Stapler Closure Technique for Laryngectomy-Revisited

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Introduction

Mechanical staplers are commonly used in modern day surgical practice; an exponential increase in its usage is seen both in open as well as laproscopic, abdominal and thoracic surgeries. Although there are a few articles regarding the use of mechanical staplers in surgery of the larynx, its use has not gained much popularity among the head and neck surgeons. In the era of organ conservation, where in a majority of the laryngectomies are performed in the salvage setting (Post radiotherapy/chemo radiotherapy failures) the advantages of mechanical staplers can be utilized and hence the need to revisit the techniques of stapler closure for laryngectomy.

Technique

Stapler Closure Technique for Laryngectomy-Types

Stapler closure for laryngectomy defects can be performed in two ways, the open and the closed techniques.

Closed Stapler Technique This procedure is ideally suited for endolaryngeal lesions i.e. primary T4a laryngeal cancers and in patients requiring a total laryngectomy and in the salvage setting. Tumors with extension to suprahypoid epiglottis, vallecula, pyriform sinus, and postcricoid extension are preferably excluded to ensure histologically negative margins.

Technique An initial on-table rigid endoscopy is done in all patients to verify tumor extent and to ensure operability and suitability for laryngectomy using the closed stapler technique. The initial steps of the total laryngectomy proceed in the standard manner, special care needs to be taken not to disrupt the mucosal continuity of the larynx/hypopharynx. Comprehensive skeletonization of the laryngeal framework, although somewhat time consuming, is the key to successful performance of the procedure. Skeletonization is continued till the extent the laryngeal specimen remains connected to the hypopharynx only by the mucosa–submucosal layer. (Figure 1a) The mobilized larynx is stabilized with one hand and the cut end of the tracheal lumen and epiglottis are grasped with the aid of tissue holding forceps. Some surgeons have described a semi-closed technique [1] to avoid trapping the suprahypoid part of the epiglottis between the jaws of the stapler, but we feel that this can be avoided by proper release of the suprahypoid epiglottis. The assistant is then instructed to maintain mild cephalad traction of the laryngeal specimen with the tissue holding forceps, as the primary surgeon introduces and aligns the linear stapler (Ethicon Endo-Surgery TX60G 60 mm Proximate Linear Stapler, Reloadable) along the entire length and parallel to the pharynx/esophagus (Figure 1b) The stapler is then activated and fired taking care not to include the nasogastric tube or any other adjoining structures. A watertight staggered double-row suture line is created towards pharyngeal closure; the laryngectomy specimen is then removed by cutting flush with a scalpel on the rim of the linear stapling device. (Figure 2a, b) The adequacy of the surgical margin is then ascertained, frozen sections may be considered if deemed necessary. In the unlikely event of a positive margin, the mechanical suture line can be easily refashioned by using either the open technique or by the traditional hand suture. A second muscular suture layer can be usually applied to reinforce the stapled suture line.

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Fig. 1 **a** Skeletonization of the larynx is continued till the extent the laryngeal specimen remains connected to the hypopharynx only by the mucosa–submucosal layer. **b** Cephalad traction of the laryngeal specimen is maintained, as the primary surgeon introduces and aligns the

linear stapler (Ethicon Endo-Surgery TX60G 60 mm Proximate Linear Stapler, Reloadable) along the entire length and parallel to the pharynx/esophagus

Open Stapler Technique In the open technique of stapling, after a standard laryngectomy is carried out, the mucosal edges of the resultant vertical defect are aligned by evenly spaced stay sutures. The linear stapler is then introduced, as the assistant maintains cephalad traction over the stay sutures and the device is then activated and fired. According to the experience of a few authors and our own experience, there are no clear benefits over the method of traditional hand suturing.

Discussion

Historically, the first total laryngectomy completed for cancer was performed by Dr. Billroth in 1873. A pharyngo-cutaneous fistula developed in the post operative period complicating the swallowing function which eventually closed with time. The history of laryngectomy spanning nearly 140 years also reveals a quest for the preferred method for pharyngeal closure, with the expectation that patients would quickly retain their normal swallowing function. The basic requirements for favorable results are based on tension free watertight closure. This was traditionally achieved by various hand suturing techniques, the use of mechanical staplers, now seems to be an effective alternative.

The first use of mechanical staplers by head and neck surgeons in laryngectomy was in the 1960–70s. [1] The first reports of stapler use for laryngectomy in the West emerged

about two decades later. The beneficial effects of the use of mechanical staplers in a wide variety of surgical procedures are well recognized. These devices usually deliver a 2–3 rows of staggered staples and are ergonomically designed to aid the surgeon in minimizing tissue damage, thereby ensuring optimal wound healing.

The reported advantages of this technique are reduced overall short term complications which include fistulae rates, infection, and hemorrhage. [2–9] Mechanical suture requires only a few minutes, and thus the operating time is significantly reduced. [3, 9]

Speech rehabilitation is an integral part of all total laryngectomies, the gold standard of which is a trachea-esophageal puncture. (TEP) Compared with the open technique, the closed technique presents some difficulties in the creation of a trachea-esophageal puncture. However, techniques involving the use of a rigid/flexible esophagoscope and a modified Seldinger technique to safely create the TEP under direct visualization without disrupting the stapler suture line have been described. [10, 11]

The main drawback of the technique is that the tumor itself is not visualized during resection, and this harbors the potential for oncologic compromise if applied in unsuitable cases. Clear surgical margins and favorable oncological outcomes can be achieved in all patients with proper case selection. [1, 2, 5–10] We have shifted to using the closed stapler technique in the salvage setting of all patients of laryngeal cancers, who had endo laryngeal recurrences in

Fig. 2 **a, b** A watertight staggered double-row suture line is created towards pharyngeal closure; the laryngectomy specimen is then removed by cutting flush with a scalpel on the rim of the linear stapling device

the past 2 years. There was no mortality or any major procedure related morbidity.

In conclusion stapler closure technique for laryngectomy is an easy and fast learning technique, allowing watertight closure of the pharynx with a low risk of contamination of the surgical field in carefully selected cases. It seems to be an effective method, even in previously irradiated patients, who are traditionally considered as high risk for complications and increased postoperative morbidity.

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