Predictors of Hemodynamic Changes after Carotid Artery Stenting

Thesis

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Omar Mohamed Abdel-Megeed Hashim

List of Contents

List of Abbreviations

Abb.	Full term
ACT	Asymptomatic Carotid Trial
CAD	Coronary artery deices
CAS	Carotid artery stenting
CCA	Common carotid artery
CEA	carotid endarterectomy
CREST	Carotid Revascularization versus Stenting Trial
CSTC	The Carotid Stent Trialists Collaboration
DBP	Diastolic blood pressure
DM	Diabetes millets
DW-MRI	Diffusion weighted magnetic resonance image
ERMED	Egyptian Railway Medical Center
ESVS	European Society for Vascular Surgery
EVA-3S	Endarterectomy Versus Angioplasty
HDI	Hemodynamic instability
HI	Hemodynamic instability
HR	Heart rate
HRR	Heart rate recovery
HTN	Hypertension

List of Abbreviations cont...

Abb.	Full term
ICA	Internal carotid artery
ICSS	International Carotid Stenting Study
MCA	Middle cerebral artery
MI	Myocardial infarction
MMD	Moyamoya disease
NASCET	North American Symptomatic Carotid Endarterectomy Trial
SBP	Systolic blood pressure
DBP	Diastolic blood pressure
SPACE	Stent-Protected Angioplasty versus Carotid Endarterectomy
STA	Superficial temporal artery
STA-ACA	Superficial temporal artery to anterior cerebral artery
STA–MCA	Superficial temporal artery to middle cerebral artery
TIAs	Transient ischemic attacks
TTT	Treatment
NIHSS	National Institutes of Health Stroke Scale

List of Tables

List of Tables cont...

List of Figures

Abstract

Background: Carotid artery stenting implies instrumentation of the carotid bulb where the baroreceptors are placed and therefore baroceptor's dysfunction may provoke hemodynamic instability, Hemodynamic depression has been reported after carotid artery stenting (CAS) and carotid endarterectomy (CEA).

Aim and objectives: This study aimed to assess the predictors of hemodynamic Changes peri carotid artery stenting.

Subjects and methods: This was Prospective observational study that was Conducted at Ain shams university hospitals –Railway hospital (ERMED) and Suez insurance hospital, the study was conducted on 20 patients that developed carotid artery stenosis.

Results: the results revealed that there was no statistically significant difference between presence and absence of hemodynamic changes as regard Lesion length, Dilatation %, and Lesion location. There was high statistically significant difference between Hemodynamic changes as regard Stent diameter, where p= 0.005.

Conclusion: Hemodynamic instability due to hypotension and bradycardia in response to carotid artery stenting occurs in a relatively high proportion of patients. This study reemphasizes the importance of close hemodynamic monitoring during and after CAS and is consistent with the previous studies witch showed that the instability didn't translate into major neurologic complications.

Keywords: Carotid, Stent, Instability, Hemodynamic, Baroreceptors, CAS.

INTRODUCTION

Cerebrovascular disease is a leading cause of death and a major cause of permanent neurological and physical impairment in adults. In the United States, cerebrovascular disease is the second most common cause of death, with approximately 795,000 strokes occurring each year ***(Benjamin et al., 2017)***.

Carotid revascularization prevents recurrent ischemic stroke in patients with significant symptomatic carotid artery stenosis. Carotid endarterectomy has been the gold standard treatment for symptomatic significant carotid artery stenosis for more than 60 years ***(Benjamin et al., 2017)***.

Carotid artery stenting (CAS) (or carotid artery stent implantation) has developed rapidly over the last 30 years, and its frequency is increasing because it is less invasive than carotid endarterectomy with a low risk of cardinal injury and fewer surgical complications ***(De Rango et al., 2011)***.

The revascularization of the carotid artery stenosis by CEA rapidly resolves chronic pressure differences in patients, so that a large blood flow and high blood pressure are delivered to the brain parenchyma without adaptation. Most patients show cerebral vasoconstriction from autoregulation of the brain, and elevated perfusion pressure is restored to a normal level within a few minutes due to this mechanism in CAS. However, in

some patients, this auto-regulating ability is impaired due to long-term excessive lowering of cerebral blood flow, which can result in persistently elevated intracranial pressure (lasting from a few hours to days), thereby causing hyperperfusion syndrome ***(Kim et al., 2013).***

Hemodynamic complications that occur after carotid artery stenting probably are mediated through dysfunction of adventitial baroreceptors. During the percutaneous artery stenting of carotid artery stenosis, the interventionist places a small guide catheter through the stenosis to allow the placement of the stent. Then he inserts an autoexpandable stent which covers the stenosis and reestablishes the blood flow. Sometimes, the interventionist uses a balloon to expand the blood vessel. This extensive manipulation of the carotid sinus and carotid walls leads to activation of the baroreceptors and hypotension and/or bradycardia ***(Popescu et al., 2011).***

Prediction of hypotension after CAS is important for preventing periprocedural ischemic complications. Diabetes mellitus, severe calcified plaque, balloon dilatation pressure, octogenarians, contralateral occlusion, female sex, distance from carotid bifurcation to maximum stenotic lesion, eccentric plaque formation, open-cell stent, and asymptomatic lesion are the reported risk factors that are independently associated with hemodynamic depression after CAS ***(Csobay-Novák et al., 2015).***

HYPOTHESIS

Hemodynamic instability following CAS has been associated by some with worse clinical outcomes. However, significant controversy still exists regarding the predictors of HI.assoctaited by more or less hemodynamic changes . Thus, the purpose of this study will be to determine the predictors of hemodynamic instability following carotid artery stenting (CAS) from a single institutional series.

Aim of the Work

This study aims to assess the predictors of hemodynamic changes after carotid artery stenting.