



# Swallowing Problems after Thyroidectomy\*

Yasser Mohammed Elbeltagy<sup>1</sup> Samia Elsayed Bassiouny<sup>1</sup> Tamer Shokry Sobhy<sup>1</sup>  
Ahmed Essameldin Ismail<sup>1</sup> Ahmed Abdelmoneim Teaima<sup>1</sup>

<sup>1</sup>Otorhinolaryngology, Head and Neck Surgery Department, Faculty of Medicine, Ain Shams University, Cairo, Egypt

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Address for correspondence Ahmed Abdelmoneim Teaima, MD, FACS, Lecturer of Otorhinolaryngology, Faculty of Medicine, Ain Shams University., 1 Ain Shams University Staff Houses, Elwaely, Cairo, 11566, Egypt (e-mail: a.teaima@med.asu.edu.eg).

## 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

## Introduction

Thyroidectomy is a commonly-performed procedure.<sup>1</sup> Dysphonia and dysphagia are common after thyroidectomy, and can affect the patient's quality of life.<sup>2</sup> Voice and swallowing complaints occur between 15 and 90 days after surgery.<sup>3</sup> 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.<sup>4</sup> 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.<sup>5</sup> Other factors such as endotracheal intubation, neural plexus injury, and reaction to pain also deserve attention.<sup>6</sup> 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 article we attempt to evaluate swallowing after thyroidectomy and correlate the subjective and objective parameters.

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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 (► **Table 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  $\geq 3$  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<sup>7</sup> 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). 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  $37.4 \pm 10.1$  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). that 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 2**)

### 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

**Table 1** Eating Assessment Tool (EAT-10)

Cite the appropriate response	0 = no problem; 4 = severe problem.				
1. My swallowing problem has caused me to lose weight.	0	1	2	3	4
2. My swallowing problem interferes with my ability to go out for meals.	0	1	2	3	4
2. Swallowing liquids takes extra effort.	0	1	2	3	4
3. Swallowing solids takes extra effort.	0	1	2	3	4
4. Swallowing pills takes extra effort.	0	1	2	3	4
5. Swallowing is painful.	0	1	2	3	4
6. The pleasure of eating is affected by my swallowing.	0	1	2	3	4
7. When I swallow, food sticks in my throat.	0	1	2	3	4
8. I cough when I eat.	0	1	2	3	4
9. Swallowing is stressful.	0	1	2	3	4
<b>Total EAT-10:</b>					

**Table 2** Comparison between the early and late postoperative results on the Eating Assessment Tool (EAT-10) questionnaire items

		Early postoperative period		Late postoperative period		p-value*	Significance
		N	%	N	%		
My swallowing problem has caused me to lose weight	No	100	100.0%	100	100.0%	—	—
	Yes	0	0.0%	0	0.0%		
My swallowing problem interferes with my ability to go out for meals	No	93	93.0%	93	93.0%	1.0	Not significant
	Yes	7	7.0%	7	7.0%		
Swallowing liquids takes extra effort	No	74	74.0%	84	84.0%	0.021	Significant
	Yes	26	26.0%	16	16.0%		
Swallowing solids takes extra effort	No	65	65.0%	87	87.0%	0.001	Highly significant
	Yes	35	35.0%	13	13.0%		
Swallowing pills takes extra effort	No	65	65.0%	87	87.0%	0.001	Highly significant
	Yes	35	35.0%	13	13.0%		
Swallowing is painful	No	21	21.0%	97	97.0%	0.001	Highly significant
	Yes	79	79.0%	3	3.0%		
The pleasure of eating is affected by my swallowing	No	77	77.0%	90	90.0%	0.001	Highly significant
	Yes	23	23.0%	10	10.0%		
When I swallow food sticks in my throat	No	66	66.0%	91	91.0%	0.001	Highly significant
	Yes	34	34.0%	9	9.0%		
I cough when I eat	No	93	93.0%	93	93.0%	1.0	Not significant
	Yes	7	7.0%	7	7.0%		
Swallowing is stressful	No	21	21.0%	64	64.0%	0.001	Highly significant
	Yes	79	79.0%	36	36.0%		
Dysphagia according to the EAT-10	No	18	18.0%	64	64.0%	0.001	Highly significant
	Yes	82	82.0%	36	36.0%		

Note: \*McNemar test.

triggering, aspiration, penetration and residue at each stage. Preoperatively, all cases had normal mobile vocal folds and normal swallowing (► **Table 3**).

The score for dysphagia was of 49% in the EPO period, and of 26% in the LPO period (► **Figs. 1, 2, 3**). 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, 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 4**).

In the LPO comparison, there also was a highly significant difference regarding age, with a higher mean age in Group II. However, there was no significant difference regarding gender (► **Table 5**).

### 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.

**Table 3** 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*	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%		

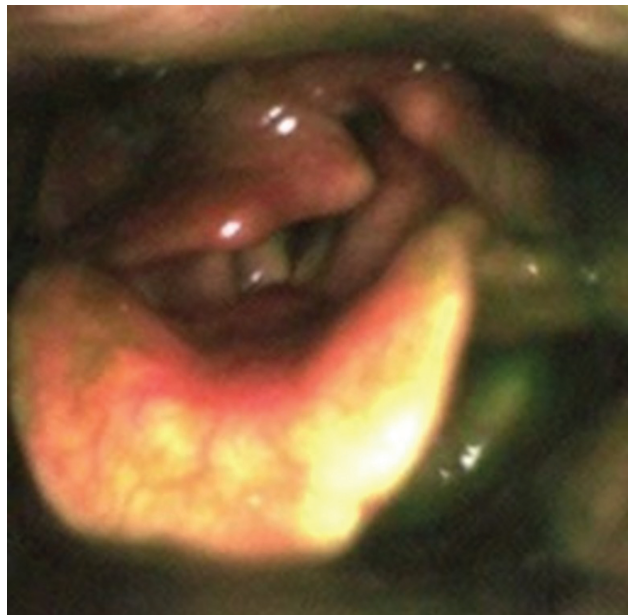
Note: \*McNemar test.

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 found among Group II. However, there was no significant difference regarding residue (→ **Table 6**).

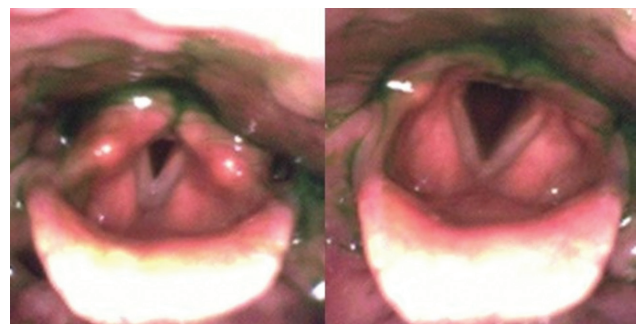
As for the LPO FEES, there was a highly significant difference between the two groups in terms of delayed triggering, aspiration, and penetration with higher percentages among Group II. However, there was no significant difference regarding residue. (→ **Supplementary Video**) (→ **Table 7**).



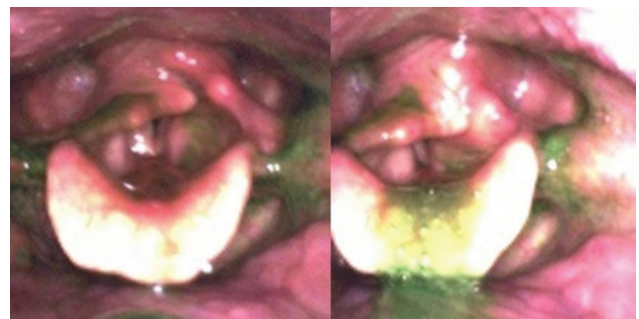
**Fig. 1** Early spill (delayed triggering).

### Supplementary Video 1

Late postoperative fiberoptic endoscopic evaluation of swallowing (FEES): early spill. Online content including video sequences viewable at: <https://www.thieme-connect.com/products/ejournals/html/10.1055/s-0041-1730302>



**Fig. 2** Residue.



**Fig. 3** Aspiration and penetration.

**Table 4** 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 5** 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	.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 6** 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.

## Discussion

The present study included 100 patients who underwent total thyroidectomy (either for multinodular goiter or localized thyroid tumor), with a mean age of  $37.4 \pm 10.1$  years; females represented 94% of the cases. In accordance with the present study, Arakawa-Sugueno et al.<sup>6</sup> 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.;<sup>6</sup> however, other

authors, such as Lombardi et al.<sup>3</sup> and Scerrino et al.,<sup>8</sup> 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 82% in the EPO period, and of 36% in the LPO period. Our findings support those of previous studies<sup>1,9</sup> that demonstrated that the incidence of dysphagia after thyroidectomy was of 58%. Jung et al.<sup>10</sup> 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, laryngotracheal fixation, skin scar retraction, and adhesion.

**Table 7** Comparison between the study groups regarding the late postoperative results on the fiberoptic endoscopic evaluation of swallowing (FEES)

		Late postoperative vocal fold mobility				p-value
		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.

Our results are also in agreement with those of Arakawa-Sugueno et al.,<sup>6</sup> 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.<sup>11</sup> and Cheney et al.,<sup>12</sup> 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.

The present study is in accordance with the study by Park et al.,<sup>13</sup> who found that 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.<sup>14</sup> 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.,<sup>10</sup> 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.

The present study is in disagreement with the study by Arakawa-Sugueno et al.<sup>6</sup> 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.<sup>15</sup> (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.

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