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A retrospective study on the preventive effect of statin after carotid artery stenting

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Abstract

This retrospective study appraised the preventive effect of statin after carotid artery stenting (CAS).

Records were extracted for 100 patients with CAS surgery indicator, aged between 20 and 75 years old, and treated for statin. The cohort study included treatment group (statin and routine treatment) and control group (routine treatment), each group 50 patients. Outcomes consisted of degree of nerve defect (as measured by National Institute of Health Stroke Scale), lipid profiles (mg/dL), and CAS complications within 30 days after surgery.

After treatment, there were no significant differences in National Institute of Health Stroke Scale, lipid profiles, and mortality rate between 2 groups. However, significant differences in total cholesterol (mg/dL, $P = .03$), low-density lipoprotein (mg/dL, $P = .01$), transient ischemic attack ($P = .03$), ischemic stroke ($P = .04$), and cardiac complications ($P = .03$) were identified within 30 days after CAS between 2 groups.

The results of this study showed that prior statin treatment may be effective for the prevention of CAS complications.

Abbreviations: CAS = carotid artery stenting, MI = myocardial infarction.

Keywords: carotid artery stenting, effect, statin

1. Introduction

Carotid artery stenting (CAS) is an alternative option and minimally invasive management for carotid artery disease.[1–5] It often occurs in patients at high risk after carotid endarterectomy.[6–8] Risk factors for carotid artery disease are history of smoking, hypertension, abnormal lipids or high cholesterol, diabetes, dyslipidemia, obesity, sedentary lifestyle, and family history of atherosclerosis.[9–14] Its prevalence rate is about 1% in general population, and increases progressively in accordance with the ages increasing.[15,16]

Statins, also known as cholesterol-lowering agents, are widely utilized for the management of dyslipidemia (abnormal amount of lipids).[17–20] It is reported that statins can decrease the incidence of stroke and myocardial infarction (MI) in stroke subjects.[17,18] Other studies reported that statins can also reduce MI occurrence after percutaneous coronary interventions.[19,20] However, few studies reported the effect of statins before CAS for the prevention of postsurgery complications.[21–24] Thus, this retrospective study investigated the preventive effect of statins after CAS.

2. Material and methods

This retrospective study was approved by the institutional local committee of The Second Affiliated Hospital of Xi'an Medical University. The informed consent was waived in this study because all individual patient data were collected from the completed case records.

This study was conducted in 2 hospitals: Xianyang Hospital of Yan'an University and The Second Affiliated Hospital of Xi'an Medical University between January 2017 and December 2019. It was performed according to the associated guidelines and regulations. This study did not apply randomization procedure, as well as blind to the patients, researchers, and outcome assessors, because of the nature of retrospective study. However, the data analyst was blinded in this study.

This study included 100 eligible patients, aged from 20 to 75 years old. All those patients were allocated to a treatment group (n = 50) and a control group (n = 50) according to the different treatments they received. All eligible patients fulfilled the CAS

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WL and X-fZ contributed equally to this work.

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The authors have no conflicts of interest to disclose.

The datasets generated during and/or analyzed during the current study are available from the corresponding author on reasonable request.

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surgery indications in accordance with the guidelines for the diagnosis and treatment of endovascular intervention for ischemic cerebrovascular disease in China in 2015.[25] No CAS contraindication was detected in any included patients. On the other hand, this study excluded patients if they suffered from severe cardiac, statin allergy or intolerance, liver and/or kidney insufficiency, history of stain usage within 2 weeks prior to the study treatment, and incomplete case record information.

All patients in both groups received successful CAS and anti-platelet treatment, including 100 mg aspirin, once daily (Bayer Healthcare Co., Ltd., Beijing, China) and 75 mg clopidogrel, once daily (Hangzhou Sanofi Shengdebao Minsheng Pharmaceutical Co., Ltd., Hangzhou, China). In addition, subjects in the treatment group also underwent 20 mg atorvastatin, twice daily (Beijing Jialin Pharmaceutical Co., Ltd., Beijing, China). All those medications were took 7 days before surgery in both groups, and atorvastatin was continued application after the surgery in the treatment group.

Outcomes were degree of nerve defect (as measured by National Institute of Health Stroke Scale, ranges from 0 to 42, with a higher score indicating a more severity of nerve defect),[26] lipid profiles (total cholesterol (mg/dL), triglyceride (mg/dL), high-density lipoprotein (mg/dL), and low-density lipoprotein (mg/dL)), and surgery complications (transient ischemic attack, ischemic stroke, cardiac complications, and mortality rate) within 30 days after CAS.

2.1. Statistical analysis

Statistical analysis was conducted using SAS package (Version 7.0; SAS Institute Inc., Cary, North Carolina). Continuous data were calculated as mean and standard deviation, and was analyzed using Student *t* test or Mann–Whitney *U* test according to the normal or non-normal data. Categorical data were presented as number and percentage, and was analyzed using Pearson chi-square test or Fisher exact test. A 2-side value of $P < .05$ was set as having statistical significance.

3. Results

A total of 100 cases were enrolled in this study according to the selection criteria. All general characteristics are shown in Table 1. There were no significant differences in those characteristics between 2 groups (Table 1). The mean age and body mass index were 65.7 (9.6) years and 24.6 (2.3) kg/m^2 in the treatment group, while those were 66.4 (10.3) years and 24.9 (2.6) kg/m^2 in the control group. The number of patient cases accounted for the race (HAN, 44 (88.0%) and HUI, 6 (12.0%)), history of smoking (27 (54.0%)) and drinking (22 (44.0%)), and stenosis region (left, 31 (62.0%) and right, 19 (38.0%)) in the treatment group, while they were race (HAN, 47 (94.0%) and HUI, 3 (6.0%)), history of smoking (24 (48.0%)) and drinking (25 (50.0%)), and stenosis region (left, 28 (56.0%) and right, 22 (44.0%)) in the control group. Educational background among the cases included primary school or under (7 (14.0%)), secondary school (25 (50.0%)), high school (10 (20.0%)), and college or university (8 (16.0%)) in the treatment group, while they were primary school or under (5 (10.0%)), secondary school (28 (56.0%)), high school (12 (24.0%)), and college or university (5 (10.0%)) in the control group. Vascular risk factors for CAS referred to cardiovascular diseases (11 (22.0%)), hypertension (5 (10.0%)), diabetes (3 (6.0%)), and hyperlipidemia (6 (12.0%)) in the treatment group, and those were 8 (16.0%) cardiovascular diseases, 7 (14.0%) hypertension, 6 (12.0%) diabetes, and 4 (8.0%) hyperlipidemia in the control group. CAS indicators consisted of 12 (24.0%) asymptomatic, 18 (36.0%) transient ischemic attacks, and 20 (40.0%) stroke in the treatment group, and those comprised of 14 (28.0%) asymptomatic, 17 (34.0%) transient ischemic attacks, and 19 (38.0%) stroke in the control group.

Table 1

General characteristics at baseline.

Characteristics	Treatment group (n = 50)	Control group (n = 50)	*P*
Age (year)	65.7 (9.6)	66.4 (10.3)	.73
Gender			
Male	35 (70.0)	32 (64.0)	.52
Female	15 (30.0)	18 (36.0)	–
Race (Asian Chinese)			
HAN	44 (88.0)	47 (94.0)	.30
HUI	6 (12.0)	3 (6.0)	–
Educational background			
Primary school or under	7 (14.0)	5 (10.0)	.54
Secondary school	25 (50.0)	28 (56.0)	.55
High school	10 (20.0)	12 (24.0)	.63
College or university	8 (16.0)	5 (10.0)	.38
BMI (kg/m^2)	24.6 (2.3)	24.9 (2.6)	.54
Smoking history			
Yes	27 (54.0)	24 (48.0)	.55
No	23 (46.0)	26 (52.0)	–
Drinking history			
Yes	22 (44.0)	25 (50.0)	.55
No	28 (56.0)	25 (50.0)	–
Vascular risk factors			
Cardiovascular diseases	11 (22.0)	8 (16.0)	.45
Hypertension	5 (10.0)	7 (14.0)	.54
Diabetes	3 (6.0)	6 (12.0)	.30
Hyperlipidemia	6 (12.0)	4 (8.0)	.51
Stenosis region			
Left	31 (62.0)	28 (56.0)	.61
Right	19 (38.0)	22 (44.0)	–
CAS indicators			
Asymptomatic	12 (24.0)	14 (28.0)	.65
Transient ischemic attacks	18 (36.0)	17 (34.0)	.83
Stroke	20 (40.0)	19 (38.0)	.84

Data are present as mean ± standard deviation or number (%).
BMI = body mass index, CAS = carotid artery stenting.

After treatment, there were no significant differences in National Institute of Health Stroke Scale ($P = .07$, Table 2), triglyceride (mg/dL, $P = .45$, Table 3), high-density lipoprotein (mg/dL, $P = .15$, Table 3), and mortality rate ($P = .57$, Table 4) within 30 days after CAS between 2 groups.

However, there were significant differences in total cholesterol (mg/dL, $P = .03$, Table 3), low-density lipoprotein (mg/dL, $P = .01$, Table 3), transient ischemic attack ($P = .03$, Table 4), ischemic stroke ($P = .04$, Table 4), and cardiac complications ($P = .03$, Table 4) within 30 days after CAS after treatment between 2 groups.

4. Discussion

Carotid artery disease occurs when plaques block the blood vessels that supply blood to the brain, which increases the risk of

Table 2

Comparison of NIHSS between 2 groups.

Outcomes	Treatment group (n = 50)	Control group (n = 50)	P
At baseline	5.8 (2.2)	6.0 (2.4)	.66
Change from baseline	−2.2 (−2.5, −1.7)	−1.7 (−2.3, −1.4)	
Difference between 2 groups		−0.5 (−0.8, −0.2)	.07

Data are present as mean (range).
NIHSS = National Institute of Health Stroke Scale.

Table 3

Comparison of lipid profiles after CAS between 2 groups.

Lipid profiles	Treatment group (n = 50)	Control group (n = 50)	P
Total cholesterol (mg/dL)	150.6 (32.9)	166.1 (39.3)	.03
Triglyceride (mg/dL)	98.1 (40.7)	104.4 (43.2s)	.45
High-density lipoprotein (mg/dL)	57.3 (20.5)	51.1 (22.9)	.15
Low-density lipoprotein (mg/dL)	92.7 (18.8)	102.6 (20.8)	.01

Data are present as mean and standardized difference.
CAS = carotid artery stenting.

Table 4

Comparison of complications within 30 days after CAS between 2 groups.

Complications	Treatment group (n = 50)	Control group (n = 50)	P
Transient ischemic attack	6 (12.0)	15 (30.0)	.03
Ischemic stroke	4 (8.0)	12 (24.0)	.04
Cardiac complications	3 (6.0)	11 (22.0)	.03
Mortality rate	1 (2.0)	2 (4.0)	.57

Data are present as number (%).
CAS = carotid artery stenting.

stroke and a medical emergency.[6–8] It manifests as sudden numbness or weakness, trouble speaking and seeing, dizziness or loss of balance, and severe headache with unknown causes. CAS is reported to benefit patients with CAS. However, it often accompanies a variety of severe complications after CAS.

Statins are reported to manage dyslipidemia.[17–20] It is reported to not only reduce incidence of stroke and MI, but also decrease complications after CAS surgery. However, most studies utilized stains after CAS operation, and few studies investigated the stains consumption before the surgery for the prevention of CAS complications.

This retrospective study explored the preventive effect of stains for patients after CAS. Although its results did not identify significant differences in National Institute of Health Stroke Scale, triglyceride, high-density lipoprotein, and death rate between 2 groups, there were significant differences in total cholesterol, low-density lipoprotein, transient ischemic attack, ischemic stroke, and cardiac complications within 30 days after CAS between 2 groups. It suggests that stains consumption before surgery can reduce the incidence of stroke and cardiac complications after CAS.

There are a few limitations in this retrospective study. First, compared to the prospective study, the present retrospective study could not use randomization and blind to both patients and researchers. The limitation is not unique to this study, and is also the weakness in all retrospective studies. Second, the present study is limited by its observational nature, which restricts its capacity to control confounding factors by baseline variables. Third, this study only assessed the preventive effect of stains within 30 days after CAS surgery. Thus, longer term preventive effect should be explored in the future studies.

5. Conclusion

This study found that stains before surgery may prevent complications within 30 days after CAS.

Author contributions

Conceptualization: Wen Liu, Ya-long Liang, Li-xia Hou, Chao Jiang, Xiao Chen.
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Correction

When originally published, Chao Jian appeared as the corresponding author. This has been corrected to Yalong Liang.

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