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Research Paper

Diagnosis and treatment of emergency surgeries in otorhinolaryngology, head and neck surgery during the covid-19 outbreak: A single center experience

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Abstract The 2019 Novel Coronavirus (2019-nCoV, SARS-CoV-2) infection has already been assigned as a Class B infectious disease requiring Class A management strategy according to "the Law on the Prevention and Control of Infectious Diseases of the People's Republic of China" and become a global pandemic. The incidence of emergencies in otorhinolaryngology, head and neck surgery such as foreign bodies in the esophagus and the respiratory tract, epistaxis, laryngeal obstruction with dyspnea, and head and neck trauma are relatively high. Emergency surgeries are required as some of these diseases progress rapidly and probably be life-threatening. In this article, we drafted the recommendations for diagnosis and treatment of emergency surgeries in otorhinolaryngology, head and neck surgery in the epidemic area of novel coronavirus pneumonia based on "Novel Coronavirus Pneumonia Diagnosis and Treatment Plan (Provisional; 7th Edition Revisions)"and WHO guidelines, combined with the experience of emergency surgeries in the Department of Otorhinolaryngology, Wuhan Union Hospital, Tongji Medical College, Huazhong University of Science and Technology, which is at the center outbreak area of the SARS-CoV-2 pneumonia (COVID-19) in China, to improve the success rate of treatment for otorhinolaryngology, head and neck surgery emergency surgeries and to reduce the SARS-CoV-2 infection rate in the perioperative period.

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The 2019 Novel Coronavirus (2019-nCoV, SARS-CoV-2) infection has already been assigned as a Class B infectious disease requiring Class A management strategy according to "the Law on the Prevention and Control of Infectious Diseases of the People's Republic of China" and become a global pandemic.[1,2] At present, the transmission mechanism of the SARS-CoV-2 has not been fully understood, and respiratory droplets and contact transmission are the major transmission paths.[3] It has also been reported that viruses could be detected in the patients' feces.[4] Transmission paths such as aerosol and digestive duct transmission are under investigation. The population is generally susceptible. The prognosis of the elderly and those with chronic diseases is poor while infants and children could also be infected, but with relatively mild symptoms. According to current epidemiological investigation, the incubation period of the SARS-CoV-2 is between 1 and 14 days, and is usually between 3 and 7 days. The primary manifestations are fever, lack of energy and dry cough, a small number of patients have accompanying symptoms such as nasal congestion, nasal discharge, diarrhea, etc. Most of the severe patients developed to dyspnea and/or hypoxemia after 1 week of onset, and some of the severe cases progressed rapidly to acute respiratory distress syndrome (ARDS), septic shock, difficult to correct metabolic acidosis and coagulopathy.[1] The upper airway of the nasopharynx is in communication with the outside world, which is the main path of respiratory tract transmission.[5] The incubation period of SARS-CoV-2 is relatively long, and some patients at the early infected stage often go to the outpatient of otorhinolaryngology, head and neck surgery for the treatment. The management of infection control and diagnosis and treatment in outpatient and emergency department could refer to "To the National Otorhinolaryngology Head and Neck Surgery Medical Personnel - Several Protective Suggestions in the outbreak of SARS-CoV-2 pneumonia" issued by Chinese Medical Association of Otorhinolaryngology, Head and Neck Surgery and " Occupational infection prevention and Control Recommendations of SARS-CoV-2 pneumonia for Otorhinolaryngology Head and Neck Surgery Medical Personnel" issued by Chinese Medical Doctor Association of Otorhinolaryngology, Head and Neck Surgery.[6]

During the prevention and control of the SARS-CoV-2, emergency surgeries in otorhinolaryngology, head and neck surgery are still required in some suspected or confirmed infected patients, such as patients suffer from foreign bodies in the esophagus and the respiratory tract, epistaxis, laryngeal obstruction with dyspnea, and head and neck trauma. As the center breakout area of COVID-19 in China,[7–10] our department has treated a group of SARS-CoV-2 infected patients with the diseases of otorhinolaryngology, head and neck surgery that require emergency surgery. We summarized and drafted the recommendations for diagnosis and treatment of emergency surgeries in otorhinolaryngology, head and neck surgery in the epidemic area of COVID-19 based on Novel Coronavirus Pneumonia Diagnosis and Treatment Plan and combined with the experience of emergency surgery in our department.

In areas where SARS-CoV-2 is spreading, it is recommended that only otorhinolaryngology, head and neck surgery emergency medical care is open and should strictly follow the prevention and control recommendations issued by Chinese Medical Association of Otorhinolaryngology, Head and Neck Surgery and Chinese Medical Doctor Association of Otorhinolaryngology, Head and Neck Surgery. The hospitals on which able to perform surgeries for patients with SARS-CoV-2 can only perform the operation after the protection of medical personnel and patients, equipment and cloth disinfection, the surroundings and the postoperative disinfection of the operating room are qualified.

Patient admissions

For patients who need surgeries because of foreign body in the esophagus and other emergency that are not quickly endanger life, the otorhinolaryngology, head and neck surgery doctors should diagnose carefully and start inpatient expert consultation promptly. All the patients who need to be done emergency surgery in otorhinolaryngology, head and neck surgery should be diagnosed according to "Novel Coronavirus Pneumonia Diagnosis and Treatment Plan (Provisional; 7th Edition Revisions)". The patients are classified into 3 groups: confirmed cases, suspected cases including patients with fever but cannot be ruled out of SARS-CoV-2 infection explicitly and patients with close contact with confirmed cases and other patients who don't have epidemiological history and obvious clinical manifestations of COVID-19 (including excluded patients).

For patients who suffer from quickly life-threatening emergency such as laryngeal obstruction with dyspnea (level 3 or higher), massive persistent epistaxis with hemorrhagic shock, severe head and neck trauma and foreign body in respiratory tract of children (although there are fewer cases of children infected with SARS-CoV-2 are reported at present, attention should be paid to the detection of recessive infection cases),[11] the emergency channel needs to be opened after being diagnosed by emergency doctors of otorhinolaryngology, head and neck surgery, and all cases need to be treated as confirmed cases (Fig. 1).

If patients are diagnosed as confirmed or suspected cases, they should be isolated in situ in principle. Consultation by expert of otorhinolaryngology, head and neck surgery should be organized by the hospital to develop a treatment plan. The treatment process and protective measures shall be implemented in accordance with the prevention and control process formulated by the hospital. If the patients need to be transferred to other hospital for treatment, special vehicles should be used, and personal

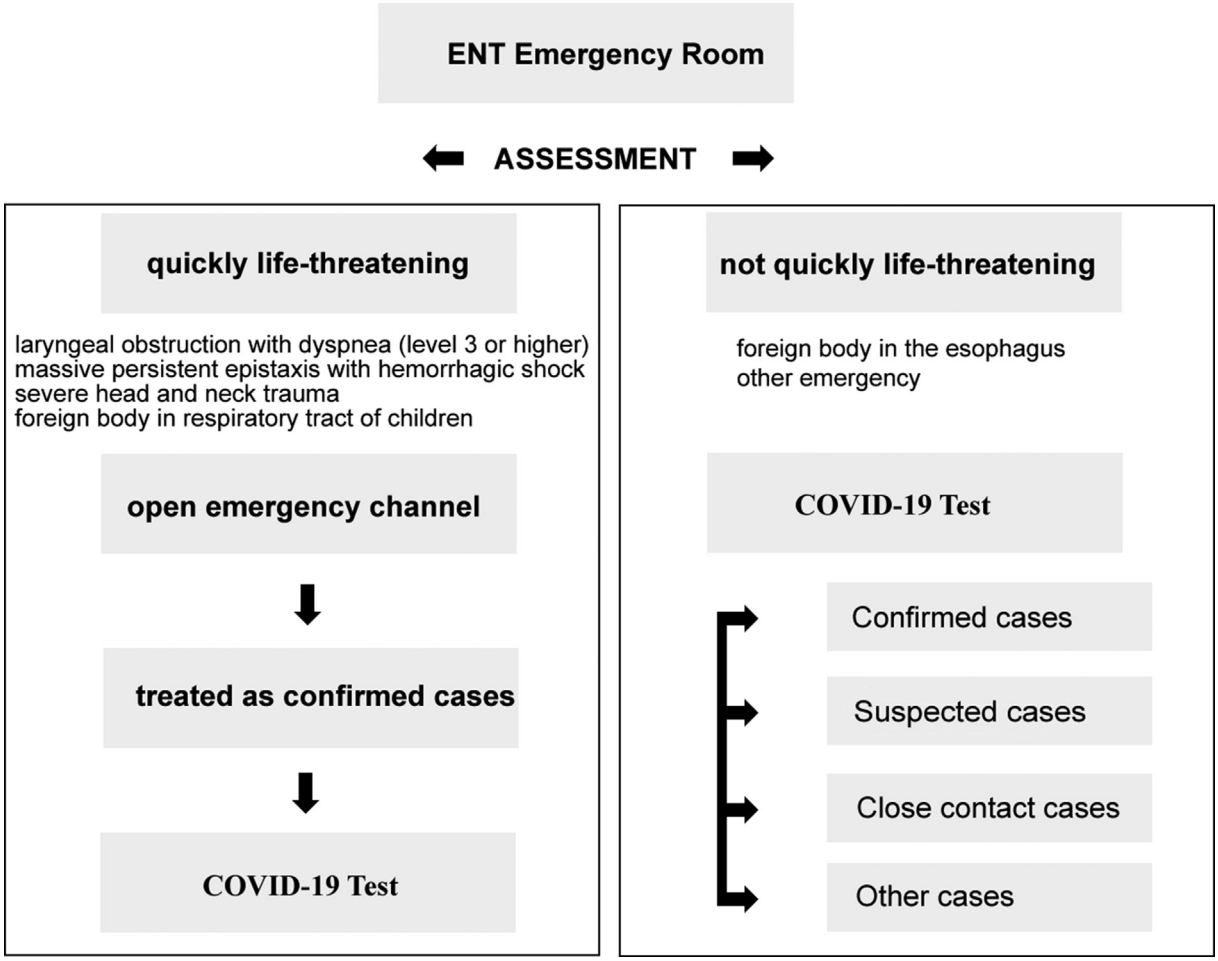

Fig. 1 Diagnosis and treatment process in ENT department.

protection and disinfection of the vehicles should be done critically.[12] The patients should be treated as suspected cases if the patients with fever couldn't be ruled out of COVID-19 or patients have a close contact with confirmed cases. If patients with no clear epidemiological history and no obvious clinical manifestations of COVID-19 are ruled out, they should be admitted to hospital according to the admission process of otorhinolaryngology, head and neck surgery emergency. As asymptomatic infected patients can also be source of infection,[1] it is recommended to list lung CT as a routine preoperative examination if possible. For patients without a clear epidemiological history and no obvious clinical manifestations of COVID-19, the medical personnel should wear second-level protective equipment during routine emergency treatment procedures.

Anxiety and fear are often occurred in confirmed or suspected cases. Psychological counseling should be strengthened especially in patients with both COVID-19 and emergency of otorhinolaryngology, head and neck surgery.

Preoperative care

For patients who need surgery because of foreign body in the esophagus and other emergency that are not quickly endanger life, isolation measures should be taken immediately after admission to the hospital if the patient are confirmed or suspected of SARS-CoV-2 infection. Isolation wards should have isolation signs and restricted access. Suspected patients should be treated in a single isolation room, and multiple confirmed patients can be treated at the same wards. Patients should rest in bed, wear masks, and restrict activities. Other treatments should follow the routine procedures of ENT emergency.

Medical personnel should implement the standard prevention procedure strictly. When entering or leaving an isolation ward, the medical personnel should follow the requirements of the "Technical Specification for Hospital Isolation" and the "Procedures for Wearing and Removing Protective Equipment for Medical Personnel" to put on and take off the protective equipment correctly. Medical personnel should strictly follow the requirements of the "Hand Hygiene Regulations of Medical Personnel " and perform hand hygiene in a timely and correct manner before and after contact with patients. The medical devices (including stethoscopes, thermometers, sphygmomanometers, frontoscopes, indirect laryngoscopes, nursing articles etc.) that are used for the diagnosis and treatment of suspected or confirmed patients should only be used by special persons. Isolation wards should perform air purification in accordance with the "Hospital Air Purification Management Regulations".[13]

After the patient is admitted to the hospital, the necessary examinations should be done timely and by the bed if possible. If the patients have to leave the isolation ward or area to do examinations such as CT, protective measures should be taken, and the patients should be accompanied by doctors and go to the examination room via special channels or elevators. Suspected patients should do etiology detection as soon as possible according to national regulations. If the patients are ruled out of COVID-19, they should be treated according to the routine emergency procedures of otorhinolaryngology, head and neck surgery.

Confirmed patients should be given effective oxygen therapy measures (according to oxygen saturation of the patients) and anti-viral treatment in time according to "Novel Coronavirus Pneumonia Diagnosis and Treatment Plan (Provisional; 7th Edition Revisions)"besides conventional treatment of otorhinolaryngology, head and neck surgery.

For patients who suffer from quickly life-threatening emergency such as laryngeal obstruction with dyspnea (level 3 or higher), massive persistent epistaxis with hemorrhagic shock, severe head and neck trauma and foreign bodies in children's respiratory, the emergency channel needs to be opened and all cases need to be treated as confirmed cases.

Intraoperative management

Emergency surgery plan of otorhinolaryngology, head and neck surgery for confirmed or suspected cases should be decided together by departments of ENT, anesthesiology, operation room, respiratory, infectious disease, medical, nursing, etc.

The operations should be done in special operation rooms which should be equipped with infrared thermometer to measure the body temperature of all medical personnel in the operation room. Surgery patients should be transported via special elevators. Standard protective measure is required for all staff involved in the operation. The equipment and instrument that are used for the patients should be disinfected according to national regulations in time.

The quick-drying hand disinfectants are recommended for hand disinfection of surgical personnel and other hand disinfectants can be used if allergic to it. Chlorhexidine (chlorhexidine) is not recommended as it cannot effectively kill SARS-CoV-2. Hand disinfectants containing chlorine, ethanol, hydrogen peroxide is recommended.[1] Minimize the number of people involved in surgery, and strictly perform personal disinfection according to national requirements before surgery. Surgery personnel must strictly wear goggles, medical N95 masks, waterproof boot covers, sterile surgical gowns, disposable protective clothing and powered air purifying respirators to protect themselves.

More attention should be paid to avoid sharps injury to the patient and blood and body fluid pollution during the operation. Local anesthesia emergency tracheotomy should be performed for patients with third-level or higher dyspnea caused by laryngeal obstruction that conservative treatment is ineffective. Lidocaine is recommended to be injected to avoid airway irritation caused cough and dissemination of airway secretions if possible when opening the tracheal ring. According to current cases analysis, retention of lower respiratory tract secretions of COVID-19 is not serious.[14] The mortality of critically ill patients with COVID-19 is very high and the survival time of the non-survivors is within 1—2 weeks after ICU admission.[15] These indicate that tracheotomy does not increase the benefits of invasive mechanical ventilation. Therefore, neither we nor the respiratory physicians recommend tracheotomy (including percutaneous gas resection) for severe COVID-19 patients at the first 3 weeks.[16] If tracheotomy is necessary, tracheal endocrine secretion should also be prevented when performing bedside surgery in an isolation ward. The ventilator should be suspended before opening the tracheal ring and ventilating airbag and the wound should be completely hemostatic. When dealing with massive epistaxis, care should be taken to avoid blood spraying and nasal packing made from absorbable materials are recommended to reduce or avoid postoperative dressing changes. Pay special attention to eye protection when handling foreign bodies in children's respiratory tract. For otitis media complications that are ineffective by conservative treatment and need to perform emergency mastoid opening, attention should be paid to avoid bone debris splashing.

The delivery of materials into or out of the special operation rooms should be done by special personnel. Indoor personnel cannot leave the operating room during the operation, and outdoor personnel can only enter the operation room after wearing protective equipment at the door. Prepare enough surgical supplies and consumables in the operating room to minimize the number of doors opening for stuff transfers.

Medical personnel's protective equipment should only be used in the isolation area and it is forbidden to leave the isolation area with isolation clothing. After the operation, remove the protective equipment in accordance with standard removal procedures and leave the isolation area. All medical waste is hermetically sealed in double-layer medical waste bags and disposed of as infectious medical waste. The special operation rooms should be disinfected in accordance with the disinfection specifications of the isolation ward, and do not perform consecutive operation in general. The surgeon should fill in the "Infectious Disease Report Form" in time.

Postoperative management

Patients should be transferred to isolation room through a special channel after surgery and are cared according to whether they are confirmed cases, suspected cases, or cases with no clear exposure history and no obvious clinical manifestations of COVID-19.

After emergency tracheotomy, postoperative care for tracheotomy should be strengthened to prevent secretion spreading caused by coughing. The ventilation management of the postoperative area should be done well. Protective measures for droplet isolation, contact isolation and air isolation should be taken. Confirmed or suspected patients could inhale α-interferon through tracheal cannula (adult 5000 000 U or equivalent dose in 2 ml of sterilized water for injection, twice daily).[1,17] Patients undergoing

nasal tamponade should be paid special attention to oxygen saturation monitoring.

The protective equipment for medical personnel shall meet the national standards. Medical surgical masks, medical protective masks, goggles, gowns and other protective supplies should be replaced once they are contaminated by patient's blood, body fluids, secretions, etc. Protective equipment should be used properly and hands should be washed before wearing gloves and be washed by flowing water after removing gloves or gowns. Sharp injury prevention measures should be implemented strictly. Each patient's medical instruments and appliances should be cleaned and disinfected in accordance with the requirements of the Medical Institution Disinfection Technical Specifications.

Confirmed cases should be transferred to the isolation ward for treatment according to the prevention and control requirements after the life-threatening otorhinolaryngology, head and neck surgery emergency is resolved by the surgery. Suspected patients, patients with fever who cannot be ruled out of COVID-19, and patients with close contacts with confirmed patients should wear masks in a single isolation ward. Suspected patients should start the etiology testing process as soon as possible in accordance with national regulations. The patients who are ruled out of COVID-19 can be treated following the routine procedures of ENT emergency.

"Medical observation" of perioperative medical personnel: Medical personnel who involved in perioperative of confirmed cases should be medical observed for 14 days. We also make some α-interferon nasal spray to avoid SARS-CoV-2 infection because it was reported nasal mucosa has higher SARS-CoV-2 concentration.[5]

Summary

In areas where SARS-CoV-2 is spreading, it is recommended that only otorhinolaryngology, head and neck surgery emergency medical care is open and should strictly follow the prevention and control recommendations issued by Chinese Medical Association of Otorhinolaryngology, Head and Neck Surgery and Chinese Medical Doctor Association of Otorhinolaryngology, Head and Neck Surgery. The hospitals that are able to perform surgery for patients with SARS-CoV-2 should open emergency channel for patients who suffer from quickly life-threatening emergency such as laryngeal obstruction with dyspnea (level 3 or higher), massive persistent epistaxis with hemorrhagic shock, severe head and neck trauma and children foreign respiratory tract and all cases need to be treated as confirmed cases. Patients who need surgery because of foreign body in the esophagus and other emergency that are not quickly endanger life, should strictly follow the procedures and strengthen infection control in all aspects including patient admission, preoperative care, intraoperative management, and postoperative management. Tracheotomy is not recommended as it does not increase the benefits of invasive mechanical ventilation at the first 3 weeks. Recommendations for otorhinolaryngology, head and neck surgery emergency surgery is to improve the success rate of treatment for otorhinolaryngology, head and neck surgery emergency surgeries and to reduce the novel coronavirus infection rate in the perioperative period. With the deepening of the understanding of SARS-CoV-2 and the continuous improvement of the diagnosis and treatment plan, recommendations for diagnosis and treatment of emergency surgery in otorhinolaryngology, head and neck surgery in novel coronavirus pneumonia situation will be further updated and improved.

Declaration of Competing Interest

We declare that we have no competing financial interests.

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