Received: 5 May 2020 | Accepted: 2 June 2020

DOI: 10.1002/lio2.417

REVIEW

Laryngoscope Investigative Otolaryngology

Recommendations for surgical management of recurrent nasopharyngeal carcinoma during COVID-19 pandemic

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Abstract

Nasopharyngeal carcinoma is endemic in southern parts of China including Hong Kong. Primary treatment entails radiotherapy ± chemotherapy depending on disease stage at presentation. Surgery is offered as a means of salvage for persistent and recurrent disease. Comprehensive preoperative work-up, careful patient selection, attention to details perioperation and multidisciplinary approach is essential in ensuring optimal outcomes after salvage surgery for recurrent nasopharyngeal carcinoma patients. Since the COVID-19 outbreak, we are faced with unprecedented challenges with priorities of care and resources being shifted to combat the virus. These include patient selection and timing of treatment, while preventing disease transmission to heath care providers. Practices and recommendations made in this document are intended to support safe clinical practice and efficient use of resources during this challenging time.

KEYWORDS

COVID-19, endoscopic nasopharyngectomy, maxillary swing nasopharyngectomy, recurrent nasopharyngeal carcinoma, robotic nasopharyngectomy

1 | INTRODUCTION

Nasopharyngeal carcinoma (NPC) is endemic in southern parts of China and Southeast Asia. According to the International Agency for Research on Cancer, amongst the 129 000 newly diagnosed cases of NPC in 2018, more than 70% were from the eastern and southeast parts of Asia, with an age-standardized rate of 3.0 per 100 000 in China compared with 0.4 per 100 000 in Caucasian populations.[1] According to the Hong Kong Cancer Registry, the incidence of NPC is ranked top 10 particularly in male patients.[2] Primary treatment for NPC is radiotherapy ± chemotherapy depending on the stage of disease at presentation. Surgery serves as a means of salvage for persistent and recurrent tumors. Depending on tumor size and location, resection can be via endoscopic, robotic, or maxillary swing approaches.[3-5]

SARS-CoV-2 virus is the causative agent of the coronavirus disease 2019 (COVID-19). It is found in high abundance in the upper aerodigestive tract mucosa, particularly the nasopharynx.[6] Patients may be asymptomatic at the time of presentation.[7] There is currently no accurate way of diagnosis.[8] Viral transmission is via close contact and droplets. Airborne transmission may occur during aerosol generating procedures (AGP) including tracheal intubation, noninvasive ventilation, tracheotomy, cardiopulmonary resuscitation, manual ventilation before intubation, and bronchoscopy.[9] As the number of confirmed COVID-19 cases increases worldwide, there is a global shortage of personal protective equipment (PPE). Hence as head and

neck surgeons, we are at great risk of becoming infected when treating patients with recurrent NPC.

The following have been adopted by the Division of Head and Neck Surgery at the Department of Surgery of The University of Hong Kong in Queen Mary Hospital when performing salvage surgery for patients with recurrent NPC. Such practices and recommendations aim to prevent viral transmission to health care providers whilst providing timely treatment for our patients at times of PPE shortage.

1.1 | Patient selection

1.1.1 | Tumor status

All patients are to undergo comprehensive work-up for tumor staging including clinical and endoscopic examination with biopsy taken for histological confirmation, and ultrasonography of the neck ± fine needle aspiration for cytology of suspected neck nodal metastasis. Magnetic resonance imaging (MRI) ± whole-body positron emission tomography scans are also performed for tumor staging. A baseline circulating cell free Epstein-Barr virus (EBV) deoxyribonucleic acid (DNA) measurement before surgery may be used as a molecular marker in the monitoring of response after treatment in the majority of patients.[10] Patients with intracranial extension, cavernous sinus invasion, and distant metastasis are not suitable surgical candidates, and will be referred to oncology for consideration of nonsurgical treatment.

1.1.2 | COVID-19 status

In accordance with that suggested by the hospital infection control unit, if resources allow, patients should be quarantined in hospital 14 days prior to surgery followed by two sets of polymerase chain reaction (PCR) test for nucleic acid sequence homology in nasopharyngeal and throat swabs taken 24 hours apart. If patients remain asymptomatic throughout the 14 days, together with two negative sets of PCR results, then we can safely conclude that patient is COVID-19 negative, whereby we can proceed with operation in the usual manner with standard precautions.[11-13]

Otherwise, admission to head and neck surgical ward is only allowed (a) on declaring absence of travel history 14 days prior to surgery, (b) absence of close contact with confirmed cases, and (c) tympanic body temperature < 37.5°C taken at ward entrance. On admission, routine bloods including white cell count and chest X-ray are checked. As recommended by Centre for Health Protection in Hong Kong (CHP) and hospital infection control unit, PCR tests will only be tested for febrile and symptomatic patients ± radiological changes on chest X-ray.

Patients who are confirmed with COVID-19 will be managed jointly with microbiologists, respiratory physicians, and the hospital infection control team. Surgery will be deferred until resolution of symptoms and in the presence of two sets of negative PCR test results. From our experience, a waiting time of up to 12 weeks is acceptable for patients with recurrent NPC.

1.2 | Infection control

According to World Health Organisation (WHO), standard droplet and contact precautions with the use of medical masks, eye protection, cap, gown, and gloves are sufficient for regular care of COVID-19 patients. However, when performing AGP for unknown, suspected and confirmed COVID-19 patients, WHO, Centres for Disease Control and Prevention (CDC) and CHP recommend full barrier protection to avoid disease transmission to health care providers. Such PPE includes gloves, goggles, face shield and gowns, as well as items filtering facepiece respirators such as N95 or powered air-purifying respirator (PAPR) hoods and aprons.[11-13]

To reduce the risk of viral transmission and conserve PPE at times of global shortage, the number of health care providers within the operating theatre is kept at a minimum at all times. Surgery is to be performed by a consultant surgeon who is experienced in the surgical management of recurrent NPC assisted by a maximum of two fellows who have completed their head and neck surgical fellowship, and one scrub nurse experienced in assisting the aforementioned surgical procedures. Such arrangements would help to shorten operation time; reduce blood loss; minimize duration of aerosol exposure; diminish perioperative morbidity; shorten hospital stay; and decrease risk of viral transmission to health care providers.

1.3 | Procedural considerations

1.3.1 | Intubation and tracheostomy

In view of COVID-19 pandemic, there have been many guidelines and protocols on how to manage the airway, intubate and perform tracheostomy for unknown, suspected and confirmed COVID-19 patients.[14-16]

To minimize aerosol exposure, complete paralysis of the patient must be ascertained throughout the procedure; mechanical ventilation is stopped prior to tracheotomy; tracheotomy is performed using scalpel knife; suction is not to be used during and after tracheotomy; all tracheostomies are to be performed by one consultant surgeon, one consultant anesthetist, and one scrub nurse experienced in the management of airways and the procedure. Thorough communication before and during the procedure is essential to ensure swift and bloodless execution whilst minimizing aerosol generation.

Other than full barrier protection for all parties, we make use of a clear sterile plastic drape suspended over two horizontal anesthetic screens to create a spacious sterile working “box” in which the surgeon performs tracheostomy. The “plastic box” acts as an additional physical barrier, further protecting the surgeon and health care providers in the operating theatre against droplet and aerosol contamination. Such a set-up is functional, readily available and cost effective.

With such a set-up, face shield can be spared for the surgeon and scrub nurse.[17]

1.3.2 | Minimally invasive nasopharyngectomy

Transnasal endoscopic approach is classically offered to patients with early tumors which are limited to the mucosa and those with early invasion of the parapharyngeal space. Four instruments are deployed through two nostrils, enabling resection of tumors in the nasopharynx via natural orifices in the absence of external scars and disruption of normal bony structures. Recent advances in technology including three-dimensional endoscopic system and endoscopic navigation system has enabled accurate dissection of tumor at the pterygopalatine fossa, isolation of the petrous and paraclival internal carotid artery (ICA), and resection of the petrous bone in the vicinity, which in turn enables surgical salvage of more locally advanced tumor at the skull base and parapharyngeal space.[18,19]

Transoral robotic surgical (TORS) nasopharyngectomy is conducted via a transpalatal wound, whereby a three-dimensional high-definition camera and two dexterous Endowrists are deployed. TORS approach may also be combined with transnasal endoscopic approach when there is skull base bony involvement. The disadvantage of TORS is the lack of tactile sensation which is crucial when resecting more extensive tumors, for example tumors invading the parapharyngeal space, whereby the ICA can be inadvertently injured during the process. Hence, TORS nasopharyngectomy is limited to the resection of small recurrent tumors with minimal parapharyngeal invasion.[4,20,21]

Minimally invasive nasopharyngectomy via endoscopic or robotic means can be performed with the help of one surgical assistant compared with two for open approaches. This has the advantage of minimizing manpower in the operating theatre, conserve PPE and reduce risk of viral transmission.

During the COVID-19 outbreak, there are concerns regarding minimally invasive approaches to the nasopharynx and skull base, in particular endoscopic approaches as a result of high viral load within the nasopharynx, and the risks of aerosolization of blood and irrigation fluids generated by diathermy and high-speed debriders and drills.[22,23] Controlled irrigation and vigilant suction of smoke, fluid and blood connected to smoke and high-efficiency particulate air (HEPA) filters by the first assistant is crucial in minimizing the risk of aerosolization. The oral cavity can be sealed with a piece of 3 M tape to further prevent aerosol leakage. Full barrier protection is advocated for all including the operating surgeon, surgical assistant and scrub nurse.

In theory, the risk of aerosolization and viral transmission to health care providers is lower with TORS as a result of the lack of bone instruments such as high-speed debriders and drills; the surgeon operates from a surgeon console which is away from the operative field; the surgical assistant and scrub nurse are both situated further away from the operative field when compared with endoscopic and open approaches. To minimize risk of droplet and aerosol contamination, the following steps are taken: (a) ensure that the cuff of the endotracheal tube is inflated with no evidence of air leak and (b) a Fr 16 Nelaton suction catheter connected to a surgical suction system with smoke and HEPA filters is placed in each nostril for suctioning of saliva prior to docking and also of blood, diathermy smoke and aerosols during the operation. The catheter(s) may be repositioned during the operation as necessary. Full barrier protection may be provided to the surgical assistant and scrub nurse. However, routine use of a face shield as an adjunctive PPE is not necessary.[24]

The creation of a sterile working space with a clear plastic drape suspended above the surgical field connected to a surgical suction system with smoke and HEPA filters, and fenestrations for passage of instruments can help to further minimize droplet and aerosol contamination during endoscopic surgery and TORS. This in turn reduces risk of viral transmission to health care providers within the operating theatre.[25] Furthermore, such a set-up obviates the routine use of a face shield as adjunctive PPE, thereby conserving resources.

1.3.3 | Maxillary swing nasopharyngectomy

The maxillary swing approach entails a Weber Ferguson Longmire incision; osteotomies of the anterior wall, medial wall of the maxillary antrum and the lower portion of the zygomatic arch; and separation of pterygoid plates from the maxillary tuberosity. The maxillary osteocutaneous unit can then be swung out whilst maintaining its blood supply from branches of the external carotid artery. This approach provides a comprehensive exposure of the ipsilateral nasopharynx down to the oropharynx inferiorly and the parapharyngeal space posterolaterally. With the removal of the posterior part of the nasal septum, the contralateral nasopharynx can also be exposed. As a result, tumors in the nasopharynx, parapharyngeal space and retropharyngeal lymph nodes can be resected safely with adequate margins. The ICA can be easily identified and safe-guarded by palpation, intraoperative ultrasound and/or navigation. In case of exposed ICA, the artery is covered by a piece of well-vascularized, previously nonirradiated tissue, for example the vastus lateralis muscle via microvascular tissue transfer, to avoid subsequent blow-out bleeding. For tumors encasing the ICA, staged surgery in the form of extracranial intracranial bypass, followed by en-bloc resection of tumor and ICA via the maxillary swing approach can be offered for selected patients.[26-29]

We have previously demonstrated widespread and high rates of droplet contamination on face shields of the operating surgeon and two surgical assistants whilst performing osteotomies during maxillary swing approach.[24] Other than blood, irrigation fluid also contributed to the vast number of droplets. Vibrations of saw blade caused droplets to be dispersed over a large area during osteotomy. This can be minimized by controlled irrigation and vigilant suction to minimize the amount of irrigation fluid and blood accumulating around the saw blade. Operation by an experienced surgeon would also help to reduce blood loss and shorten procedure time. The use of an addition physical barrier such as a plastic drape is not recommended for maxillary swing nasopharyngectomy—the plastic drape would limit working space during osteotomy; blood-stained droplets on the plastic sheet generated from osteotomies together with reflection and refraction of head-light during nasopharyngectomy will significantly

impair surgeon's visibility. Instead, full barrier protection should be provided for the operating, first and second assistant surgeons. Face-shield as an adjunctive PPE is necessary for all three parties during osteotomy.

1.4 | Tracheostomy care postoperation

NPC patients suffer from swallowing dysfunction secondary to radiation induced fibrosis—salivary gland dysfunction leading to dry mouth, oropharyngeal muscle fibrosis and cranial nerve palsies from perineural fibrosis. As a result, they present with impaired tongue movement, bolus formation, soft palate movement, pharyngeal contraction, epiglottic retroflexion, laryngeal elevation, and delayed swallowing. In addition, there is also decreased supraglottic sensation and coughing effort, rendering them prone to silent aspiration and pneumonia. The additional scarring from salvage nasopharyngectomy further aggravates such swallowing problems.[30-32]

In an attempt to minimize pneumonic risks, we ensure the following: (a) patients are kept nil per oral with a nasogastric tube or gastrostomy tube inserted intraoperation. Gastrostomy tube is inserted for patients with anticipated prolonged swallowing training and/or low swallowing rehabilitation potential—clinical and/or radiological evidence of silent aspiration; decreased supraglottic sensation ± vocal cord palsy on preoperation endoscopic assessment; and elderly patients (b) regular bedside sputum suctioning, daily vigorous chest physiotherapy by physiotherapists ± bronchoscopic toilet starting day 1 postoperation, (c) use of a nebulizer to prevent drying up of secretions which in turn can lead to airway obstruction, (d) early mobilization, (e) ensure adequate nutrition via regular assessment by dietician, (f) assessment of aspiration risks with speech therapists prior to resuming oral feeding and weaning tracheostomy tube, (g) in case a prolonged tracheostomy tube is required, we will use a nonfenestrated cuffed Shiley tube to facilitate cleansing of inner tube and prevent airway obstruction.

However, as a result of the COVID-19 outbreak, nebulizer has been refrained for fear of viral transmission via aerosolized steam. This has led to a noticeable increase in incidence of tracheitis early postoperation, complicated by bleeding and airway obstruction from sputum plugs and blood clots within the airway and tracheal tube. After discussion with the hospital infection control unit, nebulizers can be offered to high risk patients postoperation if they remain asymptomatic during in-hospital quarantine 14 days prior to operation followed by two negative sets of PCR tests. These high-risk patients include those who have clinical evidence of silent aspiration preoperation and the elderly. Nebulizers can be provided in an airborne infection isolation room or an adequately ventilated single room with at least 12 air changes per hour and negative pressure differential with respect to the corridor or an adequately ventilated single room with at least 6 air changes per hour and use of portable HEPA filter unit.[33]

1.5 | Follow-up

Patients are seen in our outpatient clinic at regular intervals on discharge—every month during the first year, every 2 months during the second year and so forth. During each follow-up, patients will undergo clinical and endoscopic examination to look for evidence of disease recurrence. We would also recommend MRI ± EBV DNA at 6 monthly intervals.

However, as a result of the COVID-19 pandemic, outpatient services and endoscopy services have been reduced by 60% and 80% respectively to minimize social contact, conserve PPE, and reduce the risk of viral transmission amongst patients and health care providers. Endoscopic examinations can only be performed in dedicated locations for symptomatic patients. As a result, during this period, for patients more than 3 months postoperation, we have adopted a combination of phone consultations and face-to-face consultations, with the latter being reserved for those with suspicious findings; unable to conduct phone consultations for example hearing impairment and/or tracheostomy tube dependent; uncomfortable with phone consultations alone.

2 | CONCLUSION

Comprehensive preoperative work-up, careful patient selection, attention to details perioperation and multidisciplinary management is essential in ensuring optimal outcomes after salvage surgery for recurrent NPC patients. Such should not be compromised despite the COVID-19 pandemic. Practices and recommendations made in this document are intended to support safe clinical practice and efficient use of resources during this challenging time.

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How to cite this article: Chow VLY, Chan JYW, Wong STS, Wei WI. Recommendations for surgical management of recurrent nasopharyngeal carcinoma during COVID-19 pandemic. *Laryngoscope Investigative Otolaryngology*. 2020;5:468–472. https://doi.org/10.1002/lio2.417