario also happens when patients are talking, coughing, or sneezing, which can spread the virus as far as 3–8 m.^{10,11} Thus, health care workers, especially those in the otorhinolaryngology head and neck surgery clinic, are extremely susceptible to SARS-CoV-2 infection, who should be defined as high-risk exposure populations.¹⁰ We recommend reducing unnecessary physical examinations in the ENT Clinic in COVID-19 epidemic areas. For COVID-19 patients who in urgent need to be examined, the medical precautions should base on Grade II precautions. For processes that are at high risk of inducing SARS-CoV-2 viral droplets, or aerosols, such as endoscope examination, emergency tracheotomy or hemostasis of epistaxis, Grade III precautions should be warranted for health care workers.^{10,14}

The medical precautions refer to otorhinolaryngology head and neck operation for COVID-19 patients

As to COVID-19 patients who must undergo emergency otorhinolaryngology head and neck surgery, the surgeon needs to notify the anesthesiologist and the operating room nurse before the surgery, as well as making a cooperative

operation plan together.¹⁵ A negative pressure operating room or an isolated operating room is required for operation. Unnecessary instruments, equipment and medical items should be moved out from the operating room.¹⁶ Tracheal intubation should be performed in a standard rapid sequential way. Using adequate muscle relaxants is recommended to avoid coughing, which can reduce the spread of SARS-CoV-2 droplets.¹⁵ Considering the patient's serum may contain SARS-CoV-2,⁶ we recommend the surgical team armed with Grade III precautions during the surgery. The hospital's infection management department should be notified for terminal disinfection immediately after the operation. An isolation ward is required to isolate the patient after the operation. The infected patient can be discharged from hospital or transferred to the relevant department for further treatment when the following requirements are fulfilled: body temperature is back to normal for more than three days; inflammation is obviously absorbed on chest CT scanning; two consecutive SARS-CoV-2 nucleic acid tests are negative (sampling interval at least one day).¹⁵

The medical precautions refer to non-fever patients in the otorhinolaryngology head and neck surgery clinic

More than 80% of COVID-19 patients have fever.^{2,12} Considering the mean incubation period of COVID-19 is reported at 5.2 days,⁵ those asymptomatic carriers who are within the incubation period are contagious, and becomes an important source of infection.¹

Health care workers in the department of otorhinolaryngology head and neck surgery are a group of people who are working close to patients' nose and throat. Therefore, as to non-fever patients, we recommend that health care workers should wear medical protective masks, goggles/protective face shield, and disposable anti-permeation isolation gowns in COVID-19 epidemic areas. If the patient is at high risk of splashing, Grade III precautions should be warranted to relevant health care workers.

The exclusion process and medical precautions refer to non-fever patients

Epidemic history is crucial for the diagnosis of COVID-19. Be conscious of the following histories: (1) travel history or residence history in Wuhan and the surrounding areas, or other community transmission areas within 14 days before the onset of illness; (2) exposure history to COVID-19 patient within 14 days before the onset of illness; (3) exposure history to a patient with fever or respiratory symptoms from Wuhan and the surrounding areas within 14 days before onset of illness; (4) exposure history to patients with clustered onset of COVID-19.¹ According to the national diagnosis and treatment guidelines of COVID-19 pneumonia (trial version 6), the patient who fulfills the above epidemic history, accompanied with typical blood routine (normal or reduced white blood cell count, reduced lymphocyte count in the early stage of onset) and chest CT (small patchy shadows or interstitial changes, especially in the extrapulmonary zone in early stage, then turns to multiple

ground-glass appearance or infiltrations in bilateral lungs; severe cases may turn to pulmonary consolidation; pleural effusion is rare), can be regarded as a suspected case.¹

It is worth noting that some patients in severe or critical illness may manifest low or moderate degree of fever, or even with negligible fever. Some patients only show mild fever, mild fatigue, without pneumonia symptoms.¹ Therefore, a normal temperature does not exclude SARS-CoV-2 infection. Regular blood routine and chest CT helps us to identify potential COVID-19 patients. However, a former study showed that typical pathological changes can only be seen 96 h after SARS-CoV-2 infection.² Another study claimed that COVID-19 has an incubation period of 4.1–7.0 days.⁵ Therefore, within 96 h after SARS-CoV-2 infection, the patient is likely to have no typical chest CT manifestations but is still contagious. Cases report in a familial cluster of SARS-CoV-2 infection showed that a 10-year-old child, who has no clinical symptoms of fever, cough or diarrhea, with normal blood routine, showed typical changes in chest CT,⁶ suggesting that normal blood routine cannot rule out COVID-19 either.

Therefore, given that we cannot completely exclude COVID-19 patients before surgery, and a potentially high risk of cross-infection between health care workers, as well as a significant medical financial burden caused by using Grade III precautions for all operation staffs, we recommend selective surgery of otorhinolaryngology head and neck surgery should be postponed in COVID-19 epidemic areas. As to emergency surgery, health care workers should be warranted based on Grade III precautions.

Summary

The situation of fighting against COVID-19 spreading in China is grim recently. All medical professionals in the department of otorhinolaryngology head and neck surgery need to strike a balance between carrying out routine medical activities and avoiding potential doctor-patient COVID-19 infection. The overall suggestions of this article are: (1) given that health care workers in the department of otorhinolaryngology head and neck surgery are at high-risk exposure, routine clinic and ward work for non-emergency patients should be minimized in COVID-19 outbreak areas; (2) clinic health care workers need to be protected by Grade II or Grade III precautions in COVID-19 outbreak areas, while Grade III precautions are recommended for surgical staffs; (3) we need to bear in mind that there is currently no effective screening method for asymptomatic carriers. Considering the experiences of fighting against COVID-19 updating rapidly, we hope that these suggestions mentioned in this article will be further updated and improved soon.

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Declaration of Competing Interest

The author declare no conflict of interest relevant to this paper.

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