https://doi.org/10.23925/2176-2724.2025v37i1e69642

Dysphagia in the postoperative period of carotid endarterectomy in intensive care units

Disfagia no pós-operatório de endarterectomia de carótida em unidades de terapia intensiva

Disfagia en el postoperatorio de la endarterectomía de carótida en unidades de cuidados intensivos

Mariana da Silva Novaes[1]
Guilherme Maia Zica[1]
Fernanda Teixeira Menezes[1]
Maria Inês Rebelo Gonçalves[1]

Abstract

Introduction: Carotid endarterectomy is a surgical procedure performed on patients with carotid stenosis, either symptomatic or asymptomatic, aimed at preventing cerebrovascular accidents.**Purpose**: To identify the prevalence and severity of dysphagia in patients who underwent carotid endarterectomy in two general intensive care units. **Methods**: Cross-sectional and retrospective study was conducted with patients over 18 years of age, of both sexes, diagnosed with carotid stenosis and admitted to two general intensive care units at Sao Paulo Hospital of the Federal University of Sao Paulo (HSP Unifesp) between May 2018 and August 2021. The patients were identified using the Speech Therapy Service database, and data collection was performed through electronic medical records. Swallowing classification was determined based on the findings from clinical evaluations and the ASHA NOMS scale. **Results**: Medical records of 50 patients were identified, of which 31 met the inclusion criteria for this study. The cohort

[1] Universidade Federal de São Paulo - Unifesp, São Paulo, SP, Brazil.

Authors' contributions:
MSS: study design, methodology, data collection and article draft.
GMZ: article draft and critical review.
FTM: study design, methodology, data collection, article draft.
MIRG: study design, methodology, article draft, critical review and supervision.

Email for correspondence: guilhermemaiafono@gmail.com
Received: 12/16/2024
Accepted: 03/16/2025

was predominantly elderly with multiple comorbidities: 80% were hypertensive, 48% were smokers or former smokers, 35% were dyslipidemic, and 35% were diabetic. Among the patients, eight (25.8%) had dysphagia and twenty-three (74.2%) had normal swallowing. Among the dysphagic patients, six (19.35%) had mild swallowing difficulties, and two (6.45%) had moderate difficulties. **Conclusion**: The prevalence of dysphagia in patients undergoing carotid endarterectomy in two intensive care units during the immediate postoperative period was 25.8%, with a range from mild to moderate severity.

Keywords: Carotid Endarterectomy; Cardiovascular Abnormalities; Critical Care; Deglutition Disorders; Speech, Language and Hearing Sciences.

Resumo

Introdução: A endarterectomia de carótida é um procedimento cirúrgico realizado em pacientes com estenose de carótida, sintomáticos ou não, com o objetivo de prevenir acidentes vasculares encefálicos. **Objetivo:** Identificar a prevalência e o grau da disfagia de indivíduos submetidos à endarterectomia de carótida em duas unidades gerais de terapia intensiva. **Métodos:** Estudo transversal e retrospectivo com indivíduos de idade superior a 18 anos, de ambos os sexos, submetidos à EC e internados em duas unidades de terapia intensiva geral do Hospital São Paulo da Universidade Federal de São Paulo (HSP Unifesp) no período de maio de 2018 a agosto de 2021. Os pacientes foram localizados por meio do banco de dados do Serviço de Fonoaudiologia e a coleta de dados foi realizada nos prontuários eletrônicos. A classificação da deglutição foi estabelecida considerando-se os achados da avaliação clínica e escala ASHA NOMS. **Resultados:** Foram identificados 50 pacientes, sendo 31 elegíveis para este estudo. Observou-se prevalência de indivíduos do sexo feminino, idosos com múltiplas comorbidades, sendo que 80% eram hipertensos, 48% tabagistas ou ex-tabagistas, 35% dislipidêmicos e 35% diabéticos. Em relação à deglutição foram encontrados oito pacientes disfágicos (25,8%) e vinte e três com deglutição normal (74,2%). Dentre os pacientes disfágicos, foram observadas alterações de deglutição leves (n=6; 19,35%) e moderadas (n=2; 6,45%). **Conclusão:** A prevalência de disfagia em pacientes submetidos à endarterectomia de carótida em duas unidades de terapia intensiva no pós-operatório imediato foi de 25,8% dos pacientes e variou de leve a moderada.

Palavras-chave: Endarterectomia das Carótidas; Anormalidades Cardiovasculares; Terapia Intensiva Cirúrgica; Transtorno de deglutição; Fonoaudiologia.

Resumen

Introducción: La endarterectomía carotídea es un procedimiento quirúrgico realizado en pacientes con estenosis carotídea, sintomáticos o no, con el objetivo de prevenir accidentes cerebrovasculares. **Objetivo:** identificar lo predominio e lo grado de disfagia en pacientes sometidos a endarterectomía carotídea en dos unidades de cuidados intensivos generales. **Métodos:** Estudio transversal y retrospectivo de pacientes mayores de 18 años, de ambos sexos, diagnosticados en el EC y admitidos en dos unidades de cuidados intensivos generales de Hospital de São Paulo de la Universidad Federal de São Paulo (HSP Unifesp) entre mayo de 2018 y agosto de 2021. Los pacientes fueron identificados a través de la base de datos del servicio de Terapia del Habla, y la recolección de datos se realizó mediante registros electrónicos. La clasificación de la deglución se realizó tomando en cuenta los hallazgos de la evaluación clínica y la escala ASHA NOMS. **Resultados:** Se identificaron los registros médicos de 50 pacientes, de los cuales 31 fueron elegibles para este estudio. Se observó una prevalencia de pacientes de edad avanzada con múltiples comorbilidades, siendo el 80% hipertensos, el 48% fumadores o exfumadores, el 35% dislipidémicos y el 35% diabéticos. Se encontraron 8 pacientes disfágicos (25.8%) y 23 con deglución normal (74.2%). Entre los pacientes disfágicos, se observaron trastornos de deglución leves (n=6; 19.35%) y moderados (n=2; 6.45%). **Conclusión:** Lo predominio de disfagia en pacientes sometidos a endarterectomía carotídea en dos unidades de cuidados intensivos en el postoperatorio inmediato fue del 25,8% de los pacientes y varió de leve a moderada.

Palabras clave: Endarterectomía carotídea; Anomalías cardiovasculares; Cuidados críticos; Trastornos de la deglución; Ciencias del habla, lenguaje y audición.

Introduction

Carotid endarterectomy (CEA) is a surgical procedure performed in patients with carotid stenosis, whether symptomatic or not, with the objective of preventing ischemic strokes (IS)[1]. This technique aims to remove atherosclerotic plaques that accumulate inside the carotid artery[2]. CEA complications are uncommon due to advancements in surgical techniques and monitoring methods. However, severe complications such as IS, restenosis, and death may still occur in 3 to 6% of cases, even in specialized centers.[3] Other reported risks include nerve injury, bleeding, infection, hematomas, and seizures.[2,3]

Preliminary studies suggest that CEA may be a risk factor for dysphagia[2,4] since neural compromise during surgery may impair muscle function due to the anatomical proximity of the carotid artery to cranial nerve branches responsible for swallowing, such as the hypoglossal, vagus, and accessory nerves.[2,5,6] Depending on the severity of nerve manipulation and/or injury, patients may present with symptoms such as facial paralysis and reduced tongue sensitivity and mobility. These deficits vary in severity, may be transient or permanent, and are frequently underreported.[2, 4, 6, 7]

A 2007 prospective study involving 19 patients who developed dysphagia after CEA described swallowing disorders related to hypoglossal and/or vagus nerve injury. After three months of rehabilitation, including outpatient speech therapy, all patients recovered their swallowing function.[2] The authors recommend specialized evaluation and early rehabilitation for these patients.

Currently, dysphagia is often mentioned as a comorbidity only in the results of various studies on CEA.[8,9] However, an in-depth investigation of this topic is still lacking.

Diagnosing dysphagia after CEA in intensive care units appears crucial to minimizing or even preventing potential risks of dehydration, malnutrition, impaired quality of life, pulmonary complications, and death. This study aimed to identify the prevalence and severity of dysphagia in individuals undergoing carotid endarterectomy in two general intensive care units.

Methods

This study was approved by the Research Ethics Committee of the Federal University of São Paulo (Unifesp) (approval no. 1153/2019). It is a cross-sectional, retrospective study including individuals over 18 years of age, of both sexes, who underwent CEA and were admitted to two general intensive care units at Hospital São Paulo (HSP) – Unifesp, between May 2018 and August 2021. Patients with risk factors for secondary swallowing disorders, such as tracheostomy, orotracheal intubation longer than 48 hours, pre-existing or current neurological diseases, prior complaints of dysphagia, and head and neck cancer, were excluded.

The study was exempted from the need for informed consent by the Research Ethics Committee due to its retrospective design. Patients were identified through the Speech Therapy Service database, and data collection was conducted using electronic medical records. Clinical, sociodemographic, and swallowing assessment protocol data were collected.

At HSP, all CEA patients are admitted to intensive care units in the immediate postoperative period and undergo specialized speech-language evaluation within 12 to 24 hours, depending on clinical status.

Swallowing assessment is performed by specialized professionals when the patient meets clinical conditions for evaluation. These conditions include a medical request for assessment, spontaneous breathing, adequate alertness (Glasgow > 9), hemodynamic stability, and medical authorization for oral diet intake.

The assessment follows the Speech Therapy Service protocol at HSP (Appendix I), starting with a detailed anamnesis and complaint collection, along with respiratory, nutritional, cognitive, and linguistic (speech and language) parameters. Subsequently, vocal quality is assessed, followed by a detailed structural analysis of the speech articulators. Finally, saliva swallowing is evaluated, and when applicable and safe, functional assessment with therapeutic trials is performed. Swallowing classification is determined as follows[10]:

- **Normal swallowing:** No abnormalities.
- **Mild dysphagia:** Presence of oral, pharyngeal, or oropharyngeal impairment without clinical signs of risk or aspiration.

- **Moderate dysphagia:** Swallowing difficulty with clinical signs of aspiration for one food consistency.
- **Severe dysphagia:** Significant swallowing impairment with clinical signs of aspiration for two or more food consistencies.

Patients are classified using the ASHA NOMS scale (American Speech-Language-Hearing Association - National Outcomes Measurement System). This scale, based on clinical evaluation, is globally used to classify a patient's swallowing function, considering four aspects: safety, independence, compensatory strategies, and the need for alternative feeding methods. Swallowing function is rated on a scale from 1 (least functional) to 7 (normal)[10] (Chart 1).

Chart 1. Classification levels of the American Speech-Language Hearing Association National Outcomes Measurement System (ASHA NOMS).[9]

LEVEL 1	Individual is not able to swallow anything safely by mouth. All nutrition and hydration is received through non-oral means (e.g., nasogastric tube, PEG).
LEVEL 2	Individual is not able to swallow safely by mouth for nutrition and hydration but may take some consistency with consistent maximal cues in therapy only. Alternative method of feeding is required.
LEVEL 3	Alternative method of feeding required as individual takes less than 50% of nutrition and hydration by mouth, and/or swallowing is safe with consistent use of moderate cues to use compensatory strategies and/or requires maximum diet restriction.
LEVEL 4	Swallowing is safe, but usually requires moderate cues to use compensatory strategies, and/or the individual has moderate diet restrictions and/or still requires tube feeding and/or oral supplements.
LEVEL 5	Swallowing is safe with minimal diet restriction and/or occasionally requires minimal cueing to use compensatory strategies. The individual may occasionally self-cue. All nutrition and hydration needs are met by mouth at mealtime.
LEVEL 6	Swallowing is safe, and the individual eats and drinks independently and may rarely require minimal cueing. The individual usually self-cues when difficulty occurs. May need to avoid specific food items (e.g., popcorn and nuts), or require additional time (due to dysphagia).
LEVEL 7	The individual's ability to eat independently is not limited by swallow function. Swallowing would be safe and efficient for all consistencies. Compensatory strategies are effectively used when needed.

Results

During the study period, medical records of 50 patients who underwent CEA and were admitted to the two general intensive care units were identified, with 31 patients meeting the eligibility criteria. A predominance of female patients (n=19; 61.3%) and elderly individuals over 60 years old (n=26; 83.88%) was observed. The mean age was 68.2 years, with a median of 69 years (±11.5), ranging from 52 to 81 years. The most prevalent medical conditions were systemic arterial hypertension (n=25; 80%), smoking (n=15; 48.3%), and dyslipidemia (n=12; 38.7%) (Table 1). Most individuals (n=25; 80.6%) presented multiple comorbidities (three or more).

The distribution of clinical and sociodemographic characteristics was similar between the non-dysphagic and dysphagic groups (Table 1).

Table 1. Numerical and percentage distribution of patients undergoing CEA concerning clinical and sociodemographic variables.

Variables		Total		Non-Dysphagic		Dysphagic	
		n (31)	% (100)	n (23)	% (100)	n (8)	% (100)
Age	< 60	5	16.1	2	8.6	3	37.5
	≥ 60	26	83.8	21	91.3	5	62.5
Sex	Male	12	38.7	9	39.1	3	37.5
	Female	19	61.3	14	60.8	5	62.5
Medical History	HTN	25	80.6	19	82.6	6	75
	DLP	12	38.7	9	39.1	3	37.5
	Smoker	15	48.3	12	52.1	3	37.5
	Alcoholic	5	16	5	21.7	0	0
	DM	12	38.7	8	34.7	4	50
	CKD	1	3.2	1	4.3	0	0
	COPD	3	9.6	2	8.7	1	12.5
	MI	4	13	3	13	1	12.5
	PE	1	3.2	1	4.3	0	0

Legend: CEA = Carotid Endarterectomy; HTN = Hypertension; DLP = Dyslipidemia; DM = Diabetes Mellitus; CKD = Chronic Kidney Disease; COPD = Chronic Obstructive Pulmonary Disease; MI = Myocardial Infarction; PE = Pulmonary Embolism

Eight patients (25.8%) were identified as dysphagic, while twenty-three (74.2%) exhibited normal swallowing. Among dysphagic patients, mild swallowing impairments were observed in six cases (75%), and moderate impairments in two cases (25%).

Mild dysphagia was characterized by brief and effective coughing or throat clearing after swallowing, as well as small amounts of oral residue due to orofacial muscle weakness.

Moderate dysphagia presented with significant swallowing safety impairments, including large amounts of oral residue after swallowing, labial asymmetry, reduced tongue mobility, and compromised oral phase swallowing. Additionally, persistent coughing, throat clearing, and reduced laryngeal elevation were observed.

The ASHA NOMS scale revealed that only four individuals (12.9%) required no modifications in food consistencies at the time of evaluation. The prevalence of individuals classified within levels 5 and 6 (n=20; 64.5%) indicated exclusive oral intake with minimal dietary adjustments. Seven individuals were classified at ASHA NOMS levels 3 and 4 (22.6%), requiring significant dietary adaptations (Table 2).

Table 2. Numerical and percentage distribution of patients undergoing CEA concerning the ASHA NOMS Scale.

ASHA NOMS	n (31)	% (100)
3	3	9.7
4	4	12.9
5	8	25.8
6	12	38.7
7	4	12.9

ASHA NOMS = Scale American Speech-Language-Hearing Association - National Outcomes Measurement System.

Discussion

The characteristics of our study group align with the international literature regarding risk factors for carotid atherosclerosis. Elderly patients with comorbidities such as hypertension, smoking, obesity, alcohol consumption, and diabetes mellitus have an increased risk of developing atherosclerotic diseases.[1-6, 12, 13, 14, 15]

In our sample, more than 80% of patients were over 60 years old. Natural aging is associated with anatomical and physiological changes that can alter swallowing biomechanics to varying degrees, such as tooth loss, reduced muscle strength and mobility, calcification of laryngeal cartilages, and sensory changes[7]. The combination of age and comorbidities may contribute to the development of swallowing disorders following CEA.

A higher frequency of CEA was observed among female individuals. In Brazil, women are more likely to seek healthcare services, with healthcare utilization rates up to 1.9 times higher than men[16,17]. As a preventive and elective procedure, CEA is primarily performed in a population that regularly accesses healthcare services and undergoes routine cardiovascular assessments.

The anatomical proximity between the surgical site and certain cranial nerves, such as the hypoglossal and vagus nerves, may explain the transient swallowing impairments observed in patients following CEA.[6, 7, 13, 14] Additionally, potential manipulation of the cervical muscles responsible for laryngeal elevation further supports the clinical dysphagia findings in this study.[1-6]

No patients reported swallowing difficulties prior to surgery; however, post-CEA speech therapy assessments revealed clinical signs such as tongue tremors and reduced mobility.

The prevalence of dysphagia in this study was 25.8%, with 19.35% classified as mild and 6.45% as moderate. According to the ASHA NOMS scale (Table 2), only 12.9% of patients were able to maintain a full oral diet without restrictions (ASHA NOMS Level 7). It was observed that 87.1% of patients required some degree of dietary modification, even in the absence of initial complaints.

It is important to highlight that speech-language pathologists specializing in swallowing disorders are trained to detect early dysfunctions, determine the origin of the impairment, and guide individualized rehabilitation. This contributes to reducing hospital stays and, consequently, lowering healthcare costs while preventing hospital readmissions.[2-5, 18]

This study had some limitations, including the absence of objective swallowing examinations and the relatively small sample size. However, it represents a pioneering study in Latin America, with a sample and methodology comparable to global studies on CEA. Additionally, conducting instrumental swallowing assessments in ICU patients remains a challenge in Brazilian healthcare settings. Prospective studies incorporating instrumental swallowing evaluations in this patient population are necessary.

CEA is a preventive procedure performed in clinically stable individuals to prevent cardiovascular deterioration and complications such as strokes. These patients are expected to undergo surgery while maintaining their vital functions without significant clinical impairments. However, our findings suggest that CEA may be a risk factor for swallowing impairments, ranging from mild to moderate in the immediate postoperative period.

The results of this study highlight the importance of clinical speech-language assessment of swallowing in post-CEA patients, particularly in intensive care units, even in the absence of subjective complaints.

Conclusions

The prevalence of dysphagia in patients undergoing carotid endarterectomy in two intensive care units during the immediate postoperative period was 25.8%, with severity ranging from mild to moderate.

References

1. Thirumala PD, Kumar H, Bertolet M, Habeych ME, Crammond DJ, Balzer JR. Risk factors for cranial nerve deficits during carotid endarterectomy: a retrospective study. Clin Neurol Neurosurg. 2015; 130: 150-4.

2. Masiero S, Previato C, Addante S, Grego F, Armani M. Dysphagia in post-carotid endarterectomy: a prospective study. Ann Vasc Surg. 2007; 21(3): 318-20.

3. Timi JRR, Toregeani JF, Miyamotto M, Ribeiro IG. Complicações perioperatórias em endarterectomia de carótida relacionadas a protamina. J Vasc Bras. 2020; 2(4): 291-5.

4. Donato G, Edoardo P, Claudia P, Walter GM, Domenico B, Alessandro C, et al. Mini-skin incision for carotid endarterectomy: neurological morbidity and health-related quality of life. Ann Vasc Surg. 2020.

5. Fokkema M, Borst GJ, Nolan BW, Indes J, Buck DB, Lo RC. Clinical relevance of cranial nerve injury following carotid endarterectomy. Eur J Vasc Endovasc Surg. 2014; 47: 2–7.

6. Monini S, Taurino M, Barbara M, Irace L, Jabbour J, Bandiera G, et al. Laryngeal and cranial nerve involvement after carotid endarterectomy. Acta Otolaryngol. 2005;125(4): 398-402.

7. Namasivayam-MacDonald AM, Riquelme LF. Presbyphagia to dysphagia: multiple perspectives and strategies for quality care of older adults. Semin Speech Lang. 2019; 40(3): 227-42.

8. Jaillant N, Thibouw F, Loucou JD, Pouhin A, Kazandjian C, Steinmetz E. A prospective survey of the incidence of cranial and cervical nerve injuries after carotid surgery. Ann Vasc Surg. 2022; 87: 380-387.

9. Esposito A, Menna D, Giordano AN, Cappiello AP. Adjunctive techniques in endovascular repair of postcarotid endarterectomy pseudoaneurysm: Case report and literature review. Catheter Cardiovasc Interv. 2023;101(5): 900-906.

10. Saconato M, Maselli-Schoueri JH, Malaque CMSA, Marcusso RM, Oliveira ACPD, Batista LAN, et al. Postorotracheal intubation dysphagia in patients with COVID-19: A retrospective study. Sao Paulo Med J. 2024;142(6): e2022608.

11. American Speech-Language Hearing Association. National Outcome Measurement System (NOMS): Adult Speech-Language Pathology training manual. Rockville, Md: ASHA; 1998.

12. Kakisis JD, Antonopoulos CN, Mantas G, Moulakakis KG, Sfiroeras G, Geroulakos G. Cranial nerve injury after carotid endarterectomy: incidence, risk factors, and time trends. Eur J Vasc Endovasc Surg. 2017; 53(3): 320-35.

13. Hye RJ, Mackey A, Hill MD, Voeks JH, Cohen DJ, Wang K, et al. Incidence, outcomes, and effect on quality of life of cranial nerve injury in the Carotid Revascularization Endarterectomy versus Stenting Trial. J Vasc Surg. 2015; 61(5): 1208-15.

14. Hammer GP, Tomazic PV, Vasicek S, Graupp M, Gugatschka M, Baumann A, et al. Carotid endarterectomy significantly improves postoperative laryngeal sensitivity. J Vasc Surg. 2016; 64(5): 1303-10.

15. Levorato CD, Mello LMD, Silva ASD, Nunes AA. Fatores associados à procura por serviços de saúde numa perspectiva relacional de gênero. Ciênc Saúde Colet. 2014; 19: 1263-74.

16. IBGE (Coordenação de População e Indicadores Sociais, Rio de Janeiro, Brasil). Síntese de indicadores sociais: uma análise das condições de vida da população brasileira. 2018. [Acesso em: 14 de setembro de 2021]. Disponível em: https://biblioteca.ibge.gov.br/visualizacao/livros/liv101629.pdf.

17. Brott TG, Calvet D, Howard G, Gregson J, Algra A, Becquemin JP, et al. Long-term outcomes of stenting and endarterectomy for symptomatic carotid stenosis: a preplanned pooled analysis of individual patient data. Lancet Neurol. 2019; 18(4): 348-56.

18. Mohd AB, Alabdallat Y, Mohd OB, Ghannam RA, Sawaqed S, Hasan H, et al. Medical and surgical management of symptomatic and asymptomatic carotid artery stenosis: a comprehensive literature review. Cureus. 2023;15(8).