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Magnifying endoscopy with narrow-band imaging to assist the linear stapler closure of the pharynx during total laryngectomy

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ABSTRACT

Objective: This study aimed to present a novel technique for stapler-assisted laryngectomy under direct visualization using a videoendoscope with narrow-band imaging (NBI-endoscopy).
Methods: A case series of five consecutive patients were treated with stapler-assisted total laryngectomy from December 2014 to March 2016. The technique involved monitoring the stapler closure of laryngopharyngeal cavity under NBI-endoscopic vision, triple checking of neo-pharynx cavity by an endoscopic view inside and transillumination verification outside, air leakage test, and guiding the insertion of feeding tube under direct visualization. The main evaluation of this study was pharyngocutaneous fistula, surgical margin, and oral feeding time.
Results: All the patients healed well without a pharyngocutaneous fistula. The mean of surgical time, oral feeding, and hospitalization time were 40 min, 6 days, and 8 days, respectively.
Conclusion: This study demonstrated a technique simple to learn and associated with decreased complication rates, which could be safe and efficient for stapler-assisted laryngectomy.

1. Introduction

The most common complication of total laryngectomy surgical is pharyngocutaneous fistula, with a global incidence of 18.2% [1,2]. Although it has reduced to 8.7% after 50 years of clinical practice for mechanical sutures in laryngectomy, the main complication of fistula is still a challenge for surgeons [3]. The first report of using a linear stapler in China came from the Department of Head and Neck Surgery in Sun Yat-Sen University Cancer Center in 2010 [4]; the incidence was 4.76%.

The advantages of stapler-assisted laryngectomy compared with traditional laryngectomy have been well demonstrated in the literature [5]. Total laryngectomy accompany with the three methods (open, semi-closed, and sealed) of using a linear stapler are available to close the laryngopharyngeal cavity. Although the open method could reveal the surgical margin in direct visualization, the risk of pharyngocutaneous fistula was higher in this method than in semi-closed and sealed methods. The semi-closed and sealed methods also have some limitations, including blindly removing the tumor, which makes the surgical margin uncertain, and blindly harpooning the epiglottis, which leads to the accidental damage to the laryngopharyngeal cavity. A videoendoscope with narrow-band imaging (NBI-endoscopy) was applied in the stapler-assisted laryngectomy to find a way to balance the advantages of the aforementioned three methods. Clinical experience, limitations, and outcomes of this novel surgical technique were discussed in this study. This novel study reported an NBI-endoscopy–assisted linear stapling device for laryngopharynx closure during total laryngectomy.

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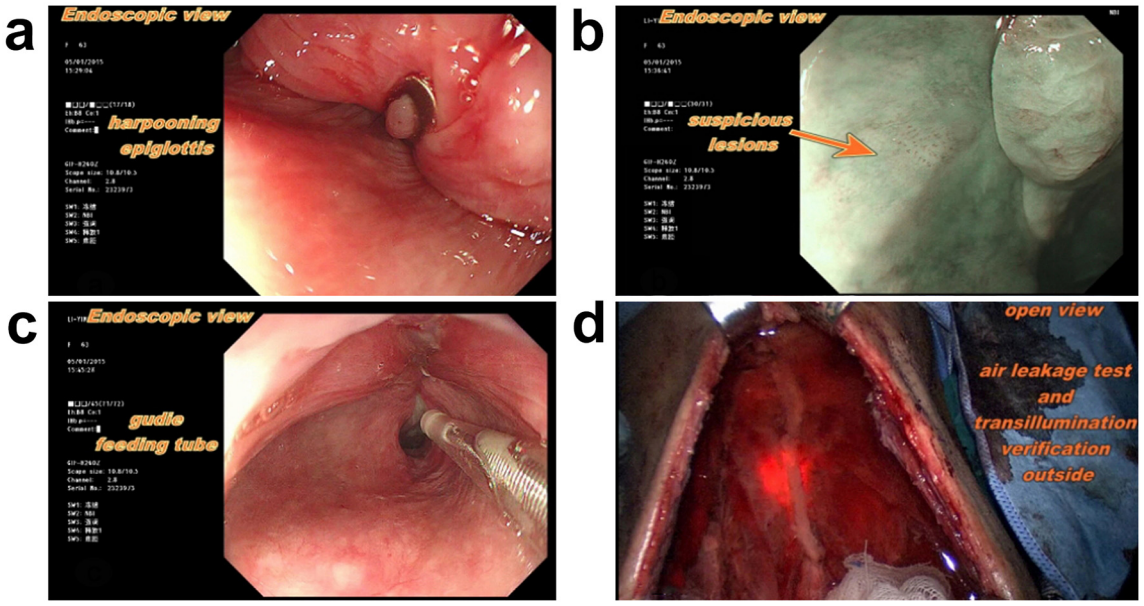

Fig. 1. (a) Holding the apex of the epiglottis under the guidance of the endoscopy. (b) Using white light and NBI to check whether the remaining mucosa had satellite or residual lesions. (c) The videoendoscope was left in the high cervical esophageal lumen to guide the insertion of the feeding tube under direct visualization. (d) A triple check by the videoendoscopic view inside, and the transillumination verification and the bubble test outside, was performed from the top to the end of the anastomotic stoma to check whether the stoma was watertight.

2. Patients and methods

2.1. Patients

From December 2014 to March 2016, a case series of five consecutive patients were treated with stapler-assisted total laryngectomy at the Department of Head and Neck Surgery in Sun Yat-Sen University Cancer Center. Each case of laryngeal cancer was provided with a personalized therapeutic approach to control cancer and for organ preservation by the multidisciplinary team (MDT) of Sun Yat-Sen University Cancer Center. This study was officially approved by the Ethics Committee of Sun Yat-Sen University Cancer Center.

2.2. Stapler-assisted total laryngectomy

Although many reports have revealed a decrease in total laryngectomies constantly over the years, this operation remains an essentially curative treatment. For each case, the decision to implement this type of mechanical suture was according to a subsequent imaging and endoscopy for this case. Contraindication for using mechanical sutures was as follows: no perioperative exploration of the suprahyoid epiglottis, piriform recess, or postcricoid was performed to show tumor involvement. Indication for using mechanical sutures was T3 and T4 laryngocarcinoma [6] that was limited to the larynx. Actually, the conditions for NBI in the new technique were the same as for using mechanical sutures. All the staplers used were linear models with 60-mm jaws, which were produced by Ethicon (Ethicon Endo-Surgery, Inc., OH, USA). The TA-60 linear stapler held a double row of 21 titanium staples. The double staggered row of staples closed instantly in B shapes and sutured the tissue between the jaws, ensuring maximum impenetrability. Total laryngectomy was performed according to the technique described in a previous study [4], which was performed by an experienced associate professor who had 20 years of experience in head and neck surgery. It allowed for any neck dissection to be performed before the skeletonization of the larynx. The stapler-with its jaws open-was inserted below the larynx after sufficiently dissociating the thyroid and cricoid cartilage, and separated from all muscular and neurovascular connections. The inner surface of the thyroid ala should be separate from pyriform sinuses in both sides. The bilaterally greater cornu of the hyoid bone was freed and resected. Moreover, we also cut the greater cornu of the thyroid cartilage off. This allowed for the maximum pharyngeal mucosa preservation and easier placement of the stapler. At this time, the larynx and the remaining thin mucosa and submucosawas of the hypopharynx was connected.

2.3. NBI-endoscopy

A modification was added to the technique to avoid blindly harpooning the epiglottis and checking residual mucosa. NBI-endoscopy was used, with the mechanical properties for 80–120 times optical magnification (GIF-H260Z, Olympus Medical Systems, Tokyo, Japan) for both white light imaging and NBI. This two imaging methods could be performed in the same video-endoscopy system (EVIS LUCERA system 290, Olympus Medical Systems, Tokyo, Japan). The NBI-endoscope was put through the oral cavity to guide the apex of the epiglottis in the position of the laryngopharynx. Then, skin hooks were put through the tracheal lumen to hold the apex of the epiglottis under the guidance of the endoscopy. The epiglottis was retroflexed into the laryngeal lumen with a skin hook under direct visualization (Video 1, step 1; Fig. 1c). When the jaws closed, the NBI electronic videoendoscope remained in the position of the laryngopharynx and was monitored alternately using white light and NBI to check whether the remaining mucosa had satellite or residual lesions (Fig. 1b). After the jaws were closed and the larynx was cut off with a scalpel, the videoendoscope remained in the laryngopharynx for laryngectomy under video-assisted observation (Video 1, step 2). The laryngeal specimen was sent for intraoperative cryosectioning for evaluating the stapled edge and a subsequent definitive anatomical-pathological examination.

After the stapler was re-opened and the pharynx was sutured linearly, the videoendoscope was left in the high cervical esophageal lumen to guide the insertion of the feeding tube under direct visualization (Fig. 1c). This could prevent the postoperative neo-pharyngeal cavity becoming too small. At the same time, air insufflation was performed to dilate and inspect the neo-pharynx lumen (the gas injection speed was 1000 mL/min, and the maintained pressure was 1 MPa). A triple check by the videoendoscopic view inside, and the transillumination