

Analysis of Clinical and Demographic Variables in the Treatment of Carotid Stenosis by Endarterectomy and Stent Angioplasty

Análise das Variáveis Clínicas e Demográficas no Tratamento da Estenose Carotídea por Endarterectomia e Angioplastia com Uso de Stent

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ABSTRACT

Introduction: Carotid stenosis plays a major role in the etiology of cerebral ischemic events. We evaluated the variables that impact the evolution of these patients. **Methods:** Data were retrospectively checked from the medical records of patients treated in the period between 2008 and 2015. Different variables were evaluated to determine the factors that influence the patients clinically. **Results:** The analysis was conducted based on a sample of 63 patients with carotid stenosis who underwent surgery. Regarding the factors that influenced the outcome, there was significant association with age ≥ 70 years, smoking and previous ischemic stroke. Although hypertension was the most prevalent comorbidity, no significant association as clinical worsening factor was found, as well as the isolated analysis of each surgery showed no significant difference. **Conclusions:** The clinical profile and lifestyle habits associated with certain comorbidities are variables that influence the clinical outcome of patients with carotid stenosis.

Key words: Demographic and clinical variables; Carotid Stenosis; Endarterectomy; Stent Angioplasty

RESUMO

Introdução: A estenose carotídea possui um papel importante na etiologia dos eventos isquêmicos cerebrais. Foram avaliadas as variáveis que influenciam a evolução desses pacientes. **Métodos:** Os dados foram verificados, retrospectivamente, a partir dos prontuários dos pacientes atendidos no período de 2008 a 2015. Diferentes variáveis foram avaliadas para determinar os fatores que influenciam clinicamente os pacientes. **Resultados:** A análise foi realizada com base em uma amostra de 63 pacientes com estenose carotídea que foram submetidos à cirurgia. Quanto aos fatores que influenciaram o desfecho, houve associação significativa com idade ≥ 70 anos, tabagismo e AVC isquêmico prévio. Embora a hipertensão tenha sido a comorbidade mais prevalente, não foi encontrada associação significativa como fator clínico de piora, assim como a análise isolada de cada cirurgia não mostrou diferença significativa. **Conclusões:** O perfil clínico e hábitos de vida associados a certas comorbidades são variáveis que influenciam o desfecho clínico de pacientes com estenose carotídea.

Palavras-chave: Variáveis clínicas e demográficas; Estenose carotídea; Endarterectomia; Angioplastia com Stent

INTRODUCTION

Carotid stenosis is one of the main causes in the etiology of transient ischemic attacks and on events such as strokes⁴. The presence of atheromatous plaques in the carotid artery represents about 10-20% of the cases in the context of cerebrovascular diseases⁹. The physiopathology is based either on the occurrence of embolization of atheromatous plaques

from the carotid artery or from thrombotic occlusion. Although it is noteworthy to mention that some cases are caused by the state of cerebral hypoperfusion due to partial occlusion, it is considered less common⁴. Patients with carotid stenosis of 60-99% represent a risk population in relation to the occurrence of ischemic brain events. If there is associated symptomatology, the imminence of danger is even more pronounced⁶. Regardless the approach is therapeutic or preventive, endarterectomy and stent angioplasty are the prominent methods and should

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be instituted according to their respective variables and indications.

The aim of the study was to evaluate which variables interfere on the postoperative results of each treatment option, analyzing the evolution of the patients comparatively.

METHOD

A cohort, observational, analytical, longitudinal, retrospective and individualized study was performed. Data from the medical records of patients treated with carotid stenosis by endarterectomy or stent angioplasty between 2008 and 2015 were analyzed. Different variables as age, sex, pre-procedure clinical manifestations, comorbidities, degree of stenosis, complications, clinical course and follow-up were evaluated in relation to postoperative outcomes to determine the factors that influence clinical outcomes.

The results of quantitative variables were described by means, standard deviations, medians, minimum values and maximum values. Qualitative variables were described by frequencies and percentages. Comparison of the groups defined by the type of surgery, endarterectomy or stent angioplasty, in relation to age was done using *Student's t-test* for independent samples. Regarding qualitative variables, the Fisher exact test or the chi-square test were considered. These tests were also used to assess the association between clinical factors and the occurrence of complications. Kaplan-Meier curves were presented for the description of the time free of clinical worsening. Values of $p < 0.05$ indicated statistical significance. The data were analyzed using the IBM SPSS Statistics v.20 software.

RESULTS

The following analysis was performed based on a sample of 63 patients with carotid stenosis. Of these, 27 (42.9%) underwent endarterectomy and the remaining 36 (57.1%) underwent stent angioplasty.

Evaluation of the association of demographic and clinical factors with postoperative complication

Of the 63 patients included in the study, 20 (31.7%) had postoperative complications. The 95% confidence interval for the percentage of patients with postoperative complications in the study population is given by: 20.3% to 43.2% (Table 1).

Table 1. Association of demographic and clinical factors

Postoperative Complications	Age (years)						p Value
	n	Means	Medians	Min	Max	SD	
No	43	68.8	69	49	84	9.0	0.569
Yes	20	67.4	68.5	46	83	10.4	

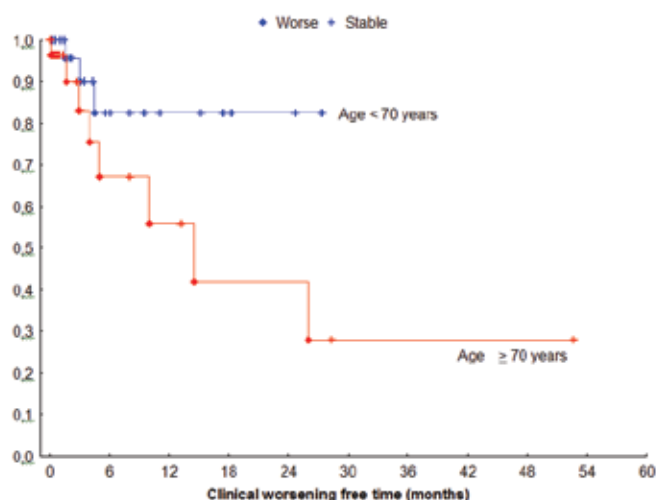
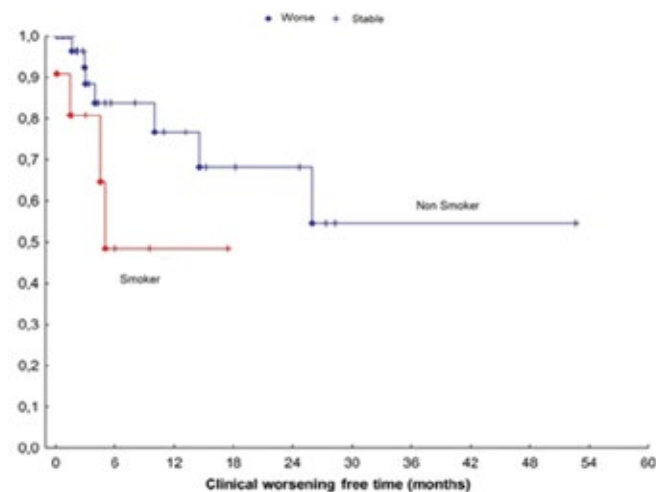
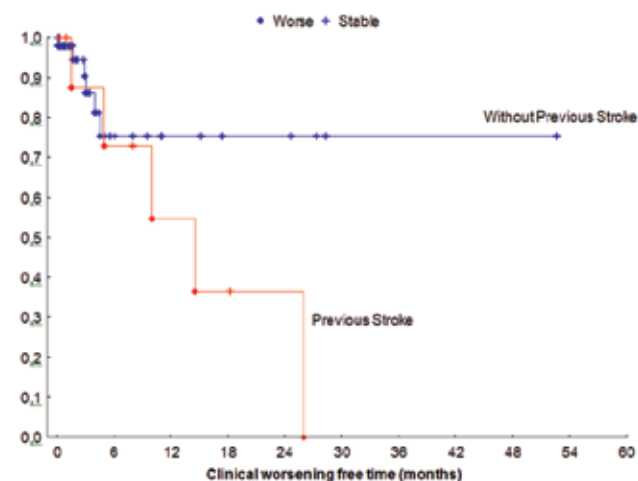
Min: minimum; Max: maximum; SD: Standard Deviation

Evaluation of the influence of demographic and clinical factors on the clinical evolution of the patient

For each of the analyzed variables, we tested the null hypothesis that there is no association between the variable and the free time of clinical worsening, versus the alternative hypothesis that there is association. Table 2 shows the p -values of the statistical tests. For variables that presented p value < 0.10 , the hazard ratio (HR) values were estimated with respective 95% confidence intervals.

Table 2. Influence of demographic and clinical factors.

Variable	p Value	HR	CI 95%	Worse clinical outcome (worst curve)
Type of surgery	0.585			
Age (years)	0.088	1.06	0.99 - 1.14	Highest age values
Age (< 70 or ≥ 70 anos)	0.058	3.31	0.88 - 12.6	≥ 70 years
Sex	0.494			
Symptomatic	0.224			
Hemiparesis	0.547			
Hemiplegia	0.414			
Hemihypesthesia	0.757			
Paresthesia	0.306			
Aphasia	0.458			
Amaurosis fugax	0.526			
Syncope (1)	0.208			
Apraxia	0.317			
Syncope (2)	0.722			
Hemianopsia	0.414			
Dizziness/vertigo	0.879			
Headache	0.944			
Hypertension	0.734			
DM	0.328			
Dyslipidemia	0.957			
Smoking	0.085	3.02	0.83 - 10.94	Smokers
Myocardial Infarction	0.805			
Previous stroke	0.056	2.62	0.79 - 8.71	Presence of previous Stroke
TIA	0.645			
Degree of Stenosis	0.998			
Complication	0.056	2.99	0.91 - 9.87	Presence of complication

**Figure 1.** Significant association of age with the clinical outcome and evolution**Figure 2.** Significant association of smoking with the clinical outcome and evolution**Figure 3.** Significant association of previous stroke with the clinical outcome and evolution

Disease free time curves are presented for the factors that presented p value <0.10 in the analysis (Figures). For these variables, a trend was found to be significantly associated with clinical outcome.

DISCUSSION

Patients diagnosed with moderate to severe atheromatous carotid stenosis may benefit from interventional surgical procedures in the treatment and prevention of ischemic stroke. Endarterectomy is one of the most accomplished and evaluated vascular surgical procedures in the last decades¹. Regarding the degree of stenosis, endarterectomy is consolidated as a preventive measure in asymptomatic cases > 60% and therapeutic in symptomatic patients > 70%⁴.

Recently, stent angioplasty has been used primarily for the treatment of patients who are at high surgical risk, either because of their underlying comorbidities or because of the age and clinical manifestations presented during the stroke¹. Stent angioplasty is a less invasive procedure compared to endarterectomy. This choice makes possible to avoid the use of general anesthesia and cervical incision, with possible nervous lesions and complications related to the surgical wound⁷. Stent angioplasty reduces hospitalization time, reducing the financial and chronological bias¹. Both procedures have their importance as effective treatments in relation to the prevention of ischemic events that may have a negative evolution with sequels and deaths in patients².

The demographic and clinical profile of the patients are predictive variables of the risk of carotid stenosis and its intrinsic complications. Numerous underlying comorbidities within a metabolic syndromic condition such as diabetes mellitus, hypertension, and dyslipidemias, as well as psychosocial factors such as smoking, obesity, alcoholism, and advanced age are risk factors that influence on the origin and progression of atheromatous carotid stenosis⁴. Hypertension has an important role on the pathophysiology of atheromatous plaque formation¹⁰. Although it was the most prevalent comorbidity in both groups of patients who underwent Endarterectomy and Stent Angioplasty in our cohort, there was no statistical direct association as a factor of clinical worsening in the evolution.

Age (> 70 years), smoking and presence of previous AVCI were factors with a significant tendency to the association of worsening in the clinical evolution in the study. Similar findings are observed in the literature with the ARIC and CHS study, which described the existence of a hardening of the carotid artery wall and its intimate layer, observed in patients

of greater age and who were smokers^{4,10}.

Older age is directly related to a higher chance of complications in the postoperative period, just as the SPACE and ICSS studies demonstrated³.

No significant difference was observed in the type of surgery alone (Endarterectomy x Angioplasty with Stent), especially regarding the evolution with unfavorable outcomes, a consistent finding with large multicentric studies such as CaRESS, SPACE and CREST⁸. The gender was not a determinant variable in the clinical evolution in relation to the time free of clinical worsening, a finding that matches with the CREST study³.

The trend of indication of endarterectomy for treatment of carotid stenosis for younger patients with less comorbidities, as well as stent angioplasty for older patients and with more comorbidities was a phenomenon observed in our study. It is noted, therefore, that patients with a higher surgical risk are preferentially submitted to the endovascular procedure⁵.

Considering the high prevalence of chronic diseases in the population of patients with atheromatous carotid stenosis, as well as its relationship with the advancement of the chance of vascular events, surgical intervention (endarterectomy or stent angioplasty) and lifestyle changes (smoking cessation, oral hypoglycemic diet, decreased fat intake, physical activity 30-60 minutes at least 3 times a week), are imperative in order to prevent complications and possible disastrous events⁴.

CONCLUSIONS

The profile of the conditions and life habits associated with specific comorbidities are variables that influence the clinical evolution of patients with atheromatous carotid stenosis. Smoking, advanced age and the presence of previous AVCI were major determinants in relation to outcomes at follow up time. The safe and effective indication of endarterectomy is mainly concentrated in younger patients with fewer chronic diseases, whereas stent angioplasty is reserved for older patients with more comorbidities, taking the surgical risk into account.

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