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Original article

Incidence of Dysphagia in Patients with Unilateral Vocal Cord Paralysis

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ABSTRACT

Background: It is essential and evaluates dysphagia among patients with UVCP to help the management, improves the quality of life, and prevents secondary complications.

Aim of the work: This research aims to find the incidence of dysphagia in patients with unilateral vocal cord paralysis [UVCP].

Patients and Methods: This study was performed in 245 patients with UVCP; 98 males and 147 females. There were two groups of patients: the non-dysphagia group [130 patients] and the dysphagia group [115 patients]. Assessment of patients was performed by the verified 10-item Eating Assessment Tool [EAT-10] and Dysphagia Handicap Index [DHI].

Results: Performing EAT-10 questionnaire revealed average values of 18.5 ± 9.56 and 34.3 ± 11.3 in the non-dysphagia group and dysphagia groups, respectively. DHI showed mean values of 45.7 ± 18.12 and 85.42 ± 21.7 in the non-dysphagia group and dysphagia groups, respectively. All of them demonstrated a highly significant variation [$P = 0.001$]. Regarding the etiology of UVCP, iatrogenic was the first cause of UVCP; it was the cause of 36.9% and 36.52%, followed by idiopathic; 23.1% and 24.34 %, intubation injury; 12.6% and 11.3%, tumor; 10% and 9.56%, trauma; 8.46% and 8.69%, thyroid surgery; 4.62% and 5.22%, and neurodegenerative disease; 4.62% and 4.35% of non-dysphagia and dysphagia groups, respectively.

Conclusion: The incidence of dysphagia in unilateral vocal cord paralysis depends mainly on the cause; however, vocal cord paralysis itself increases the incidence of dysphagia whatever the cause.

Keywords: Dysphagia; Unilateral vocal cord paralysis; Laryngeal reflexes; Self-reported swallowing disability; Dysphagia Handicap Index [DHI]

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* Main subject and any subcategories have been classified according to the research topic.

INTRODUCTION

Vocal fold movement functions by coordinating the contraction of the laryngeal muscles innervated by the vagus nerve and its branches, the recurrent laryngeal nerve, and the superior laryngeal nerve^[1].

Unilateral vocal fold immobility [UVFI] may arise secondary to etiologies that are neurogenic or mechanical. Trauma and lesions in the motor cortex, neck, and mediastinum are neurogenic causes. In contrast, the vocal folds' mechanical obstruction may be attributed to intrinsic laryngeal musculature infiltration or disordered crico-arytenoid joint stiffness^[2].

UVCP can lead to phonation and swallowing difficulties, irrespective of etiology ^[3].

Afferent input from the laryngeal region is necessary to enable the various reflexes which protect the respiratory tract from invasion by the foreign body and allow the oral, pharyngeal and esophageal phases to be swallowed ^[4].

Owing to the high risk of aspiration, impaired swallowing or dysphagia is worrisome, contributing to the possible development of pneumonia. For example, 50 % experience aspiration between patients with dysphagia after a stroke, and almost one-third of all these develop pneumonia and need treatment ^[5].

UVCP arises from damage to one recurrent laryngeal nerve; 70% to 80% are caused by two categories: idiopathic [12%-37%] and surgical [47%-56%] injuries. Surgical causes involve thyroid or parathyroid gland injury, cervical spine, cardiothoracic, neck and head surgery, neurosurgery, and foregut surgery ^[6].

If the cause of paralysis has been unpredictable, abrupt onset, and correlated with deficiencies of clinical usefulness associated with severe impairment of communication, new-onset dyspnea, dysphagia, aspiration ^[7, 8]

Symptoms of dysphonia, aphonia, and dyspnea, reduced cough strength, and dysphagia can result from the resulting glottal deficiency. The influence of UVFI on voice, breathing, and quality of life-related to voice has been thoroughly studied^[8].

Therefore, it is important to better diagnose and assess dysphagia between UVCP patients to improve quality of life and prevent secondary complications ^[3].

AIM OF THE WORK

This research aims to find dysphagia's incidence in patients with unilateral vocal cord paralysis [UVCP].

PATIENTS AND METHODS

This retrospective research was conducted on 245 patients with UVCP, 147 females and 98 males. The study was conducted in the Otorhinolaryngology departments of Al-Azhar University Hospital, Damietta, and Al-Hussein University Hospital, Cairo, between July 2017 and July 2020.

The patients gave written informed consent for their clinical records to be included in this research. The Institutional Review Board [IRB] approval was obtained from Al-Azhar University Hospital for this study.

Participants over 18 years of age have been involved in the research while the exclusion criteria were that who had dysphagia due to other causes than vocal cord lesions such as drugs, esophageal or gastric cancer, esophageal spasm, achalasia, heartburn, or history of stomach, esophageal and head and neck surgery. Also, concomitant vocal fold lesions, superior laryngeal nerve impairment without proof of impaired movement of the vocal fold [VF], bilateral impairment of VF mobility, normal or abnormal bilateral VF mobility are excluded.

All demographic data of the patients were recorded, such as age, sex, residence, education, the period of the disease, lesion laterality, and onset of dysphagia.

Testing instrumentation for dysphagia:

All patients with UVCP were confirmed by video-laryngoscopy.

Self-reported swallowing disabilities were the primary result measure. This was evaluated pre and post-surgery with the validated 10-item Eating Assessment Tools [EAT-10], with scores 3 deemed abnormal, as indicated by normative results^[9].

Dysphagia Handicap Index [DHI] has been

adopted^[10]. The total score was registered for each instrument. The existence of dysphagia was defined by DHI total scores higher than 5 and EAT-10 total scores higher than 216.

Statistical analysis: Data analysis was conducted utilizing SPSS, version 23. The data is represented as average values [with standard deviations [SDs]] and is 2-tailed in all statistical tests. For the data, non-parametric tests have been applied. To identify variations among groups, chi-square tests [χ^2], paired t-test, and student t-test has been utilized [according to ANOVA test of variance]. The $p < 0.05$ values have been deemed statistically significant.

RESULTS

The research involved 245 patients with UVCP, 98 males and 147 females. Of them, 115 patients suffered from dysphagia; there had been 40 men and 75 women. Their ages ranged between 18 and 89 years, with a mean \pm SD of 59.8 ± 5.69 years in the non-dysphagia group and 62.3 ± 6.97 years in the dysphagia group. As regard the education level; 33 [25.4%] and 9 [7.8%] were ignorant, 23 [17.7%] and 13 [11.3%] were primary school, 34 [26.1%] and 41 [35.7%] high school, and 40 [30.8%] and 52 [45.2%] had university degree in non-dysphagia and dysphagia groups, respectively. As regard laterality, 112 were right-sided; 61 [46.9%] of the non-dysphagia group and 51 [44.3%] of the dysphagia group, while the left-sided lesion was found in 133 patients 69

[53.1%] if the non-dysphagia group and 64 [55.7%] of the dysphagia group. Our patients' residence was 121 rural and 124 urban. They had a mean disease duration of 2.62 ± 1.86 years and 1.8 ± 1.05 years in non-dysphagia and dysphagia groups, respectively [Table 1].

The most common symptoms were presented in non-dysphagia group and dysphagia group as dysphagia [0% and 100%], dysphonia [19.2% and 62.6%], dyspnea [29.2% and 27.8%], cough [16.9% and 13.9%], frequent sputum [9.23% and 6.09%] and globus sensation [3.85% and 1.74%], respectively [Table 2].

Performing EAT-10 questionnaire showed mean values of 18.5 ± 9.56 and 34.3 ± 11.3 in the non-dysphagia group and dysphagia groups, respectively. Dysphagia Handicap Index showed mean values of 45.7 ± 18.12 and 85.42 ± 21.7 in the non-dysphagia group and dysphagia groups, respectively. As seen in the table, they all showed a highly significant variation [$P=0001$] [3]. On studying the etiology of UVCP, iatrogenic was the first cause of UVCP, it was the cause of 36.9% and 36.52%, followed by idiopathic; 23.1% and 24.34%, intubation injury; 12.6% and 11.3%, tumor; 10% and 9.56%, trauma; 8.46% and 8.69%, thyroid surgery; 4.62% and 5.22%, and neurodegenerative disease; 4.62% and 4.35% of non-dysphagia and dysphagia groups, respectively [table 4].

Table [1]: Demographic data of the studied patients

UVCP		Without dysphagia		With dysphagia		Significance	
		No.	%	No.	%	Test	P
Gender	Males	58	44.6	40	50.0	0.294	0.107
	Females	72	55.4	75	50.0	0.019	0.335
Age [years]		59.8 \pm 5.69; 19-86		63.2 \pm 6.97; 19-89		0.011	0.491
Education	Illiterate	33	25.4	9	7.8	13.96	0.000*
	Primary school	23	17.7	13	11.3	5.418	0.007*
	High school	34	26.1	41	35.7	6.112	0.005*
	University	40	30.8	52	45.2	3.455	0.009*
Laterality	Right	61	46.9	51	44.3	0.852	0.096
	Left	69	53.1	64	55.7	0.812	0.099
Residence	Rural	76	58.5	45	39.1	1.951	0.041*
	Urban	54	41.5	70	60.9	2.347	0.017*
Disease duration [Years]		2.62 \pm 1.86		1.80 \pm 1.05		2.13	0.0324

UVCP: unilateral vocal cord paralysis; $P < 0.05$ = significant.

Table [2]: Common symptoms of the studied patients.

Symptoms of UVCP	Without dysphagia		With dysphagia		Significance	
	N = 130	%	N = 115	%	χ^2	P
Dysphagia	0	0.0	115	100	75.82	0.000*
Dysphonia	25	19.2	72	62.6	11.871	0.000*
Dyspnea	38	29.2	32	27.8	0.091	0.144
Cough	22	16.9	16	13.9	0.127	0.085
Sputum/salivation	12	9.23	7	6.09	0.139	0.074
Globus sensation	5	3.85	2	1.74	1.064	0.058

χ^2 = Chi square test, * P <0.05= significant.

Table [3]: Outcome of the questionnaire.

EAT-10	Without dysphagia	With dysphagia	t-test	P
Range	0 – 40	0 – 40		
Mean \pm SD	18.5 \pm 9.56	34.3 \pm 11.3	9.151	0.001*
DHI				
Range	5 – 100	7 – 100		
Mean \pm SD	45.7 \pm 18.12	85.42 \pm 21.7	9.064	0.001*

* P <0.05= significant.

Table [4]: Etiology of UVCP of the studied patients.

Etiology of UVCP	Without dysphagia		With dysphagia		Significance	
	N = 130	%	N = 115	%	χ^2	P
Idiopathic	30	23.1	28	24.34	0.823	0.081
Iatrogenic	48	36.9	42	36.52	0.076	0.247
Intubation	16	12.6	13	11.3	0.234	0.172
Tumor and radiation	13	10.0	11	9.56	0.211	0.145
Accident and trauma	11	8.46	10	8.69	0.735	0.092
Thyroid surgery	6	4.62	6	5.22	0.205	0.149
Neural degeneration	6	4.62	5	4.35	0.086	0.198

χ^2 = Chi square test, P >0.05= non-significant.

DISCUSSION

To the best of our understanding, that is the first research to compare dysphagia with non-dysphagia in UVCP patients to find the incidence of dysphagia in UVCP patients in our country, Egypt. It was mentioned by many previous studies as well as our observation that UVCP can cause dysphagia in many patients. So, we try to find the incidence of dysphagia in those patients to give a spot of light on this phenomenon and try to find a solution in the next literature.

Although it is relatively easy to diagnose UVCP with a laryngoscope, insufficient knowledge of the disease burden on the population of patients captures both physical and etiological symptoms. This is notable because clinicians need more information about the incidence of dysphagia in UVCP. There are now attempts to better assess the degree of UVCP dysphagia. However, further research is needed on specific instrumentations of UVFP and the interplay with the consequent

somatic manifestations [e.g., voice, swallowing, breathing] [3].

This study was performed on 245 UVCP patients; of them, 115 suffered from dysphagia, and the rest [130 patients] had no dysphagia. It was found that females were more prominent than males of both groups, but they showed a non-significant difference between males and females in both groups.

Via the application to a single patient cluster with different definitions, **Schiedermayer et al.**[11] found the impact of dysphagia prevalence estimated in those with UVCP.

Also, in **Gates et al.**[8] the study, more than two-thirds of UVFI patients recorded symptoms of dysphagia. Other research agreed on these results and estimated that among 50% and 61% of those with UVFI may have some degree of swallowing dysfunction [12-13].

Comparison of age in both groups had a mean of 59.8 and 63.2 years in non-dysphagia group

and dysphagia group, respectively, with insignificant value [$p = 0.491$]. The level of education was studied; ignorance was found in 25.4%, and 7.8% of patients, 17.7% and 11.3 had a primary school, 26.1% and 35.7% of patients, and university graduated was found in 30.8% and 45.2% of patients with non-dysphagia and dysphagia group, respectively. They all showed a statistically significant difference.

The level of education was studied by **Francis et al.**^[14] and found some high school [6%], high school [19%], some college [25%], college [36%], university [4%], which was comparable to our study.

As regard laterality, 112 were right-sided; 61 [46.9%] of the non-dysphagia group and 51 [44.3%] of the dysphagia group, while the left-sided lesion was found in 133 patients 69 [53.1%] if the non-dysphagia group and 64 [55.7%] of the dysphagia group. Our patients' residence was 121 rural and 124 urban. They had a mean disease duration of 2.62 ± 1.86 years and 1.8 ± 1.05 years in non-dysphagia and dysphagia groups, respectively.

These data were coinciding with **Cates et al.**^[8] found that the median period of UVFI from the start of symptoms to the date of the surgery was 36 months, with the shortest reported duration being 7 months.

The delay in diagnosis and treatment can worsen the psychosocial effects of UVCP^[8,14]. Postponed determination and treatment are normal, and patients can encounter signs and symptoms for years before introducing, which can dramatically affect their point of view^[6,15].

The symptoms of dysphagia were identified as the clinic appointment's chief complaint. The symptoms were studied in non-dysphagia group and dysphagia group as dysphagia [0% and 100%], dysphonia [19.2% and 62.6%], dyspnea [29.2% and 27.8%], cough [16.9 % and 13.9%], frequent sputum and salivation [9.23% and 6.09%] and globus sensation [3.85% and 1.74%], respectively.

Francis et al.^[14] illustrated the symptoms of UVCP. They found that 97% had dysphonia, 72% had dysphagia, 22% had salivation, 50% ear

liquids only, 14% eat pureed, 42% eat solid, 58% dyspnea, 86% cough, 78% require surgery, and 68% require injection, while 30% of cases did not require treatment.

Abnormal swallow was considered when total EAT-10 total score > 2 or DHI score > 5 . EAT-10 questionnaire in the present study showed mean values of 18.5 ± 9.56 and 34.3 ± 11.3 in non-dysphagia and dysphagia groups, respectively. DHI showed mean values of 45.7 ± 18.12 and 85.42 ± 21.7 in the non-dysphagia group and dysphagia groups, respectively. All of them demonstrated a highly significant variation [$P = 0.001$]. So, the majority of patients undergoing instrumental evaluation have been shown to have abnormal swallowing function, which confirmed by **Schiedermaier et al.**^[11], who stated the same findings and recommended completion based on the results of the clinical assessment. The range of incidence estimates in this research was comparable to other research utilizing a similar mean of dysphagia examining the incidence of dysphagia in UVCP^[2,14].

Cates et al.^[8] reported that 20 % of patients with abnormal preoperative EAT-10 had a postoperative score inside the normal range. Although most patients with abnormal baseline scores kept going to report symptoms after surgery, the mean EAT-10 score improved by approximately 5 points. They added that their research results showed that dysphagia is prevalent in people with UVFI and that treatment improves, but does not fully remove, the symptoms of dysphagia. This may be due to pharyngeal weakness in UVFI^[16].

Regarding the etiology of UVCP, iatrogenic was the first cause of UVCP; it was the cause of 36.9% and 36.52%, followed by idiopathic; 23.1% and 24.34 %, intubation injury; 12.6% and 11.3%, tumor; 10% and 9.56%, trauma; 8.46% and 8.69%, thyroid surgery; 4.62% and 5.22%, and neurodegenerative disease; 4.62% and 4.35% of non-dysphagia and dysphagia groups, respectively.

Our causes agree with **Cates et al.**^[8] as they found that UVFI etiology was iatrogenic in [55%], idiopathic in [29%], neoplastic [9%], traumatic [5%], or radiation-related [2%].

Also, this agreed with **Schiedermaier et al.**^[11] who studied 415 UVCP cases and found the cause was 206 iatrogenic, 107 idiopathic, 31 tumors, 20 intubation, 19 accidental trauma, and four degenerative diseases. They added that more instrumental evaluation was most commonly correlated with etiological categories; 33 [31%] of idiopathic UVCP patients complained of dysphagia.

However, **Dworkin and Treadway**^[17] opposed these results and found that no form of dysphagia was reported in 70% of adult retrospective cohorts diagnosed with idiopathic UVP.

While it can be predicted that idiopathic and iatrogenic etiologies for UVCP would similarly affect swallowing function, this research found insignificant differences among non-dysphagia and dysphagia patients. But **Dworkin and Treadway**^[17] stated that “patients with an iatrogenic etiology more frequently complained of dysphagia, had higher DHI or EAT-10 scores”, showed increased reference for instrumental dysphagia evaluation, and showed higher aspiration rates than those with idiopathic etiology. However, through quantitative analysis of video-fluoroscopic assessment, further comparison of these two patient populations is required to better identify similarities and differences in swallowing physiology.

The study had some limitations; the first is the retrospective nature of the study that had a lack of information about preoperative dysphagia of some causes such as tumors, thyroid, and other head and neck surgeries. Patients with post-operative edema and the potential for transient aggravation of swallowing after surgical intervention in a short-term follow-up can account for ignorance of the actual cause of dysphagia.

Conclusion: The incidence of dysphagia in UVCP depends mainly on the cause. However, vocal cord paralysis itself increases the rate of dysphagia, whatever the etiology.

Financial and Non-Financial Relationships and Activities of Interest

None

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