Chapter 18
Short- and Long-Term Dysphagia

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18.1 Introduction

Deglutition is a complex event that is conventionally divided into an oral, pharyngeal, and esophageal phase. Normal deglutition requires fine neuromuscular coordination of the organs of the upper aerodigestive tracts. Particularly, the pharyngeal phase begins the involuntary part of the swallowing mechanism. The stimulus or stimuli that initiate the pharyngeal phase are not clearly defined, but appear to be derived from the end of the oral phase and are carried by the ninth and tenth cranial nerves to the swallowing center in the reticular substance of the upper medulla. The four key components of the pharyngeal phase are (1) closure of the nasopharynx to prevent nasal reflux by approximation of the soft palate to the posterior nasopharyngeal wall, (2) elevation and closure of the larynx, (3) contractions of the pharyngeal constrictors, and (4) opening of the cricopharyngeus muscle. As well known, surgical resection of head-neck cancer results in predictable pattern of dysphagia and aspiration [1, 2]. Nevertheless, swallowing capabilities are usually a questionable matter after performing transoral robotic surgery (TORS) either for malignancy or obstructive sleep apnea (OSA) [3–16].

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18.2 Our Experience

The first robotic procedure for the treatment of sleep apnea was done in May 2008 at G.B. Morgagni- L. Pierantoni Hospital in Forlì. Since then, TORS is representing an important cornerstone for the surgical treatment of sleep apnea, especially in patients with the principal site of collapse in tongue base and epiglottis. In our clinical practice before TORS, we recommend to perform a drug-induced sedation endoscopy (DISE) in all patients with suspicious tongue base collapse in order to confirm the collapsible sites evaluated during an in-office endoscopy and to plan a multilevel surgery as described in Chap. 18. Unfortunately, besides the well-known postoperative dysphagia in oropharyngeal/laryngeal cancer patients, little is known about the possible implication on swallowing after sleep surgery. To better understand this important issue, we carried out a study [17] on 78 patients (57 males and 21 females) with mean 48 years/old (range 12–72 years/old) who underwent TORS for sleep apnea. The operative technique is already described in Chap. 25. The minimal sufficient tongue base tissue volume of 7 cm^3 is recommended for alleviating obstruction. In our study, larger number of patients underwent TORS for sleep apnea during the same period but we included only patients with available follow-up data. All patients were routinely evaluated on the swallowing functions with video fluoroscopic swallow study, and chest X-ray during the first postoperative week. Additional methods were applied for evaluating the swallowing function postoperatively including MD Anderson Dysphagia Inventory (MDADI) questionnaire [18] which the patient had to fill in a preoperative visit, during first week postoperatively and after 1 month post-surgery. Additional data about start of oral feeding (days), nasogastric feeding (days), and tracheal tube (days) were collected. Subjective complaints by the patients themselves were collected for the long-term evaluation. The patients were followed up for average period of 20 ± 7.12 months (range 7–32 months). Demographic and clinical data were recorded including patient age, sex, type of surgical procedures performed, TORS operative time, and volume of tissue removed.

Only 23 out of 78 underwent tongue base reduction alone, while the remaining 55 underwent TORS in combination with other procedures as a part of multilevel surgery. Epiglottoplasty was done in all cases (100 %). Tracheostomy was done in 64 (82 %) patients, while 13 (18 %) procedures were done without tracheostomy. Associated surgical procedures (nasal and/or palatal) were done in 70 % (55 of 78). Median anterior glossectomy was added in 19 % (15 of 78) patients to further reduce oral tongue (Table 18.1). The operative time calculated for TORS procedure alone ranged from 15 to 90 min with the mean of 39 ± 11 min. Calculation of the excised volume of tongue base and epiglottic tissue was routinely done and it ranged from 3 to 40 cm^3 with the mean of 12.35 ± 5.77 cm^3. The mean time of hospital stay was 8.5 ± 2.63 days (range 5–19 days). The mean time for tracheal tube removal was 3.5 days (range 3–4 days). The mean postoperative follow-up time was 20 ± 7.12 months (range 7–32 months). On short-term basis; various parameters

Table 18.1 Patient and treatment characteristics

Characteristics	No. (%)
Sex	
Male	57 (73)
Female	21 (17)
Associated procedures	
Tracheostomy	64 (82)
Nose and/or palate	55 (70)
Median anterior glossectomy	15 (19)
Epiglottoplasty	78 (100)

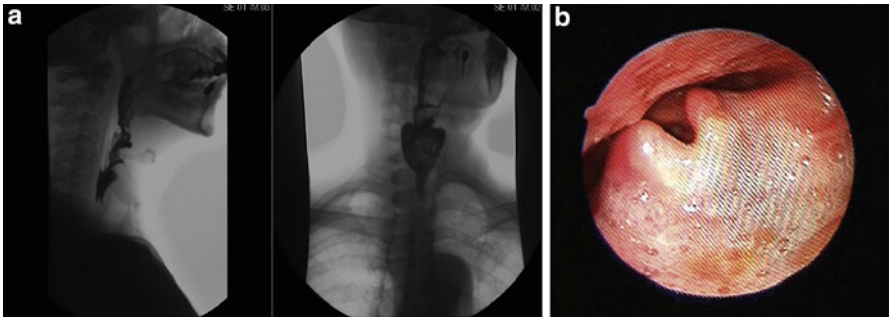

Fig. 18.1 (**a**) Video fluoroscopic swallow study after first postoperative week showing normal swallowing; (**b**) fiber-optic nasoendoscopy after 2 weeks of the same patient showing good healing with complete coverage of the removed part by mucosa

were used to evaluate swallowing outcomes in our patients, first using MDADI questionnaire which the patient had to fill in a preoperative visit, after first week postoperatively and after 1 month post-surgery. By comparing the preoperative score with the average of the two scores obtained postoperatively, there was minimal insignificant short-term impact on the swallowing function (4.58 ± 7.03 preoperative versus 5.18 ± 8.32 postoperative scores, $p = 0.56$).

Considering the result of video fluoroscopic swallow study performed to the patients in the first postoperative week after removal of tracheal tube, we noticed 59 (76%) patients with normal swallowing (Fig. 18.1), while 14 (18%) patients showed minimal aspiration, but only 5 (6%) patients experienced significant aspiration. Correlating the total volume of tissue removed from both tongue base and epiglottis to the results of video fluoroscopic swallow study regarding aspiration, no statistically significant relationship was observed ($p = 0.72$) (Fig. 18.2). Furthermore, any significant correlations between results of video fluoroscopic swallow study regarding aspiration and the different procedures added to TORS, such as midline anterior glossectomy or palatal surgeries, were not found ($p = 0.51$, $p = 0.09$, respectively). Additional parameters used are:

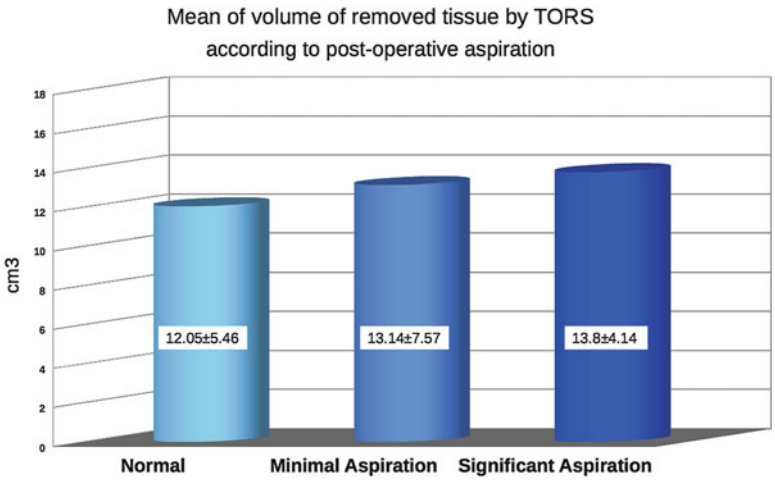

Fig. 18.2 Correlation among volumes of removed tissue from tongue base and epiglottis with grade of aspiration

- The timing for start of oral feeding: mean time 1.05 ± 0.25 days, range 1–3.
- Needing for nasogastric tube feeding: none of our patients needed nasogastric tube feeding.
- Finally, by evaluating chest X-ray findings as an indicator for chest problems related to aspiration: 72 (92 %) patients showed no lung infection or aspiration signs; 1 (1.2 %) patient showed irritation bronchitis and 1 (1.2 %) patient showed lung parenchymal density, possibly related to aspiration.

On long-term basis, none of all patients complained impairment of swallowing as assessed by the long-term consultations scheduled in the postoperative follow-up.

Moreover, by strictly following the 19 patients with initial abnormal findings on video fluoroscopic swallow study, we could demonstrate that their swallowing complaints disappeared completely within 3 months postoperatively and they also showed no remarkable weight loss related to their swallowing problems.

18.3 Discussion

One aim of this chapter is to describe the common problems related to swallowing that we usually encounter during our practice and to explain the evolution of these problems on long-term follow-up together with its impact on the patient quality of life. The results of our experience demonstrate no significant short-term impacts on swallowing in patients who underwent TORS for sleep apnea proved by nonsignificant increase in MDADI score after surgery. Also, by evaluating the results of video fluoroscopic swallow study that is usually performed in the first postoperative week, the percentage of

significant aspiration was very low (6%). Chest problems detected on chest X-ray and related to aspiration [irritation bronchitis (1.2%) and lung parenchymal density (1.2%)] are very low compared to the overall patient number. There was also rapid start of oral feeding within an average of 1–3 days with out needing of nasogastric feeding tube placement, but with a clear impact on shortening the hospital stay.

These results are not consistent with Richmon et al. [16] who stated that patients undergoing TORS for OSA are at greater risk of delay in initiation of oral diet and increased postoperative length of stay.

Also, they are better when compared to Chabolle's open tongue base reduction and hyoid epiglottopexy in which the start of oral feeding ranged from 9 to 21 days with mean of 15 days with decannulation range of 4–14 days and mean of 7 days [19].

Fujita et al. [20] reported on case of prolonged odynophagia after laser midline glossectomy and one case of minor change in taste, otherwise no persistent difficulties in swallowing. Mickelson et al. [21] reported no patients with prolonged or persistent dysphagia, odynophagia, loss of taste sensation, or aspiration after laser midline glossectomy. Powell et al. [22] stated that swallowing evaluations were unchanged from pretreatment and remained normal after radiofrequency tongue base reduction. De Vito et al. [23] did not report any significant complications with multilevel radiofrequency ablation including tongue base. Unfortunately, most of these studies did not provide real objective figures about swallowing problems after tongue base management.

We noticed that most of our patients experienced transient postoperative tongue numbness, and dysgeusia that is often described by the patients as altered sense of taste or a bitter/metallic taste. Fortunately, this complaint disappeared within 6 months in most of our patients (99%) with only one patient (1%) having persistent dysgeusia. We could notice also that irrespective of other associated procedures on the palate and even with performing tracheostomy, the final outcome is reasonable and the incidence of real and persistent dysphagia is very low, as we did not observe any significant and objective dysphagia after 6 months postoperatively especially by strictly following up the 19 patients with initial abnormal findings on video fluoroscopic swallow study. In five patients, where a subjective paresthesia in the pharyngeal area and in tongue base was registered, a completely normal physical examination, negative endoscopy, and a totally normal functional profile at swallowing protocol in our institution (fluoroscopy, functional endoscopic evaluation of swallowing) were evident. It means that a subjective subtle complaint must be put into account without any need of special therapy. One more additional observation in the analysis of our experience was the absence of any significant correlation between the incidence of aspiration problems as shown on video fluoroscopic swallow study and the volume of tissue removed from both tongue base and epiglottis. In our opinion, this will give more confidence during resection of tongue base but certainly with respect to the neural and vascular anatomy of that region.

In a previous unpublished data, we noticed that success is volume sensitive, and that was evident when we divided our patients into three groups (Fig. 18.3) according to the volume of tissue removed from both tongue base and epiglottis and calculated the percentage of successful and failed cases in each group, the group where between 10 and

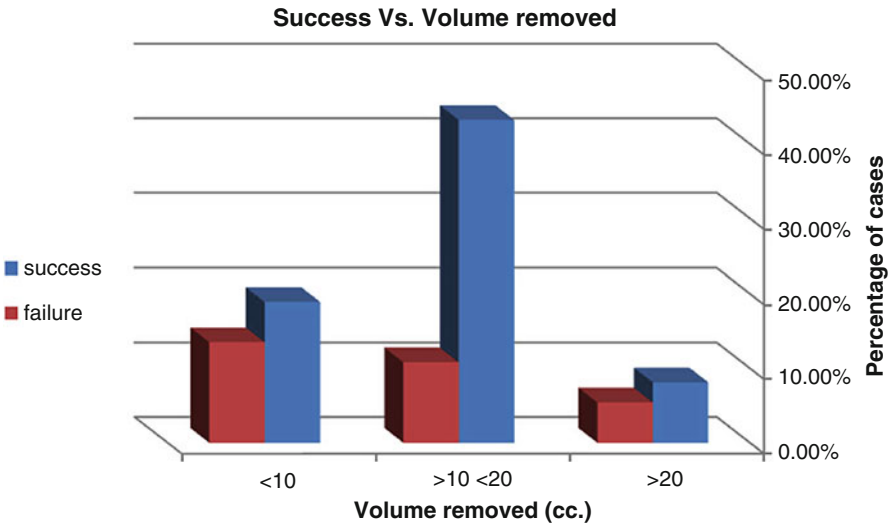

Fig. 18.3 Success versus volumes of removed tissue from tongue base and epiglottis

20 cm^3 of tissues were removed showed greater success-to-failure ratio, and accordingly we considered removal of 10–20 cm^3 as ideal for our resection in order to get better outcome after surgery.

18.4 Conclusion

- Transoral robotic surgery can be safely performed in OSA-suffering patients with an acceptable outcome.
- The return to normal oral feeding is rapid and complete with no negative impacts on quality of life.
- The postoperative swallowing assessment is highly recommended in order to identify the signs of aspiration.
- An early identification of swallowing impairment allows a quick and adequate restoring.

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