A retrospective chart review was performed of all patients who underwent total laryngectomy between 2004 and 2014. All patients underwent primary closure of the pharyngeal closure. Patients were excluded from the study if pharyngeal reconstruction was needed with a laryngofacial flap or free tissue transfer. The patients were divided into 3 groups: 1) TLSC technique, 2) classic SATL technique, and 3) modified SATL technique. Data obtained included patient demographics, factors that contribute to wound healing (e.g., diabetes, hypertension), primary tumor staging, history of radiation and/or chemotherapy, occurrence of PCF, intraoperative complications due to the technique employed, postoperative NPO length, and length of hospital stay. Fisher’s exact test and independent t-tests were used to statistically compare the data between groups.

Surgical Procedures

A total of 52 patients met inclusion criteria for the study. Thirty patients underwent TLSC and 22 patients underwent SATL. Among the 22 SATL patients, 13 underwent the classic stapler technique and 9 underwent the modified stapler technique. The average age was 67 years and 48% of patients were male. Forty-four patients had squamous cell carcinoma, 2 patients had chorionicarcoma, 1 patient had adenoid cystic carcinoma, 1 patient had a giant cell tumor, 1 patient had spindle cell carcinoma, 1 patient had chordomas of the larynx, and 2 patients had intransigent aspiration. Of the patients who had squamous cell carcinoma, 77% (24 patients) had either T3 or T4 disease. There was no significant difference in patient demographics, medical comorbidities, or history of radiation and chemotherapy between groups. These findings are summarized in Table 1.

The average length of NPO time post-operatively could not be determined because this information was not consistently recorded in the patients’ records. The average length of hospital stay for all patients was 8 days. A primary tracheoesophageal puncture (TEP) was performed in 32% of the SATL patients (7 patients) and 21% of the TLSC patients (7 patients). Intraoperative complications for the TLSC group include 2 failed attempts through the epiglottis during direct laryngoscopy prior to performing the traditional closure technique. These failures were then passed into the trachea and later grasped to help invert the epiglottis prior to stapling. The patients in the classic SATL technique group underwent closure of the neopharynx using a TX408 linear stapler (Ethicon Endo-Surgery, USA). One load was used and no oversewing was performed. This technique was performed between 2010 and 2011 by the senior author. Patients in the modified SATL technique underwent closure in the following fashion: 1) Closure of the neopharynx was performed with a linear stapler-cutter device with vascular reloop (EndoGIA, US Surgical, Norwalk, CT, USA). 2) The exposed mucosa over the everted edge of the closure was then electrodispersed using a bovie electrocautery device (Figure 1). 3) The closure was reinforced by oversutting the suture line with interrupted 3–0 vicryl sutures (Figure 2). This modified technique was performed between 2012 and 2014 by the senior author.

In this study, we describe our improved rates of PCF with SATL and hypothesize that this is due to technical modifications specifically performed with the pharyngeal closure, which is reached by inserting a mechanical stapler. Based on animal studies, Sessions et al. suggested that pharyngeal stapling was associated with a significantly lower rate of PCF in their study. It is our hypothesis that these technical improvements decrease the rate of PCF by creating a mucosal seal of the pharyngeal closure, which is reached with the use of a mechanical stapler. This is complicated by conflicting results in the literature. In a recent systematic review of 1387 patients by Miles et al., PCF rates of 0%–52% were reported, with a meta-analysis of 319 patients showing a rate of 7% (p = 0.03). This difference may be in part due to the learning curve that is associated with SATL. Factors such as surgeon experience or technical modifications used, treatment of the everted mucosal edge, and whether or not a second layer of closure is performed.

In our experience, after modifications were made to the SATL technique, the rate of PCF decreased from 38.5% to 11.1%. These modifications include the use of a vascular staple load, electrodispersion of the everted mucosal edge, and oversuturing of the suture line. With training and technical refinements, SATL is a surgical technique that has many benefits over TLSC. It is a technique that is easy to teach. The results are easily reproducible because the same pharyngeal closure is obtained every time it is performed. However, unlike lower gastrointestinal stapling, this type of procedure is one that is time consuming compared to TLSC. However, the concern is whether the rate of PCF in this study and the systematic review demonstrated conflicting results. The largest study of SATL included 1387 patients and reported a PCF rate of 52% for the classic SATL technique. Oliveira et al. and other researchers in their studies have reported a rate of 6.7% for the modified SATL technique. However, the difference in the rate of PCF between the TLSC group and the modified SATL group (p = 0.019), but no significant difference between the TLSC group and the modified SATL group (p = 0.03). These findings are summarized in Table 2.

The rate of PCF for the SATL group, including both the classic and modified technique, was 20.3%. This rate was significantly lower compared to the TLSC group (9.3%) (p = 0.008). The rate of PCF between the SATL group and the TLSC group (p = 0.03), with a significant rate decrease in our rate of PCF, with results comparable to TLSC.

If the same or lower rates than PCF are obtainable with the SATL technique compared to the TLSC technique, then SATL could be considered to be more the more advantageous procedure. Our study suggests that comparable rates of PCF can be achieved with refinements in the technique of SATL, at which all add some surgical time or technical difficulty to the procedure.

In our experience, our rate of PCF for patients undergoing SATL was 11.1%, which is comparable to the TLSC technique. We saw no downside to using a stapler device for primary closure of the pharyngeal closure, and it was easy to perform.

Conclusions

SATL is easy to teach with reproducible results regardless of surgeon experience, and has similar rates of PCF compared to TLSC with appropriate technical modifications.

References