Swallowing Problems after Thyroidectomy*

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Introduction

Thyroidectomy is a commonly-performed procedure.1 Dysphonia and dysphagia are common after thyroidectomy, and can affect the patient’s quality of life.2 Voice and swallowing complaints occur between 15 and 90 days after surgery.3 Though spontaneous complaints regarding swallowing are not common, it has been observed that the frequency of these complaints is like that of complaints regarding voice when the patient is asked about them.4 These changes can be due to several factors, including surgical manipulation, scar retraction, and the possibility of injury to the external branch of the superior laryngeal nerve and recurrent laryngeal nerve.5 Other factors such as endotracheal intubation, neural plexus injury, and reaction to pain also deserve attention.6 Although swallowing problems after thyroidectomy are common, objective assessments of these issues and their relationship to the subjective assessments are scarce in the literature. In the present

Abstract

Introduction Thyroidectomy is a common procedure. Certain swallowing problems could happen after this surgery and affect the quality of life of the patient.

Objective To evaluate swallowing after thyroidectomy in the early and late postoperative periods and to correlate subjective and objective parameters.

Methods A prospective study with 100 patients who underwent total thyroidectomy at our institution from April 2018 to September 2019. Each patient was assessed by the Arabic version of the Eating Assessment Tool (EAT-10) questionnaire and the fiberoptic endoscopic evaluation of swallowing (FEES) preoperatively, and in the early postoperative (EPO) and late postoperative (LPO) periods.

Results The rate of dysphagia was of 82% in the EPO period, and of 36% in the LPO period. Two groups were compared regarding vocal fold mobility using the FEES. Group I included 89 patients with normal vocal fold mobility, 42% of whom had early dysphagia, and only 22% had late dysphagia. Regarding swallowing, we found that in the EPO period, the rates of delayed triggering, aspiration, penetration and residue were of 12.4%, 0%, 0%, and 42.7% respectively. Group II (unilateral immobile vocal fold) included 11 patients in the EPO evaluation, and all of them had early dysphagia.

Conclusion Swallowing problems can occur in patients after thyroidectomy regardless of alterations in larynx mobility, and they are characterized by delayed triggering and stasis of food, which are also noticed in the LPO period, though more frequently in the EPO period. Moreover, there is a highly significant correlation between the subjective and objective parameters of swallowing in both EPO and LPO periods.

Keywords

► swallowing
► thyroidectomy
► dysphagia
► aspiration

This abstract was presented at the Ain Shams Faculty of Medicine Conference in March 2020.

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Patients and Methods

The present study is a prospective evaluation of swallowing after total thyroidectomy approved by the Institutional Review Board. It was conducted with 100 patients recruited from the outpatient clinic of the Otorhinolaryngology and Head and Neck Surgery Department who underwent total thyroidectomy from April 2018 to September 2019.

- **Inclusion criteria:** adult patients submitted to for total thyroidectomy.
- **Exclusion criteria:** any patient: older than 65 years of age; undergoing revision thyroid surgery; with previous neck surgery; with abnormal laryngeal mobility before surgery; with previous neurological deficit; and those undergoing neck dissection with thyroidectomy, even central neck dissection.

The sample of the present study was divided into two groups after the thyroidectomy:

- **Group I:** patients with normal vocal fold mobility (NVFM); and
- **Group II:** patients with abnormal vocal fold mobility (AVFM).

All included patients were subjected to the following:

1) Careful history taking

The history of the patients was taken using the Arabic version of the Eating Assessment Tool (EAT-10) questionnaire (► Fig. 1). The patient rated the problem on a scale of 0 to 4 (0 = no problem; 4 = severe problem). There was no formula required to calculate a raw score. The clinician only needed to add up the numbers. A score ≥ 3 on the EAT-10 is considered dysphagia. An elevated EAT-10 score indicates a higher self-perception of dysphagia.

2) Fiberoptic endoscopic evaluation of swallowing (FEES). These factors deserve attention as causes of swallowing problems after thyroidectomy.

In accordance with Langmore’s standards, the FEES was performed postoperatively, on the seventh day after the operation (early postoperative [EPO] period) and on the 60th day after the operation (late postoperative [LPO] period). The consistencies of the foodstuffs offered were thin liquid (apple juice or other light-colored thin liquid), thick liquid (mango juice), semisolid liquid (yogurt), and soft solid food (cookies, which requires some chewing).

![Fig. 1 Eating Assessment Tool (EAT-10).](image-url)
The results of the FEES were based on the bolus consistency. Example: the patient was given 5 mL of thin liquid, and it revealed a delayed triggering of the swallow reflex to the level of the valleculae, in addition to aspiration. Then he/she was given a cookie swallow, which revealed a postswallow residue, which was cleared up by multiple dry swallows. The evaluation of swallowing involved four items: early spill of food (delayed triggering), aspiration, penetration, and retention (residue). Dysphagia was defined if one or more of those findings were observed.

**Results**

The mean age of the sample was of 37.4 ± 10.1 years; females represented 94% of the cases.

A) **EAT-10 results**

Each patient had their history taken by the EAT-10 questionnaire (preoperatively, and in the EPO and LPO periods). The score for dysphagia among our cases was of 0% preoperatively, of 82% in the EPO period, and of 36% in the LPO period.

By comparing the data of the questionnaires taken in the EPO and LPO periods, we found that there was a statistically significant improvement in the LPO period regarding the items “swallowing solids takes extra effort”, “swallowing pills takes extra effort”, “swallowing is painful”, “the pleasure of eating is affected by my swallowing”, “when I swallow food sticks in my throat”, “swallowing is stressful”, and “swallowing liquids takes extra effort” (→ **Table 1**)

B) **FEES results**

All patients underwent the FEES (preoperatively, and in the EPO and LPO periods), with an assessment of the mobility of the vocal fold and comments on delayed triggering, aspiration, penetration and residue at each stage. Preoperatively, all cases had normal mobile vocal folds and normal swallowing (→ **Table 2**).

The score for dysphagia was of 49% in the EPO period, and of 26% in the LPO period (→ **Figs. 2, 3, 4**). By correlating the results on the EAT-10 and the EPO FEES assessment, we found a highly significant correlation between them, and that the sensitivity and specificity of the EAT-10 were of 100% and 30.5% respectively. There is fair agreement between the two diagnostic methods in the EPO assessment of abnormalities in swallowing. Moreover, by correlating the results on the EAT-10 and those of the LPO FEES, we found a highly significant correlation between them.

**Table 1** Comparison between the early and late postoperative results on the Eating Assessment Tool (EAT-10) questionnaire items

| Question                                                                 | Early postoperative period | Late postoperative period | p-value  | Significance |
|------------------------------------------------------------------------|-----------------------------|----------------------------|----------|--------------|
| My swallowing problem has caused me to lose weight                     | N 100, %100.0              | N 100, %100.0              | —        | —            |
|                                                                        | N 0, %0                   | N 0, %0                   |          |              |
| My swallowing problem interferes with my ability to go out for meals   | N 93, %93.0               | N 93, %93.0               | 1.0      | Not significant |
|                                                                        | N 7, %7                   | N 7, %7                   |          |              |
| Swallowing liquids takes extra effort                                   | N 74, %74.0               | N 84, %84.0               | 0.021    | Significant |
|                                                                        | N 26, %26.0               | N 16, %16.0               |          |              |
| Swallowing solids takes extra effort                                    | N 65, %65.0               | N 87, %87.0               | 0.001    | Highly significant |
|                                                                        | N 35, %35.0               | N 13, %13.0               |          |              |
| Swallowing pills takes extra effort                                     | N 65, %65.0               | N 87, %87.0               | 0.001    | Highly significant |
|                                                                        | N 35, %35.0               | N 13, %13.0               |          |              |
| Swallowing is painful                                                  | N 21, %21.0               | N 97, %97.0               | 0.001    | Highly significant |
|                                                                        | N 79, %79.0               | N 3, %3.0                 |          |              |
| The pleasure of eating is affected by my swallowing                    | N 77, %77.0               | N 90, %90.0               | 0.001    | Highly significant |
|                                                                        | N 23, %23.0               | N 10, %10.0               |          |              |
| When I swallow food sticks in my throat                                 | N 66, %66.0               | N 91, %91.0               | 0.001    | Highly significant |
|                                                                        | N 34, %34.0               | N 9, %9.0                 |          |              |
| I cough when I eat                                                     | N 93, %93.0               | N 93, %93.0               | 1.0      | Not significant |
|                                                                        | N 7, %7                   | N 7, %7                   |          |              |
| Swallowing is stressful                                                | N 21, %21.0               | N 64, %64.0               | 0.001    | Highly significant |
|                                                                        | N 79, %79.0               | N 36, %36.0               |          |              |
| Dysphagia according to the EAT-10                                      | N 18, %18.0               | N 64, %64.0               | 0.001    | Highly significant |
|                                                                        | N 82, %82.0               | N 36, %36.0               |          |              |

Note: “McNemar test.”
and that the sensitivity and specificity of the EAT-10 were of 100% and 82.1% respectively.

**Group I**

Group I included 89 patients with NVFM, 42% of them with EPO dysphagia, while only 22% of them had LPO dysphagia. As the LPO examination revealed an improvement in vocal fold mobility in 6 patients, the number of patients in this group increased to 95.

**Group II**

Group II included 11 patients with EPO AVFM, and all of them had early dysphagia (100%) according to the EAT-10. But the LPO evaluation revealed that only 45% still had AVFM.

### Comparison between the Two Groups

1) Regarding medical and personal data

By comparing the two groups regarding personal and medical data in the EPO period, there was a highly significant difference between them in terms of age, with a higher mean age in Group II. However, there was no significant difference regarding gender (►Table 3).

In the LPO comparison, there also was a highly significant difference regarding age, with a higher mean age in

### Table 2 Comparison between the early and late postoperative results for vocal fold mobility and swallowing characteristics according to the fiberoptic endoscopic evaluation of swallowing (FEES)

|                           | Early postoperative period | Late postoperative period | \( p \)-value \( \text{^*} \) | Significance  |
|---------------------------|---------------------------|---------------------------|-----------------------------|---------------|
|                           | N | %     | N | %    |                           |               |
| Vocal cords               |   |       |   |       |                           |               |
| Mobile                    | 89 | 89.0% | 95 | 95.0% | 0.031                     | Significant   |
| Immobile                  | 11 | 11.0% | 5  | 5.0%  |                           |               |
| Delayed triggering        |   |       |   |       |                           |               |
| No                        | 78 | 78.0% | 84 | 84.0% | 0.031                     | Significant   |
| Yes                       | 22 | 22.0% | 16 | 16.0% |                           |               |
| Aspiration                |   |       |   |       |                           |               |
| No                        | 94 | 94.0% | 95 | 95.0% | 1.0                       | Not significant|
| Yes                       | 6  | 6.0%  | 5  | 5.0%  |                           |               |
| Penetration               |   |       |   |       |                           |               |
| No                        | 89 | 89.0% | 91 | 91.0% | 0.774                     | Not significant|
| Yes                       | 11 | 11.0% | 9  | 9.0%  |                           |               |
| Residue                   |   |       |   |       |                           |               |
| No                        | 57 | 57.0% | 94 | 94.0% | 0.001                     | Highly significant|
| Yes                       | 43 | 43.0% | 6  | 6.0%  |                           |               |

Note: “McNemar test.

![ Fig. 2 ](early_spill_delayed_triggering.png) Early spill (delayed triggering).

![ Fig. 3 ](residue.png) Residue.

![ Fig. 4 ](aspiration_penetration.png) Aspiration and penetration.
2) Regards the results on the EAT-10 questionnaire:
As for the comparison of the EPO EAT-10 results, we found a highly significant difference between the two groups: 42% of the NVFM group and 100% of the AVFM group had dysphagia. In the LPO period, 22% of the NVFM group and 100% of the AVFM group had dysphagia, a highly significant difference.

3) Regarding the FEES results:
In the EPO FEES, there was a highly significant difference between the two groups in terms of delayed triggering, aspiration, and penetration, with higher percentages among Group II. However, there was no significant difference regarding residue (►Table 5).

As for the LPO FEES, there was a highly significant difference between the two groups in terms of delayed triggering, aspiration, and penetration with higher percentages among Group II. However, there was no significant difference regarding residue. (►Supplementary Video) (►Table 6).

Table 3 Comparison between the study groups regarding early postoperative personal data

|                     | Early postoperative vocal fold mobility | p-value |
|---------------------|----------------------------------------|---------|
|                     | Mobile (Group I) | Immobile (Group II) |
|                     | Mean | ± SD | Mean | ± SD |
| Age (years)         | 36.01 | 8.83 | 48.18 | 13.58 | 0.001* |
| Gender              |       |     |       |     |
| Male                | 6 | 100.0% | 0 | 0% | 1.0** |
| Female              | 83 | 88.3% | 11 | 11.7% | |

Notes: *Student t-test;
**Fisher exact test.

Table 4 Comparison between the study groups regarding late postoperative personal data

|                     | Late postoperative vocal fold mobility | p-value |
|---------------------|----------------------------------------|---------|
|                     | Mobile (Group I) | Immobile (Group II) |
|                     | Mean | ± SD | Mean | ± SD |
| Age (years)         | 36.16 | 8.91 | 60.00 | 0.00 | 0.001* |
| Gender              |       |     |       |     |
| Male                | 6 | 100.0% | 0 | 0% | 1.0** |
| Female              | 89 | 94.7% | 5 | 5.3% | |

Notes: *Student t-test;
**Fisher exact test.

Table 5 Comparison between the study groups regarding the early postoperative results on the fiberoptic endoscopic evaluation of swallowing (FEES)

|                     | Early postoperative vocal fold mobility | p-value |
|---------------------|----------------------------------------|---------|
|                     | Mobile (Group I) | Immobile (Group II) |
|                     | N | % | N | % |
| Delayed triggering  | No | 78 | 87.6% | 0 | 0% | 0.001* |
|                     | Yes | 11 | 12.4% | 11 | 100.0% | |
| Aspiration          | No | 89 | 100.0% | 5 | 45.5% | 0.001* |
|                     | Yes | 0 | 0% | 6 | 54.5% | |
| Penetration         | No | 89 | 100.0% | 0 | 0% | 0.001* |
|                     | Yes | 0 | 0% | 11 | 100.0% | |
| Residue             | No | 51 | 57.3% | 6 | 54.5% | 1.0* |
|                     | Yes | 38 | 42.7% | 5 | 45.5% | |

Note: 'Fisher exact test.
incidence of dysphagia after thyroidectomy was of 58%.

Those of previous studies also demonstrated that the swallowing-related questionnaire scores significantly changed one month postoperatively and showed a tendency for gradual improvement over time. Also in line with our results, Im et al. found that the swallowing impairment after thyroidectomy improved after 3 months, and most of their patients (89.3%) showed an improvement, but 3 patients continued to have pharyngeal residue-related impairment. Our findings are also in line with the results of a study by Jung et al., who reported an improvement in surgery-related swallowing impairment over time.

On comparing the two groups in the present study, there was a highly significant difference regarding age, with a higher mean age among the AVFM group. However, there was no significant difference regarding sex. We found a statistically significant difference between the 2 groups in terms of dysphagia in the EPO and LPO EAT-10 questionnaire.

There was a significant difference between the EPO and LPO assessments regarding vocal cord mobility, as 11% of the cases had EPO AVFM compared to only 5% of cases of LPO AVFM. A significant difference was also found regarding the EPO and LPO assessments of delayed triggering and residue, but there was no significant difference was found in terms of aspiration and penetration.

### Discussion

The present study included 100 patients who underwent total thyroidectomy (either for multinodular goiter or localized thyroid tumor), with a mean age of 37.4 ± 10.1 years; females represented 94% of the cases. In accordance with the present study, Arakawa-Sugueno et al. studied 54 patients who underwent total thyroidectomy, most of them women aged between 46 and 65 years.

In the present study, we divided the patients postoperatively into two groups according to the affection of the vocal fold mobility, to assess swallowing postoperatively, as in a previous study by Arakawa-Sugueno et al.; however, other authors, such as Lombardi et al. and Scerrino et al. excluded the patients with affection of the vocal fold mobility from their studies.

In the present study, according to the EAT-10, the rates of dysphagia were of 0% preoperatively, of 25% in the EPO period, and of 36% in the LPO period. Our findings support those of previous studies that demonstrated that the incidence of dysphagia after thyroidectomy was of 58%. Jung et al. explained the occurrence of postthyroidectomy swallowing problems due to multiple and complex causes like postoperative pain, sensory impairments of the neck, malfunction of the extralaryngeal muscle, laryngotraheal fixation, skin scar retraction, and adhesion.

Our results are also in agreement with those of Arakawa-Sugueno et al., as they found that 30 (55%) out of their 54 patients suffered changes in swallowing, and dysphagia occurred in 87% of the patients with abnormal laryngeal mobility in the EPO evaluation, and in 67% of them in the LPO. In the normal laryngeal mobility group, they found that dysphagia occurred in 44% in the EPO evaluation, and in 25% in the LPO evaluation.

As for the FEES, all of our patients underwent it preoperatively, and 100% had normal mobile vocal folds and normal swallowing. While the rate of dysphagia was of 0% in the preoperative FEES, it was of 49% in the EPO FEES, and of 26% in the LPO FEES.

To the best of our knowledge, the present study is the first to correlate the results of the EAT-10 and of the FEES. We found that there was a highly significant correlation between them. Moreover, the sensitivity and specificity of the EAT-10 were of 100% and 30.5% respectively in the EPO assessment, and of 100% and 82.1% respectively in LPO assessment.

These results are in accordance with those of Belafsky et al. and Cheney et al. as they stated that the EAT-10 displayed excellent internal consistency, test-retest reproducibility, and criterion-based validity, and it is a valid, reliable and simple tool. Additionally, there is a linear correlation between the EAT-10 and aspiration events and the risk of aspiration.

### Table 6 Comparison between the study groups regarding the late postoperative results on the fiberoptic endoscopic evaluation of swallowing (FEES)

|                  | Mobile | Immobile |
|------------------|--------|----------|
|                  | N      | %        | N      | %        |
| Delayed triggering | No     | 84       | 88.4%  | 0        | 0%       | 0.001*   |
|                  | Yes    | 11       | 11.6%  | 5        | 100.0%   |          |
| Aspiration       | No     | 95       | 100.0% | 0        | 0%       | 0.001*   |
|                  | Yes    | 0        | 0%     | 5        | 100.0%   |          |
| Penetration      | No     | 95       | 100%   | 1        | 20.0%    | 0.001*   |
|                  | Yes    | 0        | 0%     | 4        | 80.0%    |          |
| Residue          | No     | 89       | 93.7%  | 5        | 100.0%   | 1.0%     |
|                  | Yes    | 6        | 6.3%   | 0        | 0%       |          |

Note: *Fisher exact test.
The present study is in disagreement with the study by Arakawa-Sugueno et al. in terms of the percentage of swallowing disorders, as they found that 33% of the abnormal laryngeal mobility group had liquid penetration and aspiration in the EPO period; retention of food occurred in 87% of the sample in the EPO period, and in 60% in the LPO period.

According to the EAT-10, we found that dysphagia occurred in 100% of the AVFM patients in the EPO period, and remained in 45% of them in the LPO period. As for the NVFM group, dysphagia occurred in 42% in the EPO period, and in 22% in the LPO period.

Gumus et al. (2020) concluded that swallowing problems can also occur after thyroidectomy even in the absence of recurrent laryngeal nerve injury, which is in line with the present study.

**Conclusion**

Swallowing problems can occur in patients after thyroidectomy regardless of alterations in larynx mobility, and they are characterized by delayed triggering and stasis of food, which is also observed in the LPO period, though more frequently in the EPO period. Moreover, there is a highly significant correlation between the subjective and objective parameters of swallowing in both the EPO and LPO periods.

**Conflict of Interests**

The authors have no conflict of interests to declare.

**References**

1. Grover G, Sadler GP, Mihai R. Morbidity after thyroid surgery: patient perspective. Laryngoscope 2013; 123(09): 2319–2323
2. Finck C. Laryngeal dysfunction after thyroid surgery: diagnosis, evaluation and treatment. Acta Chir Belg 2006; 106(04): 378–387
3. Lombardi CP, Raffaelli M, De Crea C, et al. Long-term outcome of functional post-thyroidectomy voice and swallowing symptoms. Surgery 2009; 146(06): 1174–1181
4. Silva IC, Netto I, Vartanian JG, Kowalski LP, Carrara-de Angelis E. Prevalence of upper aerodigestive symptoms in patients who underwent thyroidectomy with and without the use of intraoperative laryngeal nerve monitoring. Thyroid 2012; 22(08): 814–819
5. de Pedro Netto I, Fae A, Vartanian JG, et al. Voice and vocal self-assessment after thyroidectomy. Head Neck 2006; 28(12): 1106–1114
6. Arakawa-Sugueno L, Ferraz AR, Morandi J, et al. Videendoscopic Evaluation of Swallowing After Thyroidectomy: 7 and 60 Days. Dysphagia 2015; 30(05): 496–505
7. Langmore SE. History of Fiberoptic Endoscopic Evaluation of Swallowing for Evaluation and Management of Pharyngeal Dysphagia: Changes over the Years. Dysphagia 2017; 32(01): 27–38
8. Scerrino G, Paladino NC, Di Paola V, et al. Total thyroidectomy performed with the Starion vessel sealing system versus the conventional technique: a prospective randomized trial. Surg Innov 2010; 17(03): 242–247
9. Senise AT, Queixa DS, Degani C, et al. Symptoms and signs of swallowing changes after thyroidectomy. Rev Bras Cir Cabeça Pescoço. 2009; 38(02): 67–71
10. Jung SP, Kim SH, Bae SY, et al. A new subfacial approach in open thyroidectomy: efficacy for postoperative voice, sensory, and swallowing symptoms. A randomized controlled study. Ann Surg Oncol 2013; 20(12): 3869–3876
11. Belafsky PC, Mouadeb DA, Rees CJ, et al. Validity and reliability of the Eating Assessment Tool (EAT-10). Ann Otol Rhinol Laryngol 2008; 117(12): 919–924
12. Cheney DM, Siddiqui MT, Litts JK, Kuhn MA, Belafsky PC. The Ability of the 10-Item Eating Assessment Tool (EAT-10) to Predict Aspiration Risk in Persons With Dysphagia. Ann Otol Rhinol Laryngol 2015; 124(05): 351–354
13. Park YM, Oh KH, Cho JG, et al. Changes in Voice- and Swallowing-Related Symptoms After Thyroidectomy: One-Year Follow-Up Study. Ann Otol Rhinol Laryngol 2018; 127(03): 171–177
14. Im I, Jun JP, Crary MA, Carnaby GD, Hong KH. Longitudinal Kinematic Evaluation of Pharyngeal Swallowing Impairment in Thyroidectomy Patients. Dysphagia 2019; 34(02): 161–169
15. Gumus T, Makoy O, Eyigor S, et al. Objective analysis of swallowing and functional voice outcomes after thyroidectomy: A prospective cohort study. Asian J Surg 2020; 43(01): 116–123