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REVIEW ARTICLE

Dysphagia following uncomplicated thyroidectomy: a systematic review

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Abstract

Objective Dysphagia after uncomplicated thyroidectomy is commonly reported and it includes a broad spectrum of swallowing complaints. Though various causes have been hypothesized, it remains not completely understood.

Methods A systematic review was performed to identify studies concerning dysphagia post uncomplicated thyroid surgery. A qualitative analysis of data extracted was conducted.

Results We have included 16 studies of which 15 are prospective and one are retrospective. The number of subjects varied from 12 to 254, the mean age from 39 to 54 years with an overall prevalence of females. The duration of the follow-up ranges from 1 month to 4 years. All the included trials documented postoperative dysphagia, 12 of which have detected it in the early postoperative period. Considering long-term follow-up period, 12 studies reported an overall improvement of swallow symptoms. The instrumental findings revealed non-specific alterations of swallowing.

Conclusions Dysphagia after uncomplicated thyroidectomy can arise early in the postoperative period resolving spontaneously in the first year. Diagnostic methods failed to identify the physio pathological mechanism of swallow alteration leaving this condition still unclear. Since these symptoms can reduce patient's quality of life, we suggest an appropriate education before thyroid surgery.

Keywords Dysphagia · Swallowing disorders · Thyroidectomy · Uncomplicated

Introduction

Thyroid surgery is the most common endocrine operation and has become very safe with a very low mortality and complication rate [1]. At present the emphasis is shifted towards preventing postoperative morbidity. Dysphagia and dysphonia are well-recognized complications of thyroidectomy due to injury of laryngeal nerves [2, 3]. Nevertheless, many patients complain upper aero-digestive symptoms despite intraoperative preservation of recurrent laryngeal nerves and external branch of the superior laryngeal nerve [4–6]. This was confirmed by Lombardi et al. who using laryngeal electromyography demonstrated the absence of subclinical laryngeal nerves injury in all but one of the 31 patients studied suffering of dysphagia and/or dysphonia after otherwise uncomplicated thyroidectomy [5]. The impact of anterior cervical surgical approaches to swallowing disorders was also assessed in patients operated in the region of cervical spine without complications. A stasis of the bolus in the valleculae and pyriform sinus has been revealed even in patients without a postoperative laryngeal neuropathy using the laryngeal electromyography and videofluoroscopy [7]. In this perspective, some authors have named this condition: "the functional post thyroidectomy syndrome" [5, 8]. It includes a broad spectrum of non-specific voice and swallowing symptoms such as hoarseness, tightness, globus sensation or voice and swallowing discomfort arising after an uncomplicated thyroid surgery. Usually, the severity and the duration of these symptoms are highly variable from patient to patient. Considering dysphagia, previous published studies indicated a variable incidence range from 20 to 58% calculated administrating various types of swallowing questionnaires [9–12]. To explain this condition many causes have been advocated but a clear explanation has not been formulated. Scerrino et al. in a systematic review regarding swallowing disorders

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after thyroidectomy, concluded that, depending on the possible causes of dysphagia, different types of diagnostic procedures could be used and among these, videofluoroscopy is considered the gold standard evaluating the entire swallowing process [13]. The difficulty to identify the physio pathological mechanism of these subjective upper aero-digestive symptoms is related to the normality or to the non-specific alteration of the instrumental exams [4, 6, 13]. Therefore, dysphagia appearing after uncomplicated thyroidectomy remains still unclear. We performed a systematic review of the studies regarding dysphagia after uncomplicated thyroidectomy to analyze the clinical and instrumental available data of postoperative swallowing complaints.

Materials and methods

Literature search strategy

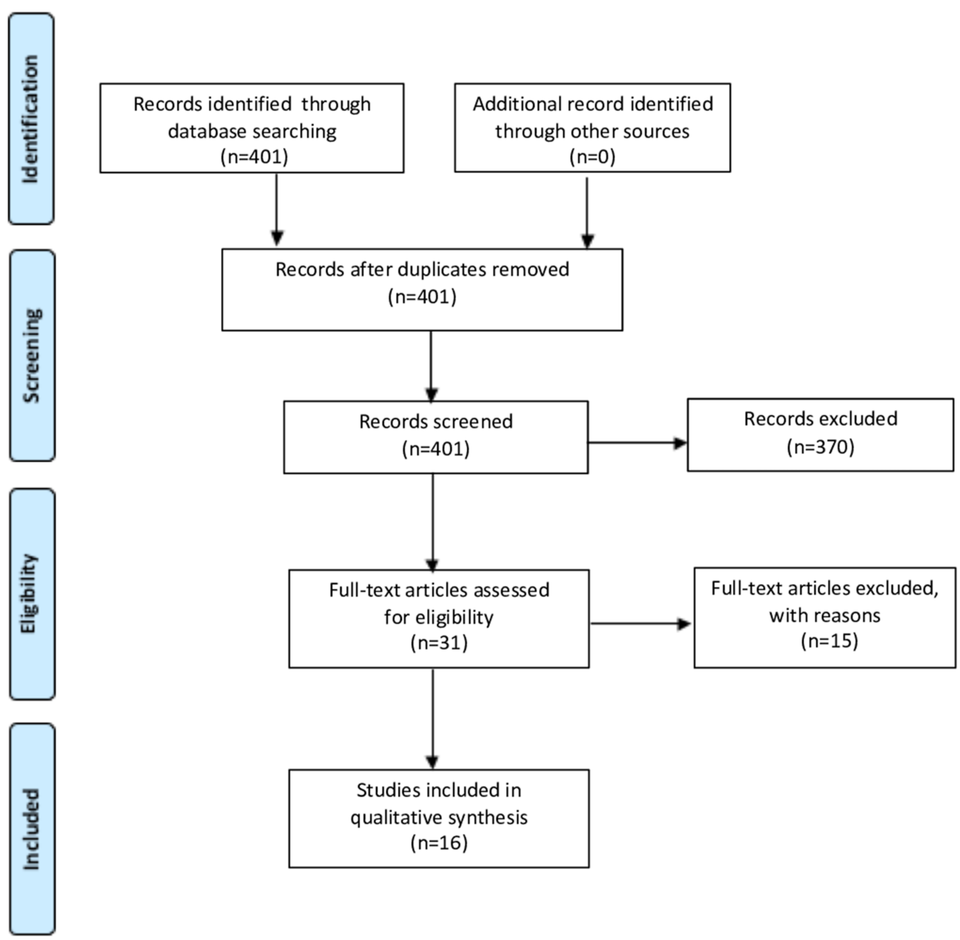
A systematic search of articles covering 1984 to date using PubMed and MEDLINE was conducted to identify articles regarding dysphagia appearing after uncomplicated thyroidectomy. The database was searched using the following terms: "dysphagia" OR "swallowing" AND "thyroidectomy" OR "uncomplicated thyroid surgery". The literature search and the screening of headings were made by two independent authors (F.G. and W.G.). Both of them read the full-text eligible articles achieving a consensus for final inclusion. Additionally, a review of references from the selected articles was performed to identify other relevant articles. The PRISMA flowchart was used [14].

Inclusion/exclusion criteria

The inclusion criteria of the studies were as follows: (1) studies regarding dysphagia appearing after uncomplicated thyroidectomy; (2) studies regarding dysphagia after thyroidectomy considering exclusively patients with dysphagia after uncomplicated thyroidectomy.

Exclusion criteria for the study were as follows: (1) studies not in English; (2) case reports, reviews, conference abstracts, letters, pediatric studies; (3) studies with unclear and/or incomplete data or considering exclusively dysphonia after uncomplicated thyroid surgery; (4) studies regarding preoperative dysphagia in patients who underwent thyroid surgeries.

Fig. 1 Flow diagram for study selection



Data extraction and data analysis

Data extraction from the eligible studies was systematically made using a structured form and it was independently checked by the two reviewers. A qualitative synthesis analysis was performed considering the selected studies regarding dysphagia after uncomplicated thyroidectomy.

Results

The flow diagram shown in Fig. 1 depicts the selection process that includes 16 studies. The studies characteristics are reported in Table 1. Fifteen trials are prospective [4, 5, 8, 9, 15–25] of which three are prospective controlled [4, 9, 25] and only one randomized controlled [19]. The remaining one is retrospective [26]. The number of subjects varied from 12 [22] to 254 [24], the mean age from 39 [20] to 54 [18] years and there is an overall prevalence of females in all the studies included [4, 5, 8, 9, 15–25]. The duration of the follow-up ranges from 1 month [20] to 4 years [24]. The types of thyroid diseases and their surgical management are reported in Table 2. Most of the authors treated both benign and malignant conditions [4, 5, 8, 9, 16–21, 24–26], only Lombardi et al. operated exclusively benign goiter [15] and Krekeler papillary thyroid carcinoma [23]. Other possible causes of dysphagia and/or dysphonia before surgery are excluded. Overall, the types of surgery performed are: total or partial thyroidectomy, hemithyroidectomy and isthmusectomy. Five authors have associated central neck dissection

Table 1 Baseline characteristics of the studies

Author	Year	Country	Study design	No. cases/controls	Mean age (years)	Sex (M:F)	Surgery complications	Follow-up
Lombardi et al. [15]	2006	Italy	Prospective	39	42.6 ± 12	0:39	Uncomplicated	3 m
Lombardi et al. [16]	2008	Italy	Prospective	VAT 29/CT 24	VAT: 43.5 CT: 50.2	VAT: 6:23 CT: 6:18	Uncomplicated	3 m
Lombardi et al. [17]	2009	Italy	Prospective	110	46 ± 13.2	13:97	Uncomplicated	29.1 ± 8.6 m
Silva et al. [4]	2012	Brazil	Prospective controlled	100 IONM/208 controls	IONM: 45.5 controls: 44.9	9:91	Hypoparathyroidism, seroma/hematoma, site infection	1–4 y
Tae et al. [18]	2012	Korea	Prospective	50 GUAB/61 CT	GUAB: 40.78 CT: 54.36	GUAB: 0:50 CT: 0:61	Uncomplicated	6 m
Lombardi et al. [5]	2012	Italy	Prospective	32	44.5 ± 10.7	7:25	Uncomplicated	1 and 3 m
Jung et al. [19]	2013	Korea	Prospective randomized controlled	42 subplatysmal/44 subfascial	48 subplatysmal/51.8 subfascial	Subplatysmal 12:30 subfascial 6:38	Uncomplicated	2 w and 3 m
Hyun et al. [20]	2014	Korea	Prospective	23 GTET/24 CT	GTET 39.32 CT 46.05	GTET 0:23 CT 8:16	Uncomplicated	1 m
Arakawa-Sugueno et al. [9]	2015	Brazil	Prospective controlled	39 NLM	25–45: NLM 14 45–65: NLM 25	NLM 3:36	ALM 15/54	7 d and 60 d
Araùjo et al. [22]	2017	Brazil	Prospective	12	45	2:10	NR	3 m
Gohrbandt et al. [21]	2016	Germany	Prospective	53	52.4	17:36	Uncomplicated	6 m
Park et al. [8]	2018	Korea	Prospective	113	50.2	25:88	Uncomplicated	1 y
Krekeler et al. [23]	2018	USA	Prospective	26	46.4	8:18	Uncomplicated	6 m
Ha et al. [24]	2018	Korea	Prospective	169 CT 32 GTET 53 GTRT	CT 50.1 ± 10.9 GTET 44.5 ± 9.3 GTRT 41.6 ± 10.7	CT 25:144 GTET 0:32 GTRT 0:53	NR	CT 42.7 GTET 50.2 GTRT 0.2 m
Sahli et al. [26]	2018	USA	Retrospective	78	51.1 ± 14.9	Tot 163:761	Uncomplicated	2 y
Im et al. [25]	2018	Korea	Prospective controlled	40/14	Cases: 47.33 controls: 42.64	Cases: 7:33 controls: 3:11	Uncomplicated	1 w and 3 m

nr not reported, *VAT* video-assisted thyroidectomy, *CT* conventional thyroidectomy, *IONM* intraoperative laryngeal nerve monitoring, *GUAB* gasless unilateral axillo-breast, *GTET* gasless transaxillary endoscopic thyroidectomy, *GTRT* gasless transaxillary robotic thyroidectomy, *ALM* abnormal laryngeal motility, *NLM* normal laryngeal motility, *d* day, *w* week, *m* month, *y* year

Table 2 Thyroid diseases and types of surgery

Author (year)	Thyroid diseases	Preoperative exclusion criteria	Types of thyroid surgery	Neck dissection
Lombardi et al. (2006) [15]	All benign diseases	Age < 21 or > 65 y, prior vocal cord paralysis, voice or laryngeal diseases requiring therapy, speech disorders, pulmonary diseases, malignant disease, neck surgery	Conventional or video-assisted total thyroidectomy	–
Lombardi et al. (2008) [16]	Benign goiter, papillary carcinoma	Age < 18 and > 75 y, previous vocal fold paralysis, voice or laryngeal disease, speech disorders, pulmonary disease malignancy other than papillary carcinoma	Conventional or video-assisted total thyroidectomy	–
Lombardi et al. (2009) [17]	Benign diseases, carcinoma papillary	Age < 21 or > 65, prior vocal cord paralysis, voice or laryngeal diseases requiring therapy, speech disorders, pulmonary diseases, malignant disease other than papillary carcinoma, neck surgery	Conventional or video-assisted total thyroidectomy	–
Silva et al. (2012) [4]	WDTC, benign goiter, thyroiditis	Abnormal laryngeal motility and diseases, gastroesophageal reflux disease	Thyroidectomy: IONM 68/controls 129 partial thyroidectomy: IONM 32/controls 79	VI level: IONM 5% controls 9%
Tae et al. (2012) [18]	18 benign 93 malignant thyroid diseases	< 18 years and > 70 y, vocal cord lesions or paralysis laryngeal nerves Previous thyroid or cervical surgeries, male patients, GUAB criteria[a], previous radiotherapy	Thyroidectomy: GUAB 37/CT 51 lobectomy: GUAB 13/CT 10	VI level: GUAB 88% CT 86.9%
Lombardi et al. (2012) [5]	19 benign diseases 13 papillary carcinoma	Age < 21 or > 65 y, prior vocal cord paralysis, voice or laryngeal diseases requiring therapy, speech disorders, pulmonary diseases, malignant disease, neck surgery	Conventional or video-assisted total thyroidectomy	–
Jung et al. (2013) [19]	Papillary thyroid carcinoma	History of neck surgery, severe thyroiditis, lateral neck metastasis, laryngeal or vocal disease requiring therapy	Total thyroidectomy: 20 subplatysmal/22 subfascial lobectomy: 22 subplatysmal/22 subfascial	–
Hyun et al. (2014) [20]	Thyroid tumor	nr	Thyroidectomy GTET 7/CT 19 hemithyroidectomy GTET 16/CT 7	VI level: GTET 9/CT 10
Arakawa-Sugueno et al. (2015) [9]	Carcinoma papillary, follicular: ALM 8/NLM 17 goiter: ALM 6/NLM 20 other: ALM 1/NLM 2	Over 65 y, previous cervical surgery, intra and postop complications, previous laryngeal disorders	Classical thyroidectomy MIVAT (partial or total thyroidectomy)	VI level ALM 3 NLM 5
Araùjo et al. (2017) [22]	nr	Laryngeal and thyroid hormone changes gastroesophageal reflux disease	10 total thyroidectomy 2 partial thyroidectomy	–
Gohrbandt et al. (2016) [21]	Goiter, papillary carcinoma, Hashimoto thyroiditis, M. Basedow	< 16 y, prior vocal cord palsy, previous neck surgery, malignant thyroid infiltrating surrounding structures	Total thyroidectomy	–
Park et al. (2018) [8]	105 malignant Tumors 8 benign tumors	Previous neck surgery or radiation, vocal cord diseases, vocal cord paralysis	69 total thyroidectomy 44 thyroid lobectomy	VI level 19 VI + LND 9
Krekeler et al. (2018) [23]	Papillary thyroid carcinoma	Preexisting vocal fold abnormalities and/or any neurological disease affecting voice or swallowing, postop laryngeal palsy	Total thyroidectomy	–

Table 2 (continued)

Author (year)	Thyroid diseases	Preoperative exclusion criteria	Types of thyroid surgery	Neck dissection
Ha et al. (2018) [24]	WDTC, hurtle cell adenoma	GTET and GTRT neoplasm < 2 cm limited to thyroid, lateral lymph node or distant metastasis, extrathyroidal extension, history of neck surgery or radiotherapy	Thyroidectomy CT 99/GTET 2/GTRT 5 hemithyroidectomy CT 70/GTET 30/GTRT 46 isthmusectomy CT, GTET 0/GTRT 2	–
Sahli et al. (2018) [26]	526 benign tumors 398 malignant tumors	Recurrent laryngeal nerve injury	Total thyroidectomy	–
Im et al. (2018) [25]	13 non-toxic multinodular goiter, 4 non-toxic diffuse goiter, 11 non-toxic single nodule, 9 malignant neoplasm, 2 benign neoplasm, 1 graves' disease	Recurrent local or regional disease/damage, history of head and neck cancer, cancer of nasopharynx	Total thyroidectomy	–

nr not reported, *VAT* video-assisted thyroidectomy, *CT* conventional thyroidectomy, *IONM* intraoperative laryngeal nerve monitoring, *WDCT* well differentiated thyroid carcinoma, *MIVAT* minimally invasive video-assisted thyroidectomy, *GUAB* gasless unilateral axillo-breast, GUAB criteria exclusion[a] papillary carcinoma extrathyroidal extension, multiple lymph node or distant metastasis, *GTET* gasless transaxillary endoscopic thyroidectomy, *GTRT* gasless transaxillary robotic thyroidectomy, *LND* lateral neck dissection, *ALM* abnormal laryngeal motility, *NLM* normal laryngeal motility

[4, 8, 9, 18, 20] and only Park et al. have extended to lateral neck dissection in nine patients [8]. The most widely used surgical technique is the conventional open thyroid surgery [4, 5, 8, 9, 15–17, 19, 21–23, 25] whereas in selected cases some authors have performed: the video-assisted thyroidectomy [5, 15–17], the minimally invasive video-assisted thyroidectomy [9], the endoscopic [20, 24] or the robotic thyroidectomy [18, 24]. Table 3 contains data concerning dysphagia following uncomplicated thyroid surgery and their trend during the follow-up. The 16 included trials have documented postoperative dysphagia. Twelve of which detected an increasing of swallowing score values in the early postoperative period (≤ of 2 weeks) [4, 9, 15–20, 23–26]. Considering the long-term follow-up period, 12 studies reported an overall improvement of swallow symptoms [5, 8, 9, 15–23, 25]. Figure 2 shows the decrease of the postoperative mean SIS values during the follow-up.

Discussion

This review has documented the presence of dysphagia in patients who underwent thyroid surgeries without complications. The qualitative analysis has shown that these subjective swallow symptoms are early detected in the first two postoperative weeks then decreasing in the first 3 months and progressively resolving over 1 year [4, 5, 8, 9, 15–25]. Overall, these data suggest that thyroid surgery can temporary influence swallowing mechanism. Indeed, if we consider the instrumental findings in these patients, different alterations of pharyngeal mechanism of swallowing have been identified. As detailed in Table 3, few studies used instrumental diagnostic methods. Three authors adopted videofluoroscopy obtaining different results. Hyun et al. reported a significantly delayed barium swallowing time at 2 weeks in patients operated using the conventional subplatysmal techniques compared with the subfascial procedure [20]. Jung et al. found a major decreasing in hyoid bone movement in patients operated with open thyroidectomy rather than endoscopically [19] as well as Im et al. after thyroidectomy with central neck dissection. This latter had not found any significant difference of the kinematics and temporal measurements such as pharyngeal transit duration, laryngeal response and closure duration in cases compared with controls. However, they observed a significant difference for mean of pharyngeal impairment score (MBSImp) in dysphagic patients over time [25]. However, we take into account that these exams have tested only thin liquid limiting the analysis of the impact of bolus consistency (and/or volume) on swallowing. The fiberoptic endoscopic evaluation of swallowing was utilized only by Arakawa-Sugueno et al. who reported in patients with normal laryngeal motility: food retention in 44% of patients in the early postoperative

Table 3 Dysphagia post uncomplicated thyroidectomy

Author (year)	Diagnostic methods	Preoperative dysphagia	Postoperative dysphagia (≤2 w)	Follow-up		
				improvement	no changes	worsening
Lombardi [15] (2006)	SIS	Swallowing symptoms: 2/39 SIS mean 0.5 ± 1.2	At 1 w: SIS mean 10.3 ± 4.9	SIS mean: at 1 m 6.0 ± 2.9 at 3 m 2.8 ± 2.8 (ss)	–	–
Lombardi (2008) [16]	SIS	Swallowing symptoms: VAT 24/29, SIS 3 ± 2.7 CT 13/24, SIS 2.08 ± 2.22 ns between two groups	At 1 w: VAT: SIS 3.93 ± 3.21(ns) CT: SIS 5.64 ± 3.44 (ss) ss between two groups	VAT: SIS 1.69 ± 1.63 at 1 m 1.24 ± 1.21 at 3 m (ss) CT: SIS 2.68 ± 2.56 at 1 m 2 ± 3.24 at 3 m (ns) at 3 m ns between two groups	–	–
Lombardi (2009) [17]	SIS	Swallowing symptoms 52/110 SIS mean 2.4 ± 3.4	At 1 w: swallowing symptoms 81/110 SIS mean 4.7 ± 4.4 (ss)	Swallowing symptoms: at 1 m 81/110 at 3 m 53/110 > 1 y 22/110 (ss) SIS mean: at > 1 y 0.7 ± 1.8 (ss)	SIS mean: at 1 m 2.9 ± 3.2 (ns) at 3 m 1.7 ± 2.7 (ns)	–
Silva (2012) [4]	UADS questionnaire	no data collected	UADS: IONM 39 controls 89 (ns) swallowing symptoms: IONM 22 controls 70 (ss)	–	–	–
Tae (2012) [18]	SSS	SSS: GUAB 0.85 ± 1.39 CT 0.62 ± 1.53	SSS elevated both groups (ss): at 1 d GUAB 2.46 ± 2.07 CT 1.63 ± 1.86 at 1 w GUAB 1.63 ± 1.86 CT 1.82 ± 2.18	SSS returned to preop levels at 6 m in both groups GUAB 0.75 ± 1.30 CT 1.02 ± 2.02 ns between two groups	–	SSS elevated both groups (ss) at 1 m: GUAB 1.94 ± 2.43 CT 1.91 ± 2.72 at 3 m: GUAB 1.57 ± 1.99 CT 1.83 ± 2.53
Lombardi (2012) [5]	SIS	SIS 2.15 ± 3.48	31/32 normal LEMG for thyroarytenoid muscles both sides, 1 fibrillation potential	–	SIS (ns) at 1 m 2.81 ± 3.63 at 3 m 1.65 ± 2.56	–
Jung (2013) [19]	SIS VFS	SIS: SubP 0.67 ± 1.28 SubF 0.36 ± 0.81 Swallowing time: SubP 0.90 ± 0.25 SubF 0.91 ± 0.22 ns between two groups	At 2 w: SIS: SubP 2.81 ± 3.02 (ss) SubF 1.59 ± 2.37 (ss) Swallowing time: SubP 1.01 ± 0.32 (ss) SubF 0.91 ± 0.24 (ns) SubP had worse SIS (ss)	At 3 m: SIS SubP 1.24 ± 2.16 (ns) SubF 0.64 ± 1.12 (ns) Swallowing time: SubP 0.95 ± 0.30 (ss) SubF 0.88 ± 0.27 (ns) SubP > 50 y SIS did not recover to preop level	ns difference in hyoid movement at any time in both groups	–

Table 3 (continued)

Author (year)	Diagnostic methods	Preoperative dysphagia	Postoperative dysphagia (≤2 w)	Follow-up		
				improvement	no changes	worsening
Hyun (2014) [20]	Video recording of swallowing SIS-6 VFS	SIS-6: GTET 0.58 CT 1.26	At 3 d SIS-6: GTET 6.09 CT 11.00	–	–	At 1 m SIS-6 GTET 4.96 (ss) CT 6.26 VFS: hyoid bone movement decreased to: GTET 84–83% CT 55–56% (ss)
Arakawa-Sugueno (2015) [9]	FEES	FEES normal	Overall dysphagia 30/54 (55%) NLM: EPO 17/39 (44%)	Dysphagia NLM: 25% LPO (ss)	–	–
Araùjo (2017) [22]	UADS questionnaire	UADS higher values	–	At 3 m ss reduction for symptoms “choke” and “dry”	–	–
Gohrbandt (2016) [21]	Voice and swallowing questionnaire ultrasound laryngeal mobility	Swallowing symptoms: 30/53 mean laryngeal mobility: 21.1 ± 6.5 mm	–	Swallowing symptoms: at 3 m 12/53 at 6 m 4/53 (ns) mean laryngeal mobility: at 3 m 14.8 ± 3.9 mm (ss) at 6 m 16.8 ± 4.1 mm (ss)	–	Swallowing symptoms: at 1 m 25/53 mean laryngeal mobility: at 1 m 12.5 ± 3.3 mm (ss)
Park (2018) [8]	TVQ	Swallowing-TVQ 6.23 ± 6.06	–	Swallowing-TVQ at 6 m 7.84 ± 6.67 (ss) at 1 y 7.63 ± 6.56 (ns)	Swallowing-TVQ at 3 m 9.15 ± 7.66 (ns)	Swallowing-TVQ at 1 m 10.20 ± 8.21 (ss)
Krekeler (2018) [23]	Semi structured interview symptoms of dysphagia and related QoL	–	At 2 w swallowing complaint: Interview Cards 80% Open interview 53% Strategies: “take smaller bites”	At 6 w and 6 m: swallowing complaint Interview Cards 42% and 17% Open interview 12% both times	–	–
Ha (2018) [24]	Pain Scale Score SIS NII	nr	Neck pain: higher GTET, GTRT vs CT (ss) NII: GTRT higher vs CT (ss) Pain Scale Score, SIS, swallowing difficulty: ns differences three groups	–	–	–
Sahli (2018) [26]	Patient-reported swallowing changes	–	51 swallowing change 174 swallowing and voice changes	–	–	–

Table 3 (continued)

Author (year)	Diagnostic methods	Preoperative dysphagia	Postoperative dysphagia (≤2 w)	Follow-up		
				improvement	no changes	worsening
Im (2018) [25]	VFS	MBSImps 1.41 MDHE 13.88 MDLE 23.85 PTD 0.74 LRD 0.27 LCD 0.56	At 1 w MBSImps 2.48 (ss) MDHE 11.17 (ss vs controls) MDLE 19.44 (ns vs controls) PTD 0.74 (ss vs controls) LRD 0.25 (ss vs controls)	At 3 m: MBSImps 1.56 (ns) MDHE 11.27 (ss vs controls) MDLE 19.57 (ns vs controls) PTD 0.28 (ss vs controls) LRD 0.28(ss vs controls)	–	–

pt patients, *UADS* upper aero-digestive symptoms, *ns* not significant, *ss* statistically significant, *nr* not reported, *SIS* swallowing impairment score, *VAS* visual analogue scale, *SWAL-QOL* swallowing quality of life, *SSS* swallowing symptom score, *LEMG* laryngeal electromyography, *VFS* videofluoroscopy, *RSI* reflux symptom index, *FEES* fiberoptic endoscopic evaluation of swallowing, *TVQ* thyroidectomy voice-related questionnaire, *NII* neck impairment index, *VAT* video-assisted thyroidectomy, *CT* conventional thyroidectomy, *IONM* intraoperative laryngeal nerve monitoring, *SubP* subplatysmal, *SubF* subfascial, *GTET* gasless transaxillary endoscopic thyroidectomy, *GTRT* gasless transaxillary robotic thyroidectomy, *MBSImps* modified barium swallowing impairment profile score, *MDHE* maximal distance of hyoid excursion, *MDLE* maximal distance of laryngeal excursion, *PTD* pharyngeal transit duration, *LRD* laryngeal response duration, *LCD* laryngeal closure duration, *d* day, *w* week, *m* month, *y* year

(EPO) and 18% in late postoperative (LPO), early spill in 21% in EPO and 7% in LPO. Moreover, liquid consistency was associated with highest risks of early spill in the EPO while pasty consistency with retention in oro/hypopharynx 31% in EPO and 18% in LPO [9]. Ghorbandt et al. performing laryngeal ultrasound have detected a significant impairment of postoperative laryngeal mobility [21] while Hyun et al. have calculated an increase contraction/relaxion ratio of cervical muscles by video recording of swallowing particularly in patients operated by conventional open thyroid surgeries [20]. Overall these results confirmed that there is impairment at this level, but they do not reveal a pathognomonic related alteration of swallowing. In order to explain this condition, many causes have been hypothesized: laryngeal trauma during intubation [27], modifications of laryngeal vascularization [28], intraoperative injury of laryngeal nerves branches [29] as well as their anastomosis with sympathetic cervical chain [10, 13, 15], injury of the prethyroid strap muscles and cricothyroid muscles [30] or of the soft cervical tissues with laryngotracheal fixation, local neck pain or psychological reaction after surgical procedure [28, 31]. It is likely that this is a multifactorial phenomenon where the organic and functional factors seem to be associated. Indeed, it would partly explain the variability of subjective perception without a typical instrumental finding. We have also observed that postoperative dysphagia is frequently associated with dysphonia, as documented in eleven studies out of the 16 included [5, 8, 15–19, 21, 22, 24–26]. Therefore, there is an overlap of swallowing and voice symptoms agreeing with the previous given description of "upper-aero digestive symptoms" [5, 8] and suggesting a common origin. The most frequent voice complaints after uncomplicated thyroidectomy are vocal fatigue, difficulty in producing high pitch and low voice [6]. Analogous to dysphagia, two are the crucial facts: first, the severity of dysphonia documented by a significant increase in GRBAS score was found in the first 2 weeks but less so after 3–6 months. Second, the instrumental methods failed to identify characteristic alterations even though Lang et al. in a recent meta-analysis considering 896 patients have reported a F0, shimmer and MPT significantly worsened in the early (< 3 months) and not in the late postoperative period [6]. Lastly, we have noted that few authors have studied the risk factors potentially involved in postsurgical dysphagia. Considering the extension of surgery that means total thyroidectomy (TT) or hemithyroidectomy (HE) and neck dissection, Park et al. have revealed significantly higher values in temporal change of swallowing-related TVQ scores in patients undergo TT, neck dissection or with macro extrathyroidal extension [8]. The techniques of thyroid surgeries may also influence swallowing. Three authors compared conventional open thyroidectomy to robotic techniques reporting a statistically significant increasing values in SIS score and delayed barium swallowing in conventional

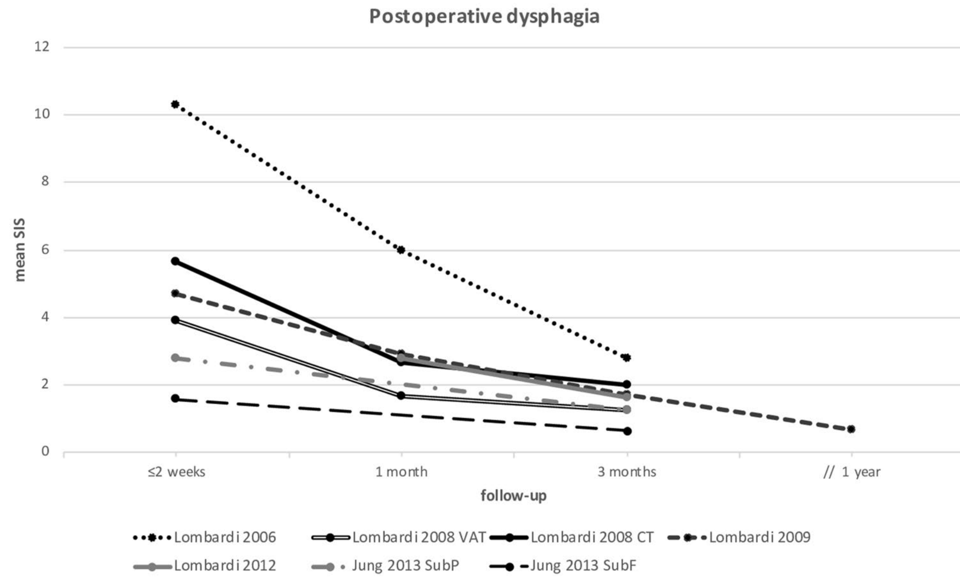


Fig. 2 Post-operative mean SIS score

group [16, 18, 20]. Even Jung et al., comparing two types of open surgery, documented a significant worsening in SIS score and in hyoid movement in group operated with subplatysmal techniques and undergo total thyroidectomy [19]. On the contrary, it has not been demonstrated that the size of the thyroid could influence the degree of dysphagia postoperatively. Independent of the type of surgery, Silva et al. observed lower prevalence in swallowing symptoms in patients operated with the use of the intraoperative neuromonitoring (IONM). They have supposed that the better identification of laryngeal nerves through a less extensive dissection, reducing the manipulation and the denervation of perithyroid tissues, could prevent the scarring and fibrosis in the surgical site. This would decrease the potential negative impact on laryngeal vertical movement [4]. However, though IOMN use has become more widespread, no consensus still exists regarding its use during thyroid surgery among surgeons [32]. Additionally, two more factors could influence postsurgical swallowing complaints: the age over 50 years [20, 26] and the laryngopharyngeal reflux [33, 34]. This latter would seem to be associated with the decrease of upper esophageal sphincter pressure [35]. In this respect, also the disturbances of esophageal motility such as the upper esophageal sphincter incoordination are recently identified in patients who underwent thyroid surgeries suggesting a role of the esophagus in the development of dysphagia [36, 37].

Conclusion

This review documented that dysphagia after uncomplicated thyroidectomy can develop early in the postoperative time and usually it resolves uneventfully in the first year. Frequently it is associated with voice changes. Instrumental diagnostic methods have revealed an impairment of swallowing but failed to identify the physio pathological mechanism leaving this condition still unclear. Considering that these symptoms can lead anxiety and dissatisfaction with surgical procedure, we recommend informing the patients before any type of thyroid surgery.

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Compliance with ethical standards

Conflict of interest The authors declare that they have no conflict of interest.

Research involving human participants and/or animals This article does not contain any studies with human participants or animals performed by any of the authors.

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