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Original Research Article

Principles and philosophies, experiences and challenges associated with undertaking otorhinolaryngologic surgical practices and procedures in COVID-19 pandemic

Sharad Hernot[1], Apoorva Kumar Pandey[1]*, Madhuri Kaintura[1], Aparna Bhardwaj[2], Fatma Anjum[1], Sonal Kala[1], Kanika Arora[1]

[1]Department of ENT and Head and Neck Surgery, [2]Department of Pathology, Shri Guru Ram Rai Institute of Medical And Health Sciences and Associated Shri Mahant Indresh Hospital, Patel Nagar, Dehradun, Uttarakhand, India

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***Correspondence:**
Dr. Apoorva Kumar Pandey,
E-mail: pandey.apoorva@gmail.com

ABSTRACT

Background: To highlight the changes, challenges, and safety recommendations associated with surgical management of a patient which were practiced effectively at our institute during the pandemic and share our experience.
Methods: This retrospective observational descriptive study conducted between 25th March 2020 and 31st October 2020 constitutes of following points covering various aspects of surgical management of patient such as- general precautions followed by otrorhinolaryngologist while doing OPD surgical procedures, while doing endoscopy, in every major operative elective or emergency surgical procedure. This study also mentions focussed considerations for specialised surgical procedures like otology surgeries, endoscopic sinus and skull base surgeries, airway surgeries, tracheostomy, head and neck carcinoma etc.
Results: Of the 342 cases operated between 25th March 2020 and 31st October 2020 during this pandemic, 69 nasal surgeries, 83 ear surgeries, 37 throat surgeries, 37 head and neck surgeries, 26 oesophagoscopies, 17 bronchoscopies, 63 tracheostomies, and 10 cases of maxillofacial trauma were performed. 983 patients were taken up for endoscopic examination of the mucosa of the head and neck in OPD as an office-based procedure.
Conclusions: Through this study, we suggest a safety and recommendations procedural framework to be followed while managing surgical patients in a way to minimise the cross transmission of virus.

Keywords: COVID-19, Otorhinolaryngology, Pandemic, SARS CoV-2, Safety recommendations, Surgery

INTRODUCTION

According to the archives of WHO (World health Organisation), Wuhan Municipal Health Commission, China reported a cluster of pneumonia cases in Wuhan's Hubei province on 31 December 2019. The disease outbreak news on the new virus was first published by WHO on 5th January 2020, and from that day the coronavirus disease 2019 (COVID-19) has posed as the greatest public health emergency of this century.[1] As of 05th November 2020, over 47 million COVID-19 cases, and 1,221,781 COVID deaths worldwide have been reported to WHO.[2] Out of these, approximately 8,396,000 confirmed cases of COVID-19 and 124861 deaths have been reported from India alone till 5th November 2020.[3] Amongst the most "at risk group" of medical health care givers are the otolaryngologists, ophthalmologists, pulmonologists, and anaesthetists. The origin of the virus is not well understood, but it is thought that a bat or a pangolin might have served as the primary reservoir.[4] The

disease is commonly marked by spectrum of symptoms like fever, cough, shortness of breath, malaise, myalgias, diarrhoea, headache, and loss of smell or taste. Severe disease is characterized by an acute respiratory distress syndrome (ARDS), which has a 50-80% mortality in patients who require mechanical ventilation.[5,6]

The Ministry of Health and Family Welfare of India implemented Lockdown Period in the entire nation starting from 24th March 2020 which continued in various phases till 30th June 2020. However, while the entire nation was in lockdown, the health care workers continued to provide their services to patients either confirmed or suspected to have COVID-19 infection.

Taking lessons from other countries that had already been affected by the pandemic, we formulated a paradigm consisting of triage and safety recommendations to be followed while dealing with patients who came to our institute for surgical otorhinolaryngology intervention during this ongoing pandemic.

The aim of this study was to highlight the changes, challenges, and safety practices associated with patient's surgical management which were practiced effectively at our institute during this ongoing pandemic situation and share our experience.

METHODS

This retrospective observational descriptive study was conducted in the department of otorhinolaryngology at a tertiary referral centre. All patients presenting to the department who required ENT (ear, nose, throat) intervention, irrespective of their COVID-19 status between 25th March 2020 and 31st October 2020 were included in the study. As we attended all the patients without knowing their COVID status prior so conclusively there was no exclusion criteria.

Triage

Triage was our first step during the COVID-19 pandemic. It was done at 2 levels starting first at hospital entry and then at otorhinolaryngology reception counter. Triage not only reduced the burden in the otorhinolaryngology outpatient department (OPD), but also ensured minimal exposure of SARS-CoV-2 virus to both healthcare workers and patients during this time without compromising essential patient care.

Strategic considerations during covid-19

Education about donning and doffing procedures of PPE was given to every hierarchy of healthcare worker. Donning and doffing rooms were separate, and the proper sequence of donning and doffing was pasted on the wall of the changing rooms to help the beginners, trainees, residents, and even consultants.

General Precautions followed by otrorhinolaryngologist while doing OPD surgical procedures commonly performed outside the Operating Room

The following are examples of the commonly performed procedures done outside operation theatre in minor OT, or dressing rooms, which are considered high risk and potential aerosol generators: Suctioning of patients with a blocked tracheotomy tube. Changing of blocked tracheostomy tube. Nasal pack placement, removal, or manipulation. Drainage of nose or ear furunculosis, stitch abscesses etc. Dressing of patients (OPD or postoperative cases). Laryngoscopy/nasal endoscopy/otoendoscopy of post-operative cases

Consultants during outpatient, endoscopy room, dressing room, or minor OT visits, and residents posted in minor operation theatre (OT), rhinomanometry room, audiology room, or voice lab etc. donned the following PPE set throughout the complete duration of OPD: 1) Double layered body covering which included a scrub suit inside, over which a disposable long sleeved full body covering gown is worn. 2) An N95 respirator or filtering face piece 2 (FFP2) or higher respirator. 3) Double gloves, 4) Face shield for prevention of possible splashing on the face or eyes, and 5) Disposable head cap that completely covers the hair. 6) Shoe covers.

Disposal of this PPE is equally important and was done in an infectious medical waste disposal receptacle before leaving the OPD.

General precautions in endoscopy room/voice lab

Endoscopic examinations of the nose, pharynx, and larynx are among the most common otorhinolaryngology diagnostic procedures which are considered aerosol generating procedures.

Specific recommendations include the following: 1) Doctor and assistant always donned PPE set already described above 2) The examination was performed by the most experienced personnel available so as to decrease the duration of the procedure. 3) Patients were asked to wear a surgical mask at all times. 4) For a nasal endoscopy, topical anaesthesia soaked cottonoids were placed to make the examination quick and more comfortable. Use of topical anaesthetic sprays was absolutely avoided. 5) Lignocaine viscous was used as topical anaesthesia for performing a laryngeal endoscopy. Use of topical anaesthetic spray was avoided. Any office-based intervention such as biopsy, injection, laser etc. procedures was deferred. 6) After each endoscopy the used endoscope was cleaned in running water to wash-off the dried secretions which gets adhered to its distal shaft and the tip. Then it was disinfected by immersing it in CIDEX® OPA (containing Ortho-phthalaldehyde) solution for a minimum of 15-20 minutes. 7) Laryngoscopy room was sanitised with a hospital grade disinfectant such as 2-3% hydrogen peroxide solution, 2-

5 grams/litre chorine disinfectant, 75% alcohol, or formalin and potassium permanganate combination.

General precautions followed by surgeon in every operative procedure

We performed RT-PCR (reverse transcription-polymerase chain reaction) for elective surgeries, and rapid antigen test for emergency surgeries in all patients preoperatively. Depending on the report, if patient is positive and surgery could not be postponed for any time in the future, patient was taken up in a designated operating room with negative pressure system. However, if the report comes out to be negative, patient was taken up in a regular operation theatre with air circulation cycle increased to at least 25 exchanges/hour. In all operations, whether patient is COVID-19 positive or negative, people inside the operation theatre were kept to a minimum of 5 which included anaesthetist, anaesthesia technician, surgeon, surgeon's assistant, and a scrub nurse. During intubation, only anaesthetist and anaesthesia technician were present in the room. Rest all were asked to leave the room and only return after the airway was secured. This routine was followed during extubation also. The surgeon entered the operating room approximately 10 minutes after intubation and exited before the extubation. Air conditioning and laminar flow of operation theatre were switched off both during intubation and extubation to limit the spread of aerosols.

Figure 1: Surgeon in full PPE.

Irrespective whether the surgery was performed on a covid positive case or a negative case, the below mentioned PPE set was donned for performing the surgery, as there was a high possibility that patient who was COVID negative could still be in the incubation period- 1) A scrub suit inside, over which a disposable long sleeved full body covering impervious surgical gown was worn. 2) Double masks including a 3-ply surgical mask inside, and N95 mask or PPF2 or higher respirator outside with proper sealing of mask with an adhesive tape over nose. 3) Double gloves. 4) Eye goggles. 5) Full Face shield for prevention of possible splashing on the face or eyes, and 6) Disposable head cap that completely covers the hair. 7) Hood cap over disposable head cap. 8) Disposable shoe covers

The surgeon, and his assistant in addition to the above wore an addition surgical gown over the scrub suit, and beneath the disposable gown as a 2nd layer of protection (Figure 1).

The door of the operating room always remained closed during the surgery. The scrub nurse prepared the surgical table in cooperation with the surgeon before the commencement of surgery. All surfaces which may be contacted during the surgery were covered beforehand. All areas at risk of contamination in the room were cleaned and disinfected after the surgery using Hospidex®-OTD solution. The tissue samples and their respective forms planned to be sent to the pathology department were marked with warning signs to minimize the risk of contamination.

Considerations for specialised surgical procedures

Otological surgeries

There are studies that document the presence of corona viruses in the epithelium of the middle ear, and that the process of drilling in the mastoid bone generates aerosols in large quantities.[7-9] Hence ear surgery during the pandemic could put the surgeon and the OT staff at risk of acquiring infection by generating aerosols during the procedure.

All ear surgeries were taken up after COVID testing. However, emergency procedures like facial nerve decompression, acute complications of diseases of the middle ear with serious risks (intracranial complications), and the presence of a foreign body in the ear (e.g. batteries, insect, organic substance etc.), and malignant temporal bone tumours, were taken up irrespective of COVID-19 status of the patient.

Once the patient was covered with drape sheets, all the necessary instruments for ear surgery were placed in a pocket made by infolding of the drape sheet. All the steps where microscope is not needed were finished first. Then patient was covered with a plastic sheet upto the feet. This plastic sheet was taped to the microscope and

drilling was then commenced. All operative procedures including instrument handling are done under the plastic sheet mount to prevent any spread of possible infection. The bone dust and blood stains soil the inner lining of the plastic drape that is disposable, thereby ensuring safety of the healthcare staff. In this thick plastic sheet holes of diameter approximately 10 centimetres were made for entry of hands and forearms of the surgeon. Once the hands were inside, the holes also taped to the forearm of the surgeon (Figure 2).

Figure 2: Our technique of draping patient for otology surgeries to lessen the aerosols spread during the surgery.

Endoscopic sinus and skull base surgeries

Following all the precautions as well as the draping techniques already described ontological surgeries, endoscopic sinonasal surgeries like septoplasty, FESS, and skull base surgeries like transnasal transsphenoidal hypophysectomy and skull base defect repair for CSF rhinorrhoea were done. Use of microdebriders was very limited. Drill or electric saw for osteotomies in cases like medial maxillectomies were not used. Instead, osteotomes/chisels/gouges and mallet were used. In all cases where biopsy material was taken, the tissue was immediately transferred to appropriate containers and covered.

Airway surgeries and tracheostomy

Tracheostomy is a routine airway-related procedure for an otorhinolaryngologist and it is an open invasive surgery with risk of extensive aerosolization. In this epidemic, tracheostomy calls were mostly attended for severe or critical patients who had undergone endotracheal intubation and mechanical ventilation because of unsustainable blood oxygen saturation and expected long ICU stay. The need and timing to perform a tracheostomy is still an issue of debate and it was only performed when there was consensus amongst the anaesthetist, pulmonologist, and ENT surgeon that a considerable benefit is expected. In our center, tracheostomy was done after 10 days of mechanical ventilation and was considered only when a COVID patient was showing signs of clinical improvement.

When tracheostomy is considered necessary, we abided by the following recommendations and steps: Tracheostomy was considered in patients only with stable pulmonary status preferably with negative COVID-19 test and falling inflammatory markers. Tracheostomy was avoided during periods of respiratory instability or heightened ventilator dependence. Bedside trachesostomy was mostly not preferred and patient was mostly shifted to negative pressure operation theatre. Tracheostomy was performed by an experienced surgeon in presence of an anaesthetist, with minimum number of assistants and staff. Disposable equipments were used whenever feasible. Electrocautery was avoided to limit the risk of aerosol generation. Surgical knot tying or ligature clips for bleeders were preferred. In case of intubated patient, endotracheal (ET) tube cuff was advanced safely below the intended site of tracheotomy to avoid cuff rupture and to hold respirations while incising trachea. Transnasal humidified rapid insufflation ventilatory exchange (THRIVE), jet ventilation and PPV (positive pressure ventilation) without a cuffed endotracheal tube was strongly discouraged. Bag and mask ventilation was also minimized.

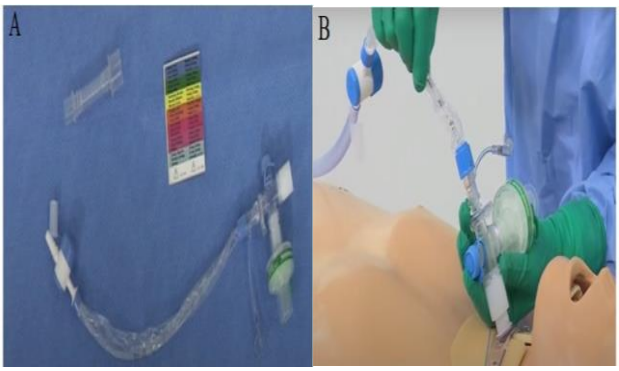

Figure 3: A) T-tube with closed inline continuous suction catheter; B) Demonstration of proper use of closed inline continuous suction catheter on a dummy patient.

It was made sure that there was no ET tube disconnection during the procedure. In case of accidental disconnection, assistant was pre-briefed to clamp the ET immediately in such event. Muscle relaxant was given prior to incising the trachea. Complete paralysis of the patient was necessary before incising the trachea to ensure that there was no coughing or any other movement. Endotracheal tube should be clamped and then cuff is advanced beyond

the proposed tracheal window. Cuff was inflated and patient was preoxygenated to 100%, ventilator was stopped and patient was paralyzed during T-tube insertion and then only anterior tracheal wall was incised. Tracheal suction was avoided because of the risk of aerosolisation. Cuffed, non-fenestrated tracheostomy tube of appropriate size was chosen. T-tube with closed inline continuous suction catheter was inserted followed by inflation of the balloon (Figure 3). Tracheostomy tube was connected to the ventilator, and when adequate ventilation is confirmed by end tidal CO_2, tracheostomy tube was sutured to the skin, in addition to tracheostomy tube strapping. Finally, the endotracheal tube was removed.

During Emergency tracheostomy, similar safety precautions and steps were followed.

Precautions and recommendations in a tracheotomised patient

Cuff was advised not to be deflated, considering high risk to patient, staff and the environment. Tracheostomy dressing was only changed when tube change is planned, or if there is sign of infection or heavy soilage. Trachesostomy tube change was mostly delayed till there is no sign of blockage like resistance to passage of suction tube or fluctuation in SpO_2 (oxygen saturation). While changing the tube, staff was kept to minimum and donned in full PPE kits. Same sequence with pause in ventilation before deflating cuff and inserting new tube with immediate re-inflation of the cuff was followed. Trial for cuff deflation and weaning was only attempted in patient who had been declared COVID-19 negative and shifted out of ICU.

Surgeries like MLS (microlaryngoscopy) and direct laryngoscopies were taken up for patients with lesions of the oropharynx, hypopharynx, or larynx, which included biopsies of suspicious growths in these regions to prove or rule out carcinoma, or excision of large benign lesions of vocal cord compromising the airway.

Head and neck carcinoma

Flexible endoscopy was done and only limited to patients with either symptoms or examination findings suggestive of a new primary head and neck cancer or recurrence, and in patients with concern for critical airway obstruction, in a separate endoscopy room as mentioned under general precautions in endoscopy room/voice lab.

Flexible naso-endoscopy was not done in patients with no history of head and neck cancer who present with low risk symptoms like globus pharyngeus, or laryngopharyngeal reflux.

Positive history and examination suggestive of carcinoma, a positive cytohistological result from fine needle aspiration of a suspicious node and confirmation findings on imaging such as CT or MRI together were taken as acceptable confirmations for a cancer diagnosis, even in the absence of a biopsy from the primary tumour site which would require direct laryngoscopy.

However, if the growth was present on lateral border of anterior portion of tongue, buccal mucosa, retromolar trigone, tonsil, tonsillolingual sulcus etc. like areas which were adequately visible, biopsy was taken under local anaesthetic infiltration, wearing full PPE set in negative pressure operation theatre.

All patients were preoperatively investigated for COVID-19 status. If patient comes out to be positive, surgery was deferred for 4-6 weeks. Once patient was free of infection and declared fit for surgery, patient was taken up for oncosurgery.

And if patient is COVID-19 negative, patient was taken up for surgery with all recommended precautions and safety measures already mentioned.

Patients operated for advanced head and neck cancer were also advised to consult the radiotherapy department post-surgery.

Thyroidectomy and neck procedures

In the case of a thyroid cancer with no adverse features (no extension into strap muscles, trachea or oesophageal musculature, no critical airway compression, and no imminent risk to or involvement of the recurrent laryngeal nerve), surgery was delayed for up to 8-12 weeks from diagnosis.

When surgery is delayed, serial monitoring was used to assess tumour progression while waiting for definitive treatment, and if any evidence of tumour progression was noted, re-evaluation of treatment options was prompted.

However, in patients who required urgent intervention for the carcinoma, patient was taken up following all the mentioned recommendations and safety measures irrespective of COVID status.

Facial trauma

Most facial injuries that came to our emergency room was examined, evaluated, and investigated by the emergency medical provider in the emergency room and radiological imaging was documented in the patient's medical record. As every facial trauma patient that reported to our institute had unknown COVID status, hence we treated every patients of unknown COVID-19 status as COVID-19 positive. For injuries that required operative intervention (for example, reduction of fractures), patient was admitted in isolation ward of ENT inpatient department. The infection status of the patient was first confirmed by RT-PCR and then definitive treatment was initiated.

In cases where emergency intervention was required (e.g. recalcitrant nasal bleed), patient was immediately shifted to negative pressure operation theatre for COVID-19 positive patients, and surgeon donned in PPE set did the nasal packing.

Paediatric patients and foreign bodies

Upper respiratory tract infection with complaints like nasal discharge, dry cough, fever, fatigue is a very common ailment of paediatric population. However, most infected children have mild clinical manifestations and thus become possible vectors of COVID-19. Consequently, we considered all children as potential carriers of SARS-CoV-2 virus. For this reason, in cases where we needed to examine oropharynx of the child, patient was examined in endoscopy room or voice lab. Oral, nasal, or pharyngeal examination was not done in OPD consultation chamber. If a child needed oesophagoscopy, bronchoscopy or direct laryngoscopy for foreign bodies or ailments of oesophagus, larynx, subglottis, or trachea, patient was first admitted in isolation ward of ENT IPD and RT-PCR was sent. Once the report was known to the surgeon then only was the patient taken up for the respective procedure with all standard precautions mentioned under general precautions in endoscopy room/voice lab.

General precautions during patient transport after surgery

Adequate PPE was donned during the transfer of SARS-CoV-2 positive patients or patients of unknown infection status. While shifting, non-intubated patients was given a surgical mask if tolerated by the patient. The ICU patients who underwent tracheotomy were shifted back to their respective ICUs by using closed inline catheter suction system, a closed circuit if patient was on ventilator or a T-piece if ventilator support was not required.

Postoperative care

If a confirmed COVID RT-PCR negative, or a COVID RT-PCR positive but asymptomatic patient developed any postoperative fever or pulmonary symptoms after the surgery, it could indicate infectious or aspiration pneumonia, pulmonary embolism, or pulmonary oedema. However, we kept a high suspicion index to identify and diagnose possible COVID symptoms in the postoperative patient. Thoracic CT screening and RT-PCR repeat testing (for negative patient) were performed in those patients who developed postoperative fever, cough, or other pulmonary complaints.

If patient was diagnosed with a confirmed COVID-19 infection during the postoperative care, patient was transferred to the COVID isolation ward/ICU. Surgical postoperative care along with medical treatment for his COVID-19 infection was provided in isolation ward for 10 days continuously, from day of onset of symptoms.

If the patients experienced improvement in respiratory symptoms, and if the infection markers and temperature came within normal level, the isolation measures were removed and the patients were either transferred back to our ward or were discharged.

Advice for patient to follow at home once discharged

Once patient is discharged from our care, a set of safety practices to be followed by the patient at home is mentioned separately in the discharge card if the patient was COVID-19 positive. These safety practices are as follows: a) Home isolation in a separate well-ventilated room with attached bathroom for at least 7 days. b) Wear mask adequately covering nose and face all times at home for 7 days. c) No visitors allowed, and maintain social distancing. d) Frequent washing of hands for at least 20 seconds after touching any open surface, before and after eating, and after sneezing or coughing. e) Disinfect bathroom fixtures, toilet seat, sink, floor, tabletops, door knobs etc. with alcohol-based surface disinfectant or by 1% sodium hypochlorite solution. f) Wash used clothes and linen in hot water. g) No use of public transport for at least 2 weeks.

Statistical analysis

It was a descriptive study representing data in figures only.

RESULTS

Of the 342 cases operated between 25th March 2020 and 31st October 2020 during this pandemic, 69 nasal surgeries, 83 ear surgeries, 37 throat surgeries, 37 head and neck surgeries, 26 oesophagoscopies, 17 bronchoscopies, 63 tracheostomies, and 10 cases of maxillofacial trauma were performed. 983 patients were taken up for endoscopic examination of the mucosa of the head and neck in OPD as an office-based procedure.

69 nasal surgeries included 30 septoplasties, 28 Functional endoscopic sinus surgeries, 6 rhinoplasties, 3 Transnasal transsphenoidal pituitary macroadenoma excision with skull base defect repair, and 2 CSF leak repair.

83 ear surgeries included 41 tympanoplasty/ myringoplasty, 34 mastoidectomies, 4 myringotomy and grommet insertion, 2 stapedotomy, and 2 cochlear implants.

Table 1: Total surgeries done in ENT department.

Surgery	Type	Number
Nasal surgeries	Septoplasty	30
	Endoscopic sinus surgeries (FESS)	28
	Septorhinoplasty	6
	Transnasal transsphenoidal pituitary macroadenoma excision with skull base defect repair	3
	CSF leak repair	2
Total patients	69	
Ear surgeries	Tympanoplasty/ myringoplasty	41
	Mastoidectomy	34
	Myringotomy and grommet insertion	4
	Stapedotomy	2
	Cochlear implant	2
Total patients	83	
Throat surgeries	Direct laryngoscopy	18
	Microlaryngoscopy	5
	Adenotonsillectomy	12
	Tonsillectomy with styloidectomy	2
Total patients	37	
Head and neck surgeries	Thyroid surgeries	12
	Submandibular gland excision	4
	Deep neck spaces incision and drainage (emergency)	5
	Cyst excision in head and neck region	4
	Penetrating trauma of neck (emergency)	3
	Total parotidectomy	1
	Partial laryngectomy	1
	Total laryngectomy	1
	Wide local excision of growth alveolus with anterior segmental mandibulectomy with bilateral supraomohyoid neck dissection with free fibula flap repair	1
	Left Partial glossectomy with left supraomohyoid neck dissection with free radial artery forearm flap	1
	Wide Local Excision of growth Left buccal mucosa with supraomohyoid neck dissection with free fibula flap repair	1
	Maxillectomy	3
Total patients	37	
Oesophagoscopy	For dysphagia	12
	For foreign body oesophagus (emergency)	14
Total patients	26	
Bronchosocopy	For patient not maintaining oxygen saturation after extubation or after Tracheostomy tube removal, to look for tracheal or subglottic stenosis / web, or granulation etc.	13
	For foreign body bronchus (emergency)	4
Total patients	17	
Tracheostomy	Emergency tracheostomy (emergency)	3
	Elective tracheostomy for intubated patient	55
	Elective tracheostomy for Maxillofacial trauma patient	5
Total patients	63	
Maxillofacial trauma	Open reduction and internal fixation with arch bar fixation with IMF	10
Total patients	10	
Endoscopic examination of the mucosa of the head and neck (OPD procedures)	Nasal endoscopy	177
	Laryngeal endoscopy	372
	Otoendoscopy	434
Total patients	983	

37 throat surgeries included 18 direct laryngoscopies, 5 microlaryngoscopies, 12 adenotonsillectomies, 2 tonsillectomy with styloidectomy.

37 head and neck surgeries included 12 thyroid surgeries, 4 submandibular gland excision, 5 deep neck space abscess incision and drainage, 4 cyst excision in head and neck regions, 3 penetrating trauma of neck, 1 total

parotidectomy, 1 partial and 1 total laryngectomy, 1 wide local excision of growth alveolus with anterior segmental mandibulectomy with bilateral supra-omohyoid neck dissection with free fibula flap repair, 1 left partial glossectomy with left supra-omohyoid neck dissection with free radial artery forearm flap, 1 wide local excision of growth left buccal mucosa with supraomohyoid neck dissection with free fibula flap repair, and 3 maxillectomies.

26 oesophagoscopies were performed in which 12 were done for complaint of dysphagia to rule out web, stenosis, or stricture, and 14 were done for foreign body in oesophagus, e.g. coin, button battery cell, denture, meat piece etc.

17 bronchoscopies were performed in which 13 were performed where patient was not maintaining oxygen saturation after extubation, or after tracheostomy tube removal, to look for tracheal or subglottic stenosis/web, or granulation etc., and 4 were performed in emergency for patient with foreign body lodged in bronchus.

63 tracheostomies were performed during this pandemic era in which 3 were done as an emergency procedure and 60 were done electively for either intubated patients, or in maxillofacial trauma patient for induction of anaesthesia as well as for maintaining airway in these patients as maxillomandibular fixation leads to excessive swelling of tongue and lips leading to chances of a compromised airway in the immediate or early postoperative period.

10 cases were operated for maxillofacial trauma.

983 patients taken up for endoscopic examination of the mucosa of the head and neck included 177 nasal endoscopies, 372 laryngeal endoscopies, 434 otoendoscopies (Table 1).

29 cases were performed as emergencies surgeries and 313 as elective surgeries (Table 2).

Out of 37 head and neck cases, 8 cases were taken up as emergency cases in which 5 were due to deep neck space abscess, and 3 due to penetrating trauma of neck. All 18 cases of foreign body retrieval from aerodigestive tract were performed in emergency. Out of 63 tracheostomies, 3 were taken up in emergency; 2 patients presenting with respiratory distress and stridor due to growth in the glottis extending to subglottis region, and 1 tracheostomy was done for impending compromised airway for a large deep neck abscess patient with supraglottitis. All 3 tracheostomies were confirmed covid positive on rapid antigen testing.

Table 2: Elective and emergency surgeries done in the department.

	Elective surgeries	Emergency surgeries
	313	29
Total surgical patients	342	

All 313 surgeries including ear, nose, throat surgeries, diagnostic oesophagoscopies and bronchoscopies, adenotonsillectomies, and maxillofacial trauma surgeries were performed as elective cases. Out of 63 tracheostomies, 55 were done electively in intubated patients requiring airway for prolonged ventilation, and 5 were done electively for maxillofacial trauma patient (Table 1).

Out of 355 surgical patients admitted in ward, 17 patients came out positive in the preoperative COVID-19 RT-PCR report, 7 turned out positive in the immediate postoperative period, and 7 came out positive after being discharged from the hospital. There were 324 patients who remained COVID negative throughout their treatment. Out of 17 patients who were confirmed positive before the surgery, 13 patients were advised postponement of surgery as they needed routine ENT intervention, where 4 were taken up as emergency cases (Table 3). These 4 emergency surgeries preoperatively confirmed for COVID positive status included 2 tracheostomies, 1 penetrating trauma of neck, and 1 deep neck space abscess.

Table 3: Number of COVID positive and COVID negative patients taken up for surgery.

Came out positive in preop period on preop RT PCR		Came out positive in post op period while in ward	Came out positive in the late postop period after being discharged from the hospital	Patient remained negative throughout
Elective surgery	**Emergency surgery**			
13	4	7	7	324
Patient denied surgery=13	Patient taken up for surgery= 4+ 7 + 7 + 337 = 342			

Surgical patients admitted in ward (n=355)

One patient who had undergone wide local excision of growth alveolus with segmental mandibulectomy with fibula flap repair was readmitted for cauterization of exuberant granulations in the reconstructed part of oral cavity. He remained stable, with negative COVID 19 status throughout his stay in the ward, and was

discharged after 5 days. Except for 5 tracheostomies and 1 transnasal transsphenoidal hypophysectomy done in the ongoing pandemic time, there were no complications reported in any of the surgical patients. Out of 5 patients who required tracheostomy, 2 succumbed to their debilitated overall condition, and 3 succumbed to the complication of SARS-CoV-2 infection. Hypophysectomy patient succumbed to post-operative meningitis and its complications. Effectively 4 confirmed and 7 suspected COVID-19 patients underwent surgery in the department at our institute.

Till date all the members of the ENT department (OPD, OT, and ward) have been strictly abiding by the protocol formulated by the department and hence, the department have been successful in remaining infection free till now even after performing mostly all the routine and emergency ENT procedures in the pandemic era, with zero incidence of any cross infection between patients, HCWs, or amongst themselves.

DISCUSSION

Coronaviruses belong to a family of common respiratory viruses, and has been linked to several outbreaks, such as the severe acute respiratory syndrome (SARS) of 2002 and the Middle East respiratory syndrome (MERS) of 2012.[10] The main symptoms related to COVID-19 are sore throat, cough, fever, difficulty in breathing (dyspnoea), body aches, headache, fatigue, anosmia, and ageusia. It is noteworthy to mention that the individual can be an asymptomatic carrier also.[1]

The main transmission route of SARS-CoV-2 is thought to be by large respiratory droplets carrying viral particles, which are formed during coughing, sneezing, and speech. If the diameter of these droplet particles is >5-10 µm, they are called as respiratory droplets, and if the diameter is <5 µm they are called as droplet nuclei.[11] Respiratory droplets stay in the air for a few seconds, and cover only a short distance before landing on the surfaces due to their weight. However, droplet nuclei are primarily formed during procedures such as mask ventilation, intubation, tracheostomy, tracheal aspiration, and endoscopic examination. After mixing with the air, they behave as aerosols. These aerosols can hang in the air and can remain active for up to 3 hours. They stay on the surfaces for even more time due to their lightness.[12] The maximum distance of transmission for SARS-CoV-2 aerosols could range from 4 meters to 8 meters.[13-15]

Clinical data indicate that approximately half of the patients with COVID-19 do not have fever during early stages of the disease, with some patients presenting to the otolaryngologist with fairly innocuous symptoms such as nasal congestion, sore throat, and hyposmia.[16]

Where lockdown had many beneficial effects, it also had its share of adverse effects. Throughout the entire nation, many big hospitals that cater to a large population of the state were converted to dedicated COVID care facility, with absolute cessation of all consultation of non-COVID cases. Also, testing could not be carried out in patients who were afebrile in the early disease or were asymptomatic. These patients ultimately aided in spreading of infection.[17]

All patients coming to hospital should pass through the triage system. All routine ENT consultations should be commenced with adequate distancing between doctor and patient. Minor ailments and regular follow ups were done via telemedicine. Every HCW (health care worker) in the hierarchy should not just be educated but also monitored regarding following of new norms like social distancing, wearing respirators, following PPE and respiratory etiquettes, and hand hygiene.

We suggest that all otorhinolaryngologists should examine every patient like a potential carrier of SARS-CoV-2 virus and suspecting every patient as potential COVID-19 patient. Hence, the use of PPE in examining every patient is incontestable.

Learning the lessons from not just other countries that had already been affected by the pandemic, but also from other institutions and practitioners of the nation which have planned out a way of providing medical services to the public amidst the corona scare, an indigenous triage and safety paradigm was formulated by the department of ENT, meeting the necessary recommendations that helped in successfully fulfilling the surgical needs of the public during the pandemic.

CONCLUSION

Through this study, we suggest that given the current pandemic situation and with high false negative rate associated with its diagnostic tests, a proper triage and safety paradigm is followed while dealing with patients admitted in the otorhinolaryngology department for surgical intervention. This helped us in giving the best possible surgical care to the patient as well as minimize the cross-transmission of virus from patient to patient, patient to health care worker, and from health care worker amongst each other.

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