

## At the center of the COVID-19 pandemic: Lessons learned for otolaryngology-head and neck surgery in China

The outbreak of Coronavirus Disease 2019 (COVID-19), first reported in Wuhan, China in December 2019, has become a pandemic. Severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), a newly identified member of *Coronaviridae*, has been identified as the cause of this highly contagious disease<sup>1</sup>. As of April 3, 2020, over 1.1 million COVID-19 cases have been confirmed worldwide; with over 55,000 deaths. After strict prevention and control measures, such as lockdown and quarantine, the number of newly diagnosed COVID-19 cases has dropped dramatically in China. Through April 3, 2020, the total number of COVID-19 cases confirmed in China stood at approximately 82,509; of which over 90% have recovered. In Wuhan, the epicenter of COVID-19 infection in China, 45,700 out of 50,000 COVID-19 diagnosed patients have recovered to date. In contrast to Wuhan, the overall epidemic situation in other major cities in China does not appear to be as serious. For example, as of April 3, 2020, 584 people have been diagnosed as COVID-19-positive in Beijing, the capital of China.

An increasing number of health care workers (HCWs) have been infected by the SARS-CoV-2 pandemic. Data from China show more than 3,300 HCWs have been infected as of early March 2020, including at least 22 deaths, while reports from Italy demonstrate more than 5,000 HCWs to have been infected<sup>2</sup>. HCWs in Otorhinolaryngology - Head and Neck Surgery, in particular, often have close contact with patients' nasal and oral secretions and are theoretically more vulnerable to SARS-CoV-2 related nosocomial infection. Thus, implementing effective strategies to prevent the SARS-CoV-2 infection in HCWs within Otorhinolaryngology-Head and Neck Surgery is of great importance for the medical community.

Routine medical practice has been severely disrupted in Wuhan, China. Many inpatient wards – even entire hospitals in some cases – have been reconstructed to treat patients with COVID-19. For example, Tongji Hospital in Wuhan, a 5,600 bed inpatient hospital and one of the largest in Wuhan, has reallocated more than 2,000 beds for the treatment of COVID-19 positive patients. All elective surgeries have been cancelled and only urgent surgeries, such as those for airway foreign body, uncontrolled epistaxis,

and emergency tracheostomy, have been performed. Prior to emergency surgery, it has generally been impossible to implement SARS-CoV-2 screening; including throat or nasopharyngeal swab for SARS-CoV-2 RNA testing, serum SARS-CoV-2 specific antibody testing, and chest CT scanning. Therefore, HCWs must assume all untested patients have COVID-19 and must use appropriate precautions.

Aside from the basic precautions that include wearing work clothes and disposable surgical masks, the Chinese have defined three grades of airborne precautions<sup>3</sup>. Grade I precautions include wearing work clothes, a waterproof medical cap, surgical mask, gown, and latex gloves. Grade II precautions include wearing a waterproof medical cap, N95 mask, anti-penetration isolation gown, latex gloves, shoe covers and wearing anti-fog protective goggles or a protective face shield if there is a risk of viral droplet production. Grade III precautions include all Grade II personal protective equipment (PPE) as well as powered air-purifying respirators (PAPR)<sup>4</sup>.

Wearing protective gear is often very mentally and physically challenging for HCWs. After hours of wearing Grade II or Grade III PPE, the outer garments of HCWs may become saturated with perspiration. When saturated, the microclimate ventilation may decrease and air permeability may be compromised. Vision often becomes blurred, due to perspiration evaporation and condensation on the surface of the goggles. In addition, the added pressure of work and increased risk of being infected can affect the mental health of the HCWs. Indeed, a survey of 5,062 HCWs in all clinical departments showed that 29.8%, 13.5% and 24.1% reported stress, depression, and anxiety symptoms, respectively<sup>5</sup>. These data suggest that adequate mental health interventions are necessary for medical professionals over the course of the COVID-19 pandemic.

COVID-19 infection symptoms include fever (83%), cough (82%), runny nose (4%), sore throat (5%)<sup>6</sup> along with nasal congestion and sneezing<sup>7,8</sup> – all common symptoms in ENT-related diseases. Another potential symptom recently recognized is olfactory and taste disturbance. A cross-sectional study of COVID-19 patients surveyed in a hospital in Milan, Italy, has recently shown that 33.9% of the patients reported at least one taste or olfactory disorder<sup>9</sup>. In contrast, the incidence of hyposmia was found to be lower in a report from Wuhan (11/214, 5.1%)<sup>10</sup>.

The protection of HCWs is not just about PPE; it encompasses all principles of infection prevention and control. For aerosol-generating medical procedures in the COVID-19 positive patient, such as tracheal intubation, non-invasive ventilation, and tracheostomy, the otolaryngologist not

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only needs PAPR<sup>11</sup>, but also needs effective multidisciplinary collaborations with other specialists<sup>12</sup>. The surgeon needs to communicate with the surgical team before the surgery<sup>13</sup>, and a negative pressure operating room is preferred for the operation<sup>12</sup>. A thorough preoxygenation with 100% oxygen and rapid sequence induction should be considered to avoid manual ventilation of the patient, which can result in aerosolization of virus from the airways<sup>12</sup>. We recommend using propofol and rocuronium bromide prior to tracheal intubation to avoid coughing and droplet production<sup>13</sup>. Tracheal intubation should be performed by a senior anaesthesiologist<sup>11,12,14</sup>. During urgent endoscopic sinonasal and skull base surgery in the COVID-19 positive patient, due to frequent suction, irrigation, and drilling which potentially aerosolize infectious vapor, we recommend that medical personnel in the operation room wear PAPR. The staff in the Department of Nosocomial Infection Management should take charge of disinfection immediately after the surgery.

The timing of tracheostomy in the critically ill COVID-19 positive patient is a controversial issue. In clinical practice, there is no clear guideline regarding when to perform the tracheostomy; however, a meta-analysis has shown no significant difference in mortality outcome between early tracheostomy (< 48hours) and late (> 15days)<sup>15</sup>. Our experience suggests that tracheostomy for prolonged intubation and airway protection of COVID-19 positive patients should be considered as a last resort. With regard to which surgical tracheostomy approach should be selected for COVID-19 positive patients, our preliminary experience indicates that open tracheostomy (OT) might be superior to percutaneous tracheostomy (PT) due to its presumed lower risk of producing viral droplets or aerosols. In an OT, the ventilator is connected to the endotracheal intubation (ET) tube until the trachea is prepared for tracheotomy. Based on our previous experience in treating patients with SARS, we disconnect the ET tube from the ventilator and withdraw the endotracheal tube to just above the tracheotomy site before inserting the tracheostomy tube. This is followed by inflating the balloon and connecting the tracheostomy tube to the ventilator<sup>16</sup> with the apnea lasting for approximately one minute. In comparison, PT requires opening the airway, and manually ventilating the patient for as long as it takes for the correct placement of the cannula, which may take several minutes, potentially increasing exposure.

In Beijing, which is outside the center of the pandemic, three designated hospitals have been opened for the treatment of patients with COVID-19. Tasks of the other non-designated (COVID-19 negative) comprehensive medical centers, such as Beijing Tongren Hospital, include screening potential COVID-19 cases and sustaining routine medical service in patients shown to be COVID-19 negative. A “fever clinic” has been set up to identify patients with COVID-19 and to separate them from COVID-19 negative patients with fever and/or respiratory symptoms similar to those found in COVID-19. The entrances and exits in the

hospitals have been rearranged to guarantee strict temperature screening before people can enter the hospital, and only patients with a normal temperature are allowed to enter the emergency and outpatient departments. Patients with a body temperature higher than 37.3°C are guided to the fever clinic to have additional screening examinations, including throat swab for SARS-CoV-2 RNA testing and chest CT scanning. When a patient’s viral nucleic acid test result is found to be positive, the patient is transferred to one of the COVID-19 designated hospitals for treatment. These methods of hospital designation and screening have allowed for routine medical care to continue for the population.

During the COVID-19 outbreak, the emergency services have been running normally in Beijing Tongren Hospital with regard to otolaryngology-head and neck surgery care; however, the emergency room visits from January 23 to March 28, 2020 have been only two-thirds that of the corresponding period in 2019. During this period in 2019, patients were evaluated in the emergency department mainly for acute rhinitis, epistaxis, acute otitis media, otitis externa, and nasal trauma. By contrast, emergency room visits in 2020 were mainly for epistaxis, pharyngeal foreign body, acute otitis media, esophageal foreign body and nasal trauma. Review of the hospital’s appointment register system, which covers the entire outpatient service, indicated that outpatient visits during the COVID-19 epidemic were reduced to 20% of the corresponding period in the prior year likely because of the social distancing strategy in force during this period. Although the overall workload was reduced during the epidemic, the physical and mental stress suffered by the otolaryngology-head and neck surgery staff was still considerable, in our opinion.

In a medical center not designated to care for COVID-19 patients, such as Beijing Tongren Hospital, patients are required to pass strict screening procedures before admission for care. The screening of patients includes epidemiological history, routine blood tests and chest CT. The epidemiological history has been an important part of screening, and a record of the patient’s movement within two weeks can be obtained by scanning a smartphone at the entrance of the hospital. Patients who have remained in Beijing for over 14 days are permitted to enter, and patients are scheduled for surgical procedures only when the test for COVID-19 is negative. During hospitalization, the patient is admitted in a single room to ensure good ventilation, reduce close contact with others, and eat alone, and all patients are instructed to wash hands frequently.

Knowledge of prevention and control of common ENT diseases can be provided to the general public via the public media platform. At present, as Beijing enters the spring pollen season, patients with pollen-induced allergic rhinitis will have symptoms such as nasal congestion, runny nose, sneezing and cough, and in combination with asthma, may also have difficulty in breathing and decline in lung function. As some COVID-19 patients have similar symptoms<sup>6,7</sup>, Beijing Tongren Hospital is cooperating

with the China Meteorological Administration and Beijing Meteorological Bureau to establish a pollen monitoring network carrying out pollen prediction, popularizing the service through internet (<http://www.weather.com.cn>) and mobile App technology (WeChat), and providing medical services such as online consultation and medicine delivery service.

Fortunately, following great effort and sacrifice, the outbreak of COVID-19 is now well under control in China. Generally speaking, this demonstrates that COVID-19 is a controllable infectious disease. However, based on the Chinese experience, there needs to be tremendous cooperation between hospitals under the coordination of the Centers for Disease Control, as well as cooperation between medical specialties. The outbreak of COVID-19 cannot be limited

by national boundaries and few, if any, countries are likely to be spared. Strengthening international cooperation is the only way to defeat this terrible pandemic.

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