

Fiberoptic Endoscopic Evaluation and Management of Dysphage in Patients with Difficulty Swallowing Due to Cerebrovascular Occlusion

Serebrovasküler Okluzyon Nedeniyle Yutma Güçlüğü Yaşayan Hastaların Fiberoptik Endoskopik Olarak Değerlendirilmesi ve Disfaji Yönetimi

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ABSTRACT Objective: Today various methods have been developed for dysphagia monitoring. Fiberoptic endoscopic (FE) evaluation is one of these methods. In our study, we aimed to evaluate patients with swallowing difficulties due to cerebrovascular occlusion (CVO) with FE examination and to convey the treatment methods applied. **Material and Methods:** Between January 2017 and December 2021, medical records, patient demographics, neurological diagnosis, FE results of 72 patients with dysphagia due to CVO and FE were evaluated and Penetration-Aspiration Scores (PAS), Functional Oral Intake Scale (FOAS), NIH (National Institutes of Health) Swallowing Safety Scale scores were calculated. Ten patients who came for follow-up were re-evaluated with FE and compared with regard to PAS, FOAS, and NIH swallowing safety values. **Results:** The patients' FE findings were categorized and according to PAS scoring, the average value was calculated as 3.58±2.44, the FOAS average value was 5.06±1.97, and the NIH swallowing safety average value was calculated as 1.42±1.6. According to the comparison results of 10 patients who could be re-evaluated with endoscopic examination after treatment during follow-up, a significant improvement was detected in PAS, NIH swallowing safety, and FOAS values ($p<0.05$). **Conclusion:** Thanks to the objective evaluation with FE, the diagnosis of dysphagia can be made earlier and it can provide visible information in terms of treatment and follow-up. Therefore, evaluation of every patient with suspected dysphagia with FE will allow us to minimize possible complications and reduce the risk of mortality due to dysphagia.

ÖZET Amaç: Disfaji takibi açısından günümüzde çeşitli yöntemler geliştirilmiştir. Fiberoptik Endoskopik (FE) değerlendirme bu yöntemlerden birisidir. Bizde çalışmamızda serebrovasküler okluzyon (SVO) nedeniyle yutma güçlüğü yaşayan hastaların FE muayene ile değerlendirilmesi ve uygulanan tedavi yöntemlerini aktarmayı amaçladık. **Gereç ve Yöntemler:** Ocak 2017 ile Aralık 2021 yılları arasında SVO nedeniyle disfaji problemi olan ve FE uygulanan 72 hastanın tıbbi kayıtları, hasta demografisi, nörolojik tanı, FE sonuçları değerlendirildi ve Penetrasyon-Aspirasyon Skorları (PAS), Fonksiyonel Oral Alım Skalası (FOAS), NIH (National Institutes of Health) Yutma Güvenlik Skalası skorları hesaplandı ve hastalar arasında karşılaştırma yapıldı. **Bulgular:** Hastaların FE bulguları kategorize edilip PAS skorlamasına göre ortalama değer 3,58±2,44, FOAS ortalama değeri 5.06±1.97 ve NIH yutma güvenliği ortalama değeri 1.42±1.6 olarak hesaplandı. Takiplerde tedavi sonrası endoskopik muayene ile yeniden değerlendirilme yapılabilen 10 hastanın karşılaştırma sonucuna göre PAS, NIH yutma güvenliği ve FOAS değerlerinde anlamlı bir düzelmeye saptandı ($p<0.05$). **Sonuç:** FE ile yapılan objektif değerlendirme sayesinde disfaji tanısı daha erken dönemde konulabilmekte ve tedavi ile takip açısından gözle görülebilir bilgiler sunabilmektedir. Bundan dolayı disfaji şüphesi olan her hastanın FE ile değerlendirilmesi olası komplikasyonları en aza indirmemize olanak sağlayacak ve disfajiye bağlı mortalite riskini azaltacaktır.

Keywords: Dysphagia management; cerebrovascular occlusion; fiberoptic endoscopic evaluation

Anahtar Kelimeler: Disfaji yönetimi; serebrovasküler okluzyon; fiberoptik endoskopik değerlendirme

Swallowing is a sensorimotor behavior that involves interaction with both cerebral hemispheres and swallowing muscles, along with the corticobulbar pathways up to the pons and medulla, allowing the food in the mouth to pass into the stomach.^{1,2} Dysphagia, on the other hand, is a finding frequently encountered in

various neurological diseases in which these pathways are impaired, especially in patients with cerebrovascular occlusion (CVO).^{2,3} The incidence of dysphagia increases with advancing age and comorbid diseases. However, this is not a normal result of healthy aging and may indicate any underlying pathology.⁴

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Aspiration is defined as the entry of the consumed substance under the vocal cords and into the trachea. Penetration, on the other hand, is defined as any substance entering the larynx during oral feeding and collecting in the supraglottic region.⁵

Timely assessment of dysphagia is important to identify the underlying source and give patients proper direction on management and expectations. Early intervention can help reduce the risk of complications such as malnutrition and aspiration pneumonia.⁴

The incidence of clinical dysphagia with general neurological disorders has been reported to be 75-80% in the literature, and 42-67% in the first three days after stroke. With the clinical examination, it can be said that 7% of the patients had swallowing disorder in the 6th month. Nineteen percent of stroke patients with dysphagia are discharged with a gastrostomy tube.⁶

In the diagnosis of dysphagia, assessment of clinical aspiration risk markers at the bedside, and performing neurological examination, including reflexes such as swallowing, gagging and coughing, and to evaluate pulse oximetry measurements and water drinking tests are important. Endoscopic, radiological, and electromyographic evaluations and videofluoroscopic swallowing studies are also among the diagnostic procedures.⁷

Fiberoptic endoscopic (FE) evaluation of swallowing has been accepted as an effective tool in the evaluation of dysphagia. Many authors have described the technique and utility of FE observation in the complete assessment of swallowing. FE can be easily completed during an outpatient or inpatient setting in the office setting.⁴

The aim of this study is to clinically evaluate patients with dysphagia due to CVO with the FE swallow test applied in the office setting, to determine the effects of dysphagia on the functional and nutritional status of patients, and to evaluate rehabilitation programs.

MATERIAL AND METHODS

A retrospective study was conducted on an average of 72 patients who had dysphagia due to CVO and underwent FE at the Konya City Hospital and Konya Training and Research Hospital Ear, Nose, and

Throat Clinic between 2017 and 2021. Approval for the study protocol was obtained from the Ethics Committee of Necmettin Erbakan University (date: April 16, 2021, number: 2021/3199). Medical records, patient demographics, neurological diagnosis, and FE results were evaluated. Causes of non-CVO dysphagia, multiple sclerosis, cerebral palsy, etc. were excluded. Re-evaluation was performed on 10 patients who came back for control. All procedures were carried out in accordance with the ethical principles of the Declaration of Helsinki.

First, a complete otolaryngology physical examination was applied to the patients. As a result of the physical examination, tongue movements, laryngeal elevation, and gag reflex were evaluated. Then, endoscopic examination findings with flexible fiberoptic videoendoscopy were noted.

Our FE protocol was made using water and yoghurt colored with blue or green food coloring and 2 different consistencies of food. According to the endoscopic examination findings, the anatomical structure of the nasopharynx and larynx, the space-occupying lesion, the structure of the vallecula, the pyriform sinuses, the presence of salivary ponding, the structure of the epiglottis, and vocal cords were evaluated.

First, the patient was asked to hold the food in his mouth and oral awareness was evaluated. After swallowing, the presence of premature escape, delay in the pharyngeal phase of swallowing, presence of fragmented swallowing, pathological residue, difficulty in initiating swallowing, laryngeal elevation limitation, decreased larynx sensation, aspiration and penetration status, and cough after swallowing reflex was noted. Penetration aspiration score (PAS), Functional Oral Intake Scale (FOIS), and National Institutes of Health (NIH) Swallowing Safety Scale scores were calculated according to the evaluation (Table 1, Table 2, Table 3).⁸⁻¹⁰

At the end of the evaluation, life change suggestions and home exercises that he could apply at home were organized. At the same time, swallowing therapies (shaker exercise, Mendelsohn exercise, vital stim applications, thermal splint, larynx elevation exercises, tongue root strengthening exercises, and supraglottic swallowing exercises) were referred to the

physiotherapist. Treatment for those who need surgical intervention, percutaneous endoscopic gastrostomy (PEG) was recommended.

STATISTICAL ANALYSIS

SPSS Windows software (ver. 22; IBM SPSS, Chicago, USA) was used. Descriptive statistics were

determine the distribution of data. For the comparison of normally distributed numeric data, paired samples t test was used, data were given as mean±standard deviation. A p value below 0.05 was considered statistically significant.

RESULTS

Of the 72 patients with different etiologies who applied with the complaint of swallowing and were included in the study, 34 (46%) were female and 38 (54%) were male. The mean age was 65.81±12.04 years. None of the patients had a nasogastric tube, tracheostomy, or gastrostomy.

As a result of the FE evaluation, pharyngeal phase delay was detected in 23 patients, difficulty in initiating swallowing in 25 patients, larynx elevation limitation in 25 patients, decreased oral awareness in 23 patients, weakened gag reflex in 34 patients, decreased larynx sensation in 23 patients, fragmented swallowing in 34 patients, pathological residue in 24 patients, aspiration in liquid food in 22 patients, penetration in liquid food in 32 patients, aspiration in solid food in 7 patients, and solid food penetration in the patient was observed (Table 4).

As a result of the findings, 67 patients were offered life style changes, 63 patients home exercise, 29 patients thickener, 27 patients shaker exercise, 4 patients Mendelsohn exercise, 48 patients vital stim, 26 patients thermal splint, 39 patients larynx mobilization exercises, 23 the tongue root strengthening exercises, and the supraglottic swallowing maneuver was applied to 6 patients (Table 5).

As a result of the evaluation, 3 of the 72 patients included in the study had advanced aspiration, so the alternative feeding method was PEG was recommended and oral intake was stopped.

used to compare general characteristics of all participants. Test of normality, including the Kolmogorov-Smirnov and Shapiro-Wilk tests, was used to

TABLE 1: Functional Oral Intake Scale.

Description	Level
No oral intake	1
Tube feeding with very little oral intake	2
Tube feeding with regular oral intake	3
Complete oral intake in a single consistency	4
Full oral intake in multiple consistencies requiring special preparation	5
Complete oral intake, requiring no special preparation but avoiding certain foods or liquids	6
Complete oral intake with no restrictions	7

TABLE 2: Penetration-Aspiration Score.

Description	Level
Contrast material does not escape into the airway	1
Contrast material enters airway, remains on vocal cords, no residue	2
Contrast material remains on vocal folds, visible residue remains	3
Contrast material touches vocal cords, no residue	4
Contrast agent to the vocal cords contacts, there is visible residue	5
Contrast material descends below vocal cords, no residue	6
Contrast material descends below the vocal cords, visible residue despite the patient's response	7
Contrast material goes under the vocal cords, visible residue, no response in the patient	8

TABLE 3: National Institutes of Health-Ingestion Safety Scale.

Description	Point	Point
Remnant in vallecula	0 (none)	1 (exist)
From the hypopharynx penetration into the vestibule	0 (none)	1 (exist)
Residue in piriform	0 (none)	1 (exist)
Rrom piriform laryngeal residue towards the vestibule	0 (none)	1 (exist)
Entry into the upper esophagus	0 (100% input)	3 (no entry)
Aspiration	0 (none)	1 (exist)

TABLE 4: Dysphagia examination and FE evaluation results in CVO patients.

Examination	n (%)
Pharyngeal phase delay	23 (31)
Difficulty in starting swallowing	25 (34)
Limitation of larynx elevation	25 (34)
Decreasing oral awareness	23 (31)
Gag reflex weakness	34 (72)
Of larynx sensing	23 (31)
Particular swallowing	34 (72)
Pathological residual	24 (33)
Aspiration in liquid food	22 (30)
Penetration in liquid food	32 (44)
Aspiration in solid food	7 (1)
Penetration in solid food	7 (1)

FE: Functional endoscopic; CVO: Cerebrovascular occlusion.

TABLE 5: Treatment methods arranged as a result of FE sinus surgery evaluation.

Treatment methods	n (%)
Life style change recommendations	67 (93)
Home exercise recommendations	63 (87)
Addition to thickening food	29 (40)
Shaker exercise	27 (37)
Mendelson exercise	4 (0.5)
Vital stim application	48 (66)
Thermal siplint application	26 (36)
Larynx mobilization exercises	39 (54)
Language root strengthening exercises	23 (31)
Supraglottic swallowing maneuver	6 (0.8)

FE: Functional endoscopic.

As a result of the endoscopic examination and evaluation, the mean value of the PAS was 3.58 ± 2.44 and the mean value of the FOIS score was 5.06 ± 1.97 . The mean value of the NIH swallowing safety score was calculated as 1.42 ± 1.6 (Figure 1, Figure 2, Figure 3) (Table 6).

According to the comparison results of 10 patients who could be re-evaluated with post-treatment endoscopic examination, the pre-treatment PAS was 4.30 ± 2.58 , the post-treatment PAS was 3.70 ± 2.66 , and the pre-treatment NIH swallowing safety score was 2.60 ± 2.27 . Post-treatment NIH swallowing safety score was 1.40 ± 1.95 , pre-treatment FOIS score was 4.10 ± 2.42 , while post-treatment FOIS score was 4.60 ± 1.95 . According to the results of the compari-

son, PAS, NIH swallowing safety, and FOIS, a significant improvement was found in the values ($p < 0.05$) (Table 7).

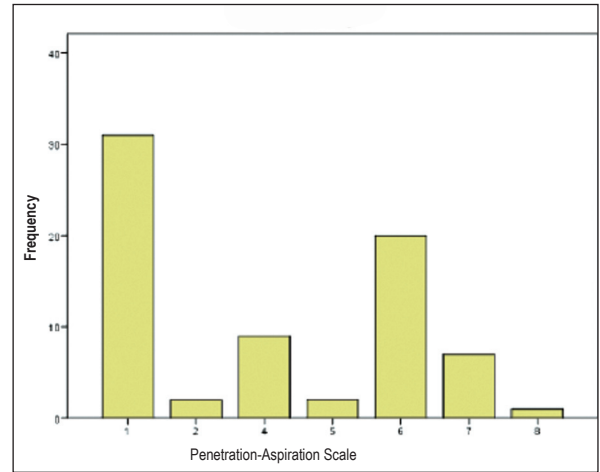


FIGURE 1: Penetration-Aspiration Scale graphic.

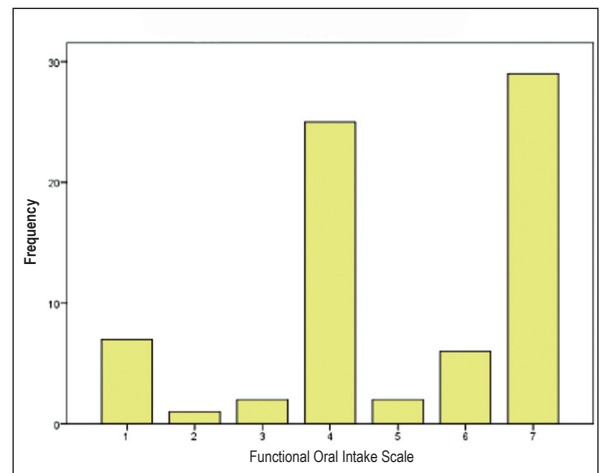


FIGURE 2: Functional Oral Intake Scale graphic.

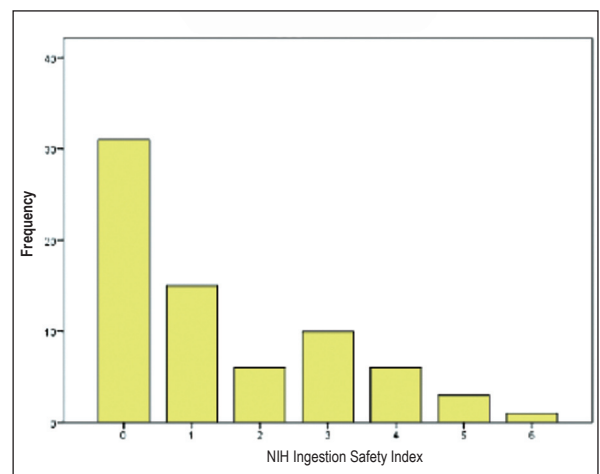


FIGURE 3: NIH Ingestion Safety Index graphic.

TABLE 6: Mean values of PAS, FOAS, and NIH swallowing safety scale.

	PAS	FOAS	NIH Ingestion Safety Index
Minimum	1	1	0
Maximum	8	7	6
Average	3.58±2.47	5.06±1.97	1.42±1.64

Data are presented as mean±standard deviation.

PAS: Penetration-Aspiration Scores; FOAS: Functional Oral Intake Scale; NIH: National Institutes of Health.

TABLE 7: FE evaluation before and after treatment in CVO patients.

n=10	Before treatment	After treatment	p value
PAS	4.30±2.58	3.70±2.66	0.004
FOIS	4.10±2.42	4.60±1.95	0.011
NIH ingestion safety	2.60±2.27	1.40±1.95	0.002

*Statistical: Paired samples was performed with the t-test. Data are presented as standard deviation; FE: Functional endoscopic; CVO: Cerebrovascular occlusion; PAS: Penetration aspiration score; FOIS: Functional Oral Intake Scale; NIH: National Institutes of Health.

DISCUSSION

Dysphagia increases the risk of aspiration pneumonia and malnutrition at a high rate in elderly individuals and may cause an increase in the mortality of the patient in both cases.⁴ Although stroke is the major cause of dysphagia, there is limited information about when and how to treat and nutrition of patients with dysphagia after acute stroke.¹¹ In our study, we aimed to evaluate the swallowing function using the FE method in the follow-up periods of stroke patients. The aim of this study is to show how useful FE is in the follow-up of dysphagia in a certain patient population.

Timely screening and intervention are essential in preventing complications such as malnutrition and aspiration pneumonia in this high-risk population. Surgical intervention (PEG tube placement) was recommended in approximately 5% of patients. This surgical procedure was performed to minimize the risk of aspiration. Evaluating dysphagia in patients with CVO in their early stages can reduce the risk of complications and the need for further treatment modalities.

As a result of our study, abnormal findings were observed in most of the patients and approximately 90% of the patients were recommended to exercise

or change their life according to the FE results. The use of PAS, FOIS, and NIH dysphagia scores was found useful in the follow-up and treatment decisions of the patients. A significant regression was observed in the complaints of patients evaluated with FE before and after treatment, and significant improvement was observed in PAS, FOIS, and NIH scores.

The main goal in the rehabilitation of swallowing disorders is not to switch all patients to oral intake. It is aimed to prevent aspiration pneumonia, airway obstruction and malnutrition, and to ensure that the patient receives adequate fluid and nutrients in a safe way. The patient’s diagnosis, demographic information, cognitive status, severity of dysphagia, and the current pathophysiology affect and shape the treatment. Various techniques such as neuromuscular electrical stimulation, transcranial magnetic stimulation, thermal tactile stimulation, swallowing exercises, postural regulation techniques, swallowing maneuvers, biofeedback, and changing food density size are used to treat swallowing disorders.¹²

It was stated that shaker exercise, one of the exercises applied to the patients, increases the exercise suprahyoid muscle activity, improves laryngeal elevation, and facilitates the opening of the upper esophageal sphincter. The supraglottic swallowing maneuver is preferred in patients with reduced vocal cord closure and difficulty initiating swallowing. The Mendelsohn maneuver is used in patients with insufficient larynx elevation and inadequate opening of the upper esophageal sphincter.¹²

The anterior fuisial arches, in which the swallowing reflex is triggered, are stimulated with cold, and the swallowing reflex is tried to be triggered. It is thought that with the application of thermal tactile stimulation, bilateral activation occurs at the cortical level and facilitates the oropharyngeal phase.¹³

Vital stim is known to increase the activation of these muscles at the end of the stimulation applied to the suprahyoid muscles. It has been said that it is effective in 40% of patients with general dysphagia.¹²

Tongue exercises are used to increase tongue strength, improve tongue pressure, and increase the pressure between the tongue and pharynx. In this way, oral transit time and effective cleaning of the bolus are ensured.¹⁴

In this study, we performed regional swallowing rehabilitation and life changes according to the findings in the FE results of the patients. We think that it is the examination method that should be preferred in the first place in the management of dysphagia, since the objective evaluation with FE provides visible findings.

Smithard et al. examined the results of dysphagia in stroke patients in the acute phase and showed that dysphagia is a serious risk factor for mortality in the first 3 months and causes poor long-term outcomes.¹⁵ Therefore, in all stroke patients, swallowing and aspiration risk should be evaluated with a comprehensive and valid clinical examination at an early stage.

This study has several limitations. Aspiration pneumonia rates could not be determined precisely because of its retrospective nature. Many patients could not be re-evaluated during follow-up due to the advanced age of the patient population and the difficulty of reaching the hospital. It was observed that the complaints of 10 patients who were re-evaluated regressed and they benefited from the exercises.

CONCLUSION

Abnormal FE findings leading to changes in daily life were observed in most patients who were sent for

evaluation of dysphagia due to CVO. Although most of these patients could be managed with conservative treatment exercises and life style changes, a small percentage of patients required surgery or enteral nutrition. This suggests the necessity of early evaluation of dysphagia in this patient population to reduce the risk of potential complications such as malnutrition and aspiration pneumonia.

Thanks to the objective evaluation with FE, the diagnosis of dysphagia can be made earlier and it can provide visible information in terms of treatment and follow-up. Therefore, evaluation of every patient with suspected dysphagia with FE will allow us to minimize possible complications and reduce the risk of mortality due to dysphagia.

Source of Finance

During this study, no financial or spiritual support was received neither from any pharmaceutical company that has a direct connection with the research subject, nor from a company that provides or produces medical instruments and materials which may negatively affect the evaluation process of this study.

Conflict of Interest

No conflicts of interest between the authors and / or family members of the scientific and medical committee members or members of the potential conflicts of interest, counseling, expertise, working conditions, share holding and similar situations in any firm.

Authorship Contributions

Idea/Concept: Mehmet Erkan Kahraman, Ekrem Özsöz; **Design:** Mehmet Erkan Kahraman, Ekrem Özsöz; **Control/Supervision:** Mehmet Erkan Kahraman; **Data Collection and/or Processing:** Ekrem Özsöz; **Analysis and/or Interpretation:** Mehmet Erkan Kahraman; **Literature Review:** Ekrem Özsöz; **Writing the Article:** Ekrem Özsöz; **Critical Review:** Mehmet Erkan Kahraman.

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