

How I Do It

Closed Total Laryngectomy During the COVID-19 Pandemic Disease

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INTRODUCTION

Surgical activity during the coronavirus disease 2019 (COVID-19) pandemic diffusion has been reduced in several centers to emergency and oncological procedures only, in accordance with the national scientific medical societies' guidelines and governments' indications from March to May 2020.

Otolaryngology represents one of the most hazardous surgical specialties with regard to severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) exposure due to the close contact with the upper respiratory tract, where viral load is particularly elevated. The exposure and manipulation of these areas during endoscopic evaluation and surgery can aerosolize the virus over the surgeon or within the operating room.¹

The Italian Society of Otolaryngology recently published guidelines for the surgical management of ear, nose, and throat procedures (www.sioechcf.it). Elective procedures should not be performed unless they are urgent or cannot be deferred (e.g., oncological diseases, risk of permanent organ damage, or life-threatening conditions). The guidelines include the execution of two swabs (4 days and 48 hours before surgery) for COVID-19 testing. If the test cannot be performed before a procedure, the patient must be considered as positive and the procedure should be performed with full personal protection equipment (PPE). Moreover, it cannot be excluded that the quality of PCR testing for detecting SARS-CoV-2 could be jeopardized by several factors (e.g., collection of inappropriate/inadequate material, virus-specific diagnostic window).²

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Total laryngectomy represents one of the procedures that cannot be deferred; nevertheless, it leads to prolonged exposure of a potentially infected or infected airway while performing the opening and suturing of the pharynx, which represents a risk that cannot be underestimated during the current COVID-19 pandemic.

Different suturing techniques of the pharynx have been described in the last years. Manual suturing is the most widely used; however, mechanical suturing devices are another well-established option.³

In this report, we present a modified surgical technique using the mechanical linear stapler for closure of the pharynx that, beyond the already described advantages associated with the mechanical stapler suturing,³ can be considered an effective tool to reduce the risk of SARS-CoV-2 spread in the operating room during total laryngectomy.

METHODS

From the beginning of COVID-19 outbreak we, modified our procedure for total laryngectomy. Together with the use of the linear mechanical stapler for closure of the pharynx (ETHICON Linear Cutter NTLC75, J&J Medical N.V., Belgium), we made some modifications to our tracheostomy technique and to the management of the specimen.

The preoperative evaluation of the lesion was always performed using flexible HD-video pharyngo-laryngoscopy coupled with the NBI (Olympus Medical System Corp., Tokyo, Japan) to precisely assess the margins of the tumor. Computed tomography with or without magnetic resonance imaging was considered part of the staging. The biopsy was performed as a frozen section at same time of laryngectomy in order to avoid two separate procedures with general anesthesia, unless clinical staging required a panendoscopy.

Inclusion criteria were the presence of laryngeal malignancy without pharyngeal involvement with indication for total laryngectomy. Involvement of the thyroid cartilage was not a contraindication for stapler use because it does not modify the pharyngeal closure. Contraindications for the closed procedure were involvement of the posterior part of the paraglottic space lateral to the arytenoid; involvement of the mucosa of the suprahoid epiglottis, in particular the lingual surface; and

involvement of the mucosa of the aryepiglottic folds and post-cricoid area.

The surgical procedure is described below and showed in Video S1:

During intubation, and then only for the 20 minutes that follow, anesthesiologists and essential staff are allowed to be inside the operating room.

1. The nasogastric feeding tube (NGT) is inserted before surgery using a video flexible naso-pharyngo-laryngoscope, which increases the distance between the operator and the patient's airway.
2. The skin incision, raising of the flap, and lateral neck dissection are performed following the standard technique. The use of cold scalpel and scissors is preferred to monopolar cautery; suturing of the vessels is preferred to bipolar coagulation; and a smoke evacuator is always used to reduce the spread of plume, which can potentially contain viral particles.⁴
3. After neck dissections, the larynx is released like in the standard technique: the pyriform sinuses are freed through dissection from the perichondrium of the thyroid cartilage, after the section of the pharyngeal constrictor muscles. After an oblique incision at the third and fourth tracheal rings, the incision is extended from the tracheoesophageal groove to the postcricoid area, exposing the cricoarytenoid muscles. The hyoid bone is then removed, and the mucosa of the lingual surface of the epiglottis is released from the perichondrium via a submucosal plane using scissors and a delicate swab, allowing to separate the larynx from the remaining part of the mucosa of the pharynx. Traction of the epiglottis avoids its being caught in the stapler jaws.
4. Before the opening of the trachea, the cuff of the ventilation tube is pushed below the desired point of opening. The cuff is overinflated, and the trachea is sectioned and sutured to the skin. The mechanical ventilation is stopped; the orotracheal tube is removed; and a new tube is positioned in the tracheostomy. Once the tracheal tube's balloon is inflated, a povidone iodine-soaked gauze is introduced into the tracheal lumen and the ventilation is reestablished. A second povidone iodine-soaked gauze is placed into the distal tracheal stump in order to prevent exposure of the tracheal mucosa.
5. The stapler with its opened jaws is inserted obliquely below the larynx, and the suture is performed allowing for a closed



Fig. 1. Oblique stapling allows an easy and complete engagement of the mucosa by the stapler jaws. It represents a compromise between transversal and vertical orientation, the first will be too large for the stapler with excessive traction of the mucosa, the latter has the chin as obstacle for the proper engagement of the mucosa.

technique without any contamination of the surgical field and operating room (Fig. 1).

6. The gauze in the trachea is removed only before the insertion of the tracheostomy tube which balloon cuff is inflated.
7. The specimen is opened in a dedicated area far from the operating room by the surgeon with full PPE to check the radicality of the resection, and the tracheal gauzes are considered and managed as hazardous waste when disposed of.

RESULTS

Between February 15, 2020, and April 7, 2020, we performed four total laryngectomies (3 males, 1 female; mean age 66 years, range 41–87 years) using the described technique. All patients were treated for glottic squamous cell carcinoma (3 patients were never treated before and staged as cT4N0M0; 1 patient was treated for recurrence of the disease after radiotherapy performed for cT2N1M0 glottic cancer). All patients underwent total laryngectomy and bilateral neck dissection. The evaluation of excision showed clear margins in all cases. After definitive histology, staging was T4N1M0 for the first two patients who were discharged at day 15; NGT was removed at day 13. The remaining two patients (currently still waiting for definitive histologic results) are still hospitalized, and no clinical signs of pharyngocutaneous fistula have been observed.

DISCUSSION

Several studies demonstrated the advantages of the use of linear stapler for the closure of the pharynx. These include significant reduction of operating time, minimal contamination of the operating field by pharyngeal secretion, rapid recovery of swallowing, reduction of hospitalization time, and similar rate of pharyngocutaneous fistula.³ The additional advantage of minimizing the exposure of the aerodigestive mucosa makes the stapler a tool of primary importance in the total laryngectomy during COVID-19 pandemic diffusion.

Given the controversial indication of the rhinopharyngeal swabs for asymptomatic patients and the consequent unavailability due to increased demand that could not be met, none of our patients underwent the test. Moreover, false negative results are possible due to the low viral load during the first days of infection and during the final phase of the infection.²

Therefore, since the beginning of the COVID-19 pandemic our policy has been to act like every patient was infected in order to avoid further unrecognized infection.

To date, we do not have certainty about the duration of the COVID-19 epidemic; therefore, univocal indications are needed on the procedures that cannot be postponed, such as those concerning surgical and nonsurgical management of oncologic patients. All gestures must be adapted to this emergency, minimizing the risk of infection for healthcare professionals.

There are some mandatory preoperative and postoperative procedures still at risk for viral exposure, such as diagnostic flexible naso-pharyngo-laryngoscopy, which unfortunately is unavoidable. The preliminary direct

laryngoscopy, usually performed for panendoscopy and biopsy under general anesthesia, can be avoided if the preoperative clinical staging is precise using NBI followed by radiologic imaging because the histology can be obtained at the time of the main operation as a frozen specimen. The positioning of the NGT can also be performed during the intubation in order to reduce the viral exposure.

Few options have been proposed for a safer postoperative management of the tracheostomy, such as the use of viral filters and closed suctioning systems.⁵ The present protocol of closed total laryngectomy allowed us to safely continue to treat advanced laryngeal cancer during the pandemic diffusion of SARS-CoV-2, minimizing the exposure to open airways with risk of infection of the surgical staff.

The protocol applied in the present technique respected the COVID-19 guidelines of the Italian Society of Otolaryngology at the time the article was written. The

guidelines will necessarily change and evolve in the future and will be different in other countries; thus, the readers should comply to the updated guidelines of their local health authorities.

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