

COVID-19: An otolaryngological perspective

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Abstract

Otolaryngologists around the world are amongst the front-line fighters against the pandemic coronavirus disease (COVID-19). As knowledge about the disease epidemiology and clinical profile is rapidly evolving, we are still not sure about many different aspects of the disease transmission and presentation. Otolaryngologists regularly deal with the upper aerodigestive tract, which is the portal of transmission and site of multiplication of the virus. There is a substantial risk of getting infected and transmitting the disease further. We discuss the various recommendations pertaining to the emergency and elective procedures in otolaryngology, and head and neck surgeries in these difficult times, so as to sensitise the clinicians while dealing with such cases, till the pandemic is under control and things get back to normal.

Keywords: Otorhinolaryngology, COVID-19, Aerosol generating procedures, Universal precautions.

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Disease Epidemiology and Clinical Characteristics

Coronavirus disease (COVID-19) is a novel respiratory disease caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) RNA virus of family Coronaviridae and order Nidovirales. This is a zoonotic coronavirus disease showing close homology with SARS-CoV of bats.¹ However, it has already infected humans and been declared a pandemic. Now human-to-human transmission is the main concern considering the high infectivity of the virus. Current evidence suggests that disease transmission in human beings is via the droplet route, while the faeco-oral route is still debated. However, concerns have been emerging regarding the airborne route of transmission. Hence COVID-19 has become a concern all over the world.

The disease usually presents in mild form, similar to

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the common seasonal flu with an incubation period ranging between 2 to 14 days that can rarely extend up-to 28 days.² Fever, dry cough, shortness of breath, sore throat, malaise, easy fatigability, and headache is the usual presentation.³ The severe form of the disease can lead to pneumonia, acute respiratory distress syndrome (ARDS), and later to multi-organ dysfunction, and has a case fatality rate (CFR) between 2 to 3% in countries which have one of the best healthcare systems in the world.^{4,5} The fact which is concerning is a majority of patients who have anosmia and dysgeusia are usually asymptomatic, which is worrisome as they can act as carriers for the disease.⁶ Hence for now, especially in South East Asia, the focus is on effective containment. However, in the resource-deprived developing world of South East Asia, the CFR can be worrisome. This region must therefore focus on the containment of the disease through social distancing ensured by enforcing country-wide lockdowns.⁷

Many possible pharmacological treatments are under trial, and attempts are being made to create an effective vaccine using various viral proteins. The disease is yet to have a definite treatment.⁸ In the absence of any specific treatments, observation and supportive care of the patient are the mainstay of case management with an emphasis on personal protection.⁹

Cause of Concern

The upper respiratory tract (the nose, nasopharynx, mouth, oropharynx, larynx, trachea, and bronchi) are areas with high viral load.^{10,11} Evidence suggests that viral load in the nose and nasopharynx of asymptomatic carriers are as high as those with symptoms.^{6,12} Data from China and Europe suggests that ENT surgeons have been unexpectedly struck with high numbers, falling ill, and have died due to the virus, followed by dentists and ophthalmologists. Studies have shown that tracheobronchial secretions carry the highest concentration of virus and followed by mucous and saliva.¹³ In some patients, the virus can be detected in saliva weeks after the onset of symptoms.

Risk to Otolaryngologists amid the Pandemic

As otolaryngologists deal with the upper aerodigestive tract, which is the portal of entry and site of multiplication and spread for the virus, the high risk involved in the profession warns all to be careful and take precautions. The idea of advising tests to all patients who present to the otolaryngology clinics with upper aerodigestive symptoms is impractical; hence, all patients should be presumed to be positive unless proven negative. It is ideal to use at minimum a N95 respirator or powered air-purifying respirator (PAPR), gown, cap, eye protection, and gloves for all kind of aerosol-generating procedure (AGP) or examination.¹⁴ There have been incidences from China and the UK where the healthcare professionals have contracted the disease even with protective gear. The use of personal protective equipment (PPE) is cumbersome and uncomfortable. However, this is the need of the hour given huge numbers of asymptomatic carriers of the virus due to varied incubation periods and varying disease severity. ENT clinicians should actively limit the number of procedures performed, and patients should be actively triaged as acute emergencies, sub-acute emergencies, clinically non-urgent, and elective conditions. Such practice will help to eliminate unnecessary exposure and contamination at clinics though it will result in delayed assessments for patients thought to be non-urgent or elective. However, all patients can be taken care of once the pandemic is under control. This seems to be a practical solution now though it will lead to health care burdens later.

ENT procedures and COVID-19

Procedures which involve any kind of proximity to the upper aerodigestive tract are considered high risk given the aerosol-generating nature. These include ENT examinations; surgical procedures including endoscopic examination and outpatient clinic endoscope-guided procedures such as nasal cautery, foreign body removal, biopsies, microbiology sampling, and endoscopy-guided injections; indirect or direct endoscopic laryngoscopy; any airway procedure performed in outpatient minor operating theatre or dressing rooms such as tracheostomy tube changes, dressing or tracheo-oesophageal puncture (TEP) care in laryngectomized patients. Emergency procedures include tracheostomy, which is considered the highest AGP, comparable to nasal endoscopies, due to the high pressures involved in ventilation when done in general anaesthesia, and spontaneous coughing by the patient when done in local anaesthesia. Similarly, other airway

establishment procedures including cricothyrotomy, orotracheal or nasotracheal intubation done with the help of direct laryngoscope or in a fibre-optic guided way also have high risks of contamination. Otologic procedures such as examinations, suctioning (which induces cough), examination under a microscope, ear surgeries; neck examinations for a lump and non-aerodigestive contaminating neck surgeries such as thyroidectomy and neck dissection, do not involve direct airway manipulation. However, the proximity to the aerodigestive tract makes these high-risk procedures.¹⁵ In brief, all ENT examinations and procedures are high risk in terms of risk of aerosol generation and contamination.¹⁶

Initial Risk Assessment

An otolaryngologist should:

1. Assess the risk based on history and examination, and get the information of COVID status on the patient. Get a PCR test pre-procedure. Some institutions may afford the luxury of doing two tests 48 hours apart to confirm the status. This is not possible in all places.
2. Do the risk assessment of the procedure and modifications accordingly. Ask yourself: Can the procedure be delayed? Are there other alternatives? Can the surgical approaches be modified? Can a different technique or tool be used to reduce aerosolization?

Thus, it is imperative that otolaryngologists and other physicians stay abreast of this outbreak and appreciate essential precautionary practices that are potentially crucial. In many regions globally including South East Asia, it is a widespread practice for patients with upper respiratory tract infections to seek advice of family practitioners and otolaryngologists as a primary care physician. Such a practice inadvertently poses inherent risks for physicians.

Risk Stratification

Consider three possible levels of risk: These are suggestions. One needs to check local area guidelines too.

- a. GREEN:** standard precaution for COVID-negative patients and non-AGP. Surgical mask, eye cover, and gloves for a non-ENT procedure.
- b. YELLOW:** for AGPs with COVID-negative or very low suspicion of COVID determined with the help of clinical history and contact history. N95 mask, face shield, eye cover, long sleeve fluid-resistant gowns, and gloves.

c. RED: for COVID-positive patients. PAPRs and maximal PPE available at your institution.

As per the above-mentioned description, it should be clear to consider that all ENT-related examination and procedures, even in COVID-19 negative patients, fall in the category of YELLOW, and all ENT examination and procedures in suspected, symptomatic or diagnosed patients of COVID-19 fall under the category of RED.

Triage

The job of an otolaryngologist involves triage of procedures into the subcategories mentioned above after initial history, examination and risk assessment

done with protective equipment. This triage is warranted to determine the nature of risks involved in further care of the patients and hence to re-stratify them as per the need of the procedures in order to assess the urgency of performing the surgery, the risks involved and the type of protections to be used by the healthcare workers (HCWs) and caregivers. The various categories of surgeries are highlighted in Table-1.

After triage and stratification, further management plan needs to be made. For acute emergencies, which need to be done within a day of presentation, testing for COVID status might not be possible as the results take time. Hence all such procedures need to be considered

Table-1: Triage of various categories of surgeries.

Acute Emergencies	<ul style="list-style-type: none"> ◆ Airway obstruction of any kind ◆ Airway obstruction due to any surgically remediable cause ◆ Battery foreign bodies ◆ Other foreign bodies in the aerodigestive tract with a functional compromise and respiratory obstruction and dysphagia ◆ Neck trauma with injuries to the vessels and upper aerodigestive tract ◆ Torrential epistaxis ◆ Orbital infective conditions acute threatening of vision loss ◆ Burns requiring airway establishment given impending or anticipated airway obstruction ◆ Life-threatening otologic surgery such as intracranial complications of chronic suppurative otitis media (CSOM) <p>The acute emergency surgery needs to be performed on an as early as possible basis on the same day of presentation within 24 hours.</p>
Subacute Emergencies	<ul style="list-style-type: none"> ◆ Continued epistaxis despite nasal packing ◆ Sinus surgery for a complication of rhinosinusitis or impending functional loss or life-threatening catastrophe ◆ Deep neck space infection ◆ Cellulitis, abscess or sepsis not responding to antimicrobial therapy ◆ Nasogastric tube insertion ◆ Acute management of dysphagia ◆ Traumatic injury of face, nose, pinna or maxilla facial fractures ◆ Acute facial nerve palsy ◆ Acute mastoiditis ◆ Lymphoma biopsy for tissue diagnosis ◆ Laryngoscopic laryngeal/ hypopharyngeal biopsy or oropharyngeal/ nasopharyngeal biopsies for tissue diagnosis ◆ Surgery for respiratory papillomatosis with symptoms <p>These procedures need to be performed within 48 to 72 hours.</p>
Clinically nonurgent (with the definite need of surgery and long waiting may affect the outcome)	<ul style="list-style-type: none"> ◆ Surgery for any kind of cancers of the head and neck ◆ Surgeries for aerodigestive tract stenosis or stricture ◆ Ear foreign bodies not causing pain or vegetative ear foreign bodies ◆ Cochlear implantation post meningitis ◆ Perilymph fistula ◆ Symptomatic mucocele ◆ Other sinus nasal pathology leading to acute rhinosinusitis ◆ Surgery for pharyngeal pouch or dysphagia ◆ Microlaryngoscopic procedure for lesions causing breathing difficulty without any compromise of the airway ◆ CSF rhinorrhea repair <p>These procedures need to be performed -within 4 to 6 weeks of presentation</p>
Elective (need of surgery is there. However, the wait time might not significantly impact the outcome)	<p>All other surgeries which do not have acute effects on patient outcome and can be deferred for 2 to 3 months safely</p>

This list is mentioned as per the multiple guidelines regarding COVID-19 in recent times including and not restricted to those from ENTUK, American Academy of Otolaryngology and Head and Neck Surgery (AAOHN), International Federation of Otolaryngological Societies (IFOS), ENT Canada, Stanford University, Western Australia ENT, National Health Service (NHS), Center for Disease Control (CDC).

as RED category. For the situations which are categorised as subacute emergencies, tests for COVID needs to be done on an expedited basis, and should be placed in YELLOW or RED category as per the results. In case of delayed reporting, the procedure should be undertaken with all the necessary precautions labelled in RED category. For clinically non-urgent cases, surgery needs to be done as per the COVID test results with precautions. The elective cases may be deferred for a month or two so that the risk of exposure to the patient and the HCW is reduced.

For all yellow and red category cases, the operating room (OR) environment should be contained, separated, and secluded in terms of access, and should have laminar negative pressure airflow to reduce risk of contamination. All the staff in the OR should have appropriate PPE. Sanitization and disinfection of the OR machines and surfaces should occur at regular intervals, along with separate management and handling of biomedical waste from these ORs.

Consent

All patients should be explained the details of the procedure, complications, chance of spreading COVID-19 in case they are infected, risk of contracting the disease from an HCW who is asymptomatic carrier, and the risks of higher morbidity and mortality in longer major surgeries performed in a COVID-19-positive setting, as evidenced in China and Europe. They should be explained in detail about the tests not done, reports awaited, and the risk of a false negative result.

Various Surgical Considerations

Clinically non-urgent and elective procedures are to be taken up for surgery with prior COVID test performed and with adequate planning and precautions. In case the patient tests positive, re-schedule the date. We discuss herein the various concerns and guidelines with regards to acute and subacute emergency situations, which will help clinicians and surgeons in their decisions.

1. Surgical airway establishment

Areas of particular concern are AGPs that include airway establishment or surgery of the upper aerodigestive tract. Even after airway establishment with intubation and tracheostomy, there is a high chance of cross-infection to other patients in that care unit and to the HCWs when any open system of ventilation is used. Therefore, patients with a tracheostomy/airway should be covered with a closed system identical to the one in

which a patient is connected to a mechanical ventilator. This is to minimise the aerosol generated that could cross-contaminate other patients and HCWs given the suction requirements of these patients. All bedside procedures are to be performed in a separate treatment room away from patient cubicles with HCWs wearing PPE as in the clinics.

Tracheostomy and other airway procedures in cases of airway obstruction are lifesaving procedures. In an intensive care setting, the possibility of weaning sedation by removing the endotracheal tube (ETT) and improving ventilation and hastening recovery reducing the dead space, easy access to tracheobronchial toileting, avoidance of intubation related-laryngotracheal stenosis and reduced chances of ventilator-acquired pneumonia substantiates the rationale for tracheostomy.

Risks of tracheotomy in COVID-19 setting

During the SARS outbreak 2003, Wei et al documented a high chance of aerosol contamination during tracheostomy.¹⁷ This is due to the fact that positive pressures are involved while ventilating and changing the tube. Any airway irritation, and bucking or cough of the patient worsens the scenario. Dormalen et al, with their experience in SARS CoV-2, also conveyed that the aerosols generated can infect the surgical team till 3 hours, and even people involved in the care and suctioning are at high levels of risk of contracting the disease.¹⁸

Timing

As shown by Chen et al, the virus can be active and be actively shedding from critically ill individuals till 2 to 4 weeks; there is no safe time for doing a tracheostomy in a COVID-19 setting.¹⁹ Hence, patients already on ventilation for more than two weeks and predicted not to improve for more than one to two weeks should be considered for tracheostomy in view of the risks involved in the disease transmission in creating a direct opening of the airway to the exterior. In terms of the duration of intubation, multiple systemic reviews have failed to note any significant benefits of early tracheostomy over late in critically ill patients except in those of head injury where some role in cerebral protection has been documented.²⁰⁻²³ Hence, in a COVID-19 setting, in a critically ill patient, it is imperative to practice the timing of tracheostomy to be at least more than 10 to 14 days of ventilation in the ICU.

Rational safety measures

Various safety guidelines have been published by AAOHNS,²⁴ ENT UK,²⁵ and the National Tracheostomy Safety Project,²⁶ UK, and ENT Canada.²⁷ These guidelines can be summarised as follows:

The decision has to be crucial and involving the intensivists as any proven definite benefit of tracheostomy is yet to be reported in a COVID-19 setting. It is better to delay it in case the patient has a higher dependency on the ventilators till the pulmonary condition stabilises. It has to be done with maximal PPE protection, with aspirators attached and in a negative pressure OR if possible with strict donning and doffing protocol to minimise contamination with pre-designated minimum staff required. The tube, a cuffed non-fenestrated one, should be ready and pre-checked with all other instruments required to be on the table to prevent any extra human interference in the OR. The procedure is to be done in complete paralysis, a closed setting ventilation with pre-oxygenation, holding of ventilation during the stoma and using cold instruments with preferable avoidance of the bovie to avoid fumes. The ETT needs to be advanced down by passing the stoma site; stoma needs to be made, then flows turned off, ETT clamped, cuff deflated, and withdrawn slowly to introduce the tracheostomy tube when adequate withdrawals ensured. The cuff of the T tube is to be immediately inflated, maintaining adequate cuff pressure to prevent leaks, and ventilation circuit should be attached quickly with minimal suction use during the procedure to avoid aerosolization, and an HME with a viral filter attached to the external end of the tracheostomy tube. Even in post-op, suctioning should be done via the closed circuit. The T tube change has to be done in a delayed manner to reduce tube changes to a minimum with first tube change after 7 to 10 days and should always be done with full PPE protection. ENT UK recommends routine tube changes in 30-day interval. Doffing of the PPE should be as per the guidelines with a buddy check to ensure adequacy.

2. Nasal Procedures

Rationale

Nasal procedures are documented to be highly AGPs, as can be evidenced in Europe and China where the spread to HCWs progressed rapidly after endoscopic nasal surgeries. Even nasal endoscopic examination is a concern as around 20-60 % of patients present with loss of smell and dysgeusia. Hence European Rhinology Society (ERS) warns for safety precautions for operative and diagnostic nasal interventions.²⁸

Recommendations

The Western Australian ENT recommends hand hygiene practices, disposable fluid-resistant gown, disposable respirator mask, hood-type theatre hat, single-use visor or goggles, and double gloves ensuring cuff of gown covered for aerosol-generating examinations of the nasal cavity.²⁹ The ERS also suggests the same with additional recommendations for the use of PAPR, with full PPE for the purpose of exposure to nasal aerosols along with advice to practice social distancing, postponement of elective cases, possible telephonic consultations for minor issues, avoidance of powered automation, and restricted entry and strict containment of endoscopy areas. The endoscopy needs to be done in video monitoring rather than direct visualization by the eyes.

Epistaxis

ENT UK recommends the highest level of PPE - respirator, negative pressure room, and reduced personnel for the management.³⁰ Nasal pressure, anti-fibrinolytics, and control of primary risk factors are recommended for initial management with bio-absorbable packing if required as initial treatment. For non-responders, silver nitrate cautery is advised, and in case of failure or continuous bleed, non-absorbable nasal packing with anterior and posterior packing can be done as required. In the case patient does not respond to the packing and control of primary associated factors or packing is not possible due to multiple co-morbidities as decided by the ENT surgeon, the patient needs to be taken for surgical intervention with the full precautions mentioned above. Surgical intervention should ideally be avoided unless acutely needed. At any stage when the bleeding stops, the patient can be managed conservatively with local antibiotic cream, saline nasal drops, and antihistamines with the addition of anti-staphylococcal prophylactic coverage for 48 hours with the non-absorbable nasal packs. ENT UK recommends PPE with fluid-resistant surgical apparel, face and eye shields, and double pair of gloves at minimum for the aftercare of the instruments and endoscopes of nasal interventions. They recommend removal of the outer glove only after the initial cleaning of the instruments and the scope with soap and water and then the standard chlorine dioxide decontamination process with restriction of access to the cleaning area.

3. Foreign Bodies

Management of foreign bodies in the upper aerodigestive tract can have aerosol generation due to

diagnostic and therapeutic intervention and manipulation. Various guidelines suggest a proper history at the beginning. All cases with an unclear history of foreign body ingestion and cases with a definite history of ingestion of foreign body without evidence of acute airway obstruction/absolute dysphagia require examination. Look for respiratory, swallowing, phonatory difficulties, noisy breathing, drooling, crepitus, swelling, bleeding, emphysema or severe pain. Patients with ingestion suggestive history and examination, and those with acute airway obstruction or absolute dysphagia at the initial presentation need to be stabilised and have appropriate radiological investigation done. The foreign body needs to be taken out with the desired scope after stabilisation, with full PPE, including level 2 fluid-resistant gowns, double gloves, FFP3 mask, PAPR, eye protection, face shield and hood.^{31,32} Patients with unremarkable history and examination need to be observed and then taken for radiological investigation to rule out a foreign body. In the case of a negative radiologic examination, the patients can be safely discharged after 2 to 3 days of observation. Frauenfelder et al recommend proper communication, pre-procedure briefing, sealed negative pressure OR if possible, scheduled co-ordinated OR transfer, play out of the procedure and possible difficulty to avoid intraoperative confusions, and a debriefing after completion of the procedure with special care to avoid air leaks to prevent contamination.³³

4. Head and neck infections, cellulitis and abscesses

Head and neck infections and their associated complications are ENT emergencies and need to be managed as per the acute and subacute category (Table-1) either on the same day or within a maximum of 48 to 72 hours of presentation. In the case of a suppurated lymph node ultrasound-guided wide-bore needle aspirations can be done with hyaluronidase injections to break the septa in small well-marginated collections of less than 2 to 2.5 centimetres. For collections larger than 2.5 cm, those with multiple septa, those involving multiple compartments in the deep neck space, spreading facial cellulitis not responding to broad-spectrum antibiotic coverage, and presence of air in the tissue spaces showing air producing organisms and necrotizing fasciitis of head and neck needs to be operated on an emergent basis. Considering the urgency, multiple COVID testing is not possible to rule out the disease. Hence, these patients need to be operated with full PPE and special care for

the airway establishment as majority of these cases either need a flexible fiberoptic endoscopic-guided intubation or a tracheostomy for the need of general anaesthesia. Standard COVID OR precautions need to be taken in these cases, including reduction of unwanted staff in the OR environment, and pre and post-procedure briefing and debriefing.¹⁶

5. Head and Neck Cancer Surgery

Except for airway obstructions, biopsies of lymphoma and other non-diagnostic lesions, bleeding from exophytic tumor masses, and aggressive variants such as mucosal melanomas, all other cancer surgeries are classified as clinically non-urgent and can be planned in 3 to 4 weeks. These cases can be posted for surgery after PCR test and adequate prior planning and precautions. ENT UK recommends remote triage for head and neck cancer patients in the pandemic scenario, with recommendations for early single-point referrals, one-stop investigations, deferment of benign tumour management, adequate record-keeping, best and rational utilisation of diagnostic facility, maintenance of minimum numbers in the multidisciplinary teams with people in back up, limited protocolization, surgical changes such as the use of pedicled flaps for reducing surgical time, restriction to OR access to persons directly involved in care, possible hypofractionated radiotherapy therapy in eligible patients, and emphasis to use protective equipment as desired in order to prevent contamination.³⁴ ENT Canada have recommended for focus on cancer screening and palliative care at community level and prioritisation of the radiation, systemic and surgical treatment of cancers for rationalising treatment offered with constraint in place. Oncological emergencies mentioned above need to be dealt with full care and maximal protection in the absence of rule out multiple COVID tests.

6. Otolgic Surgery

Drilling of bone leads to spread of bone dust and aerosolization, which are not directly from the aerodigestive tract. However, the evidence of viraemia, and prior evidence of the presence of coronavirus in the epithelium of middle ear makes otologic surgery a tricky situation. At this juncture, the risk of unknown transmission increases and hence, fluid-resistant gowns, FFP3 masks and if possible respirators in the case of a non-fit test, eye protection, shoe covers, and face shields should be used in an emergency ear surgery when COVID testing reports are not available. Emergent otologic surgeries include acute mastoiditis,

intracranial complications of chronic suppurative otitis media (CSOM), and acute post-traumatic facial palsy with a definite fracture line seen traversing through the facial nerve. Daycare procedures include myringotomy for acute suppurative otitis media (ASOM) with complications especially in paediatric age group and intra-tympanic steroid injections for idiopathic sudden sensory neural hearing loss. Care should be taken through slow drilling with reduced irrigation, possible use of curettage instead of drilling, and good hypotension. Use of an endoscope is theoretically better compared to microscopes due to distance from the site of work of the HCW accepting the limitation of the single-hand use for operating in the case of use of endoscopes. Temporal bone lesions and CP angle lesions should not be treated as urgent unless there is some impending neurological compromise, which is anticipated in the near future. For CP angle lesions, a retrosigmoid approach is to be used rather than a translabyrinthine approach to reduce surgical time and drilling. Other nonemergent otologic surgery can be deferred for a minimum of 12 weeks. Thus Otologic surgery can be prioritized.³⁵

For outpatient use of micro suctioning for otologic reasons such as wax removal and suction clearance of discharge or debris, in the case of an unknown covid-19 status non fenestrated suction tips need to be used with face, eye protection, N-95 masks and fluid-resistant gowns with shoe covers for protection from spillage and contact.

Conclusion

Considering the high risk of exposure during diagnostic and therapeutic interventions for ENT surgeons during the COVID-19 pandemic, dedicated protocols for management needs to be prepared by all institutions. Due to the increased aerosol production in the work environment, all cases presented to the ENT clinic needs to be screened at the general practice clinic before attending the specialty clinic. Diagnostic or therapeutic examination or intervention needs to be done with adequate PPE desired for the procedure as per the risks involved. In view of a large number of asymptomatic cases, especially in resource scanty developing world of South East Asia region, all cases without confirmed negative COVID test need to be treated as suspected with maximum care and protection in order to ensure safe and efficacious treatment.

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