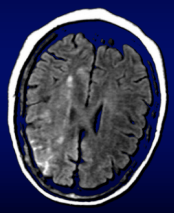
Cerebral Hyperperfusion Syndrome Following CEA



Enrico Ascher, MD
Anil P. Hingorani, MD
Natalie A.Marks, MD, RVT

- Nothing to Declare

Cerebral Hyperperfusion Syndrome

Etiology

" Loss of cerebral autoregulatory mechanisms resulting from chronic ischemia. " Waltz et al J Nucl Med 1972

1. Why symptoms are delayed for 3 to 8 days?
2. Why symptoms subside within 2 to 3 days?
3. No hemodynamic data pre, during and after CHS.

Cerebral Hyperperfusion Syndrome

11 Patients with post – CEA seizures

Intraoperative mean Cerebral Blood Flow (Xe-133 clearance) :

Pre – CEA	37.3 ± 13.4 ml / 100 g / min
Post – CEA	85.5 ± 31.8 ml / 100 g / min

↑ CBF predict CHS

Sundt et al Mayo Clin Proc 1981

Cerebral Hyperperfusion Syndrome

Intraoperative TCD Monitoring

MCA PSV and/or Pulsatility Index ↑ 100 % after CEA:

→ Risk of hyperperfusion syndrome (11% vs 2%)

High sensitivity, very low specificity

Dalman, Moll et al. Eur J Vasc Endovasc Surg 1999

Cerebral Hyperperfusion Syndrome

Predisposing factors

- Severe ICA stenosis
  - Ipsilateral
  - Contralateral
- Postoperative hypertension

Cerebral Hyperperfusion Syndrome

850 consecutive CEAs:
18 Patients – 19 Cases (2.2%) CHF

- *Male 11 : Female 7*
- *Age 69 ± 8 Years*
- *Hypertension 16*
- *Smoker 8*
- *CAD 7*
- *Diabetes 5*

Cerebral hyperperfusion syndrome after carotid endarterectomy: Predictive factors and hemodynamic changes

Enrico Ascher, MD, Natalia Markevich, MD, RVT, Richard W. Schutzer, MD, Sreedhar Kallakuri, MD, Theresa Jacob, PhD, and Anil P. Hingorani, MD, *Brooklyn, NY*

Purpose: It is believed that cerebral hyperperfusion syndrome (CHS) is caused by loss of cerebral autoregulation resulting from chronic cerebral ischemia and that factors including increased intraoperative cerebral blood flow, ipsilateral or contralateral carotid disease, and postoperative hypertension may cause CHS. We describe our experience with CHS, which diverges from published reports.

J Vasc Surg

Cerebral Hyperperfusion Syndrome

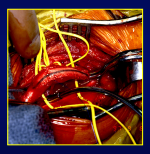
19 cases

- *Onset of symptoms 0 to 8 days (mean 3 days)*
- *Symptoms :*
  - *severe headaches 15*
  - *seizures 5*
  - *ataxia / visual defects 1*
  - *Intracranial bleed 1*

Cerebral Hyperperfusion Syndrome

Completion Duplex Exam Protocol

- *B – mode imaging*
- *Color flow*
- *Spectral analysis*
- *Flow volume (x 3)*



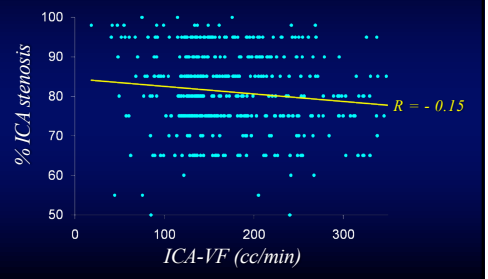
Mean ICA Volume Flow (ICA-VF)

Cerebral Hyperperfusion Syndrome

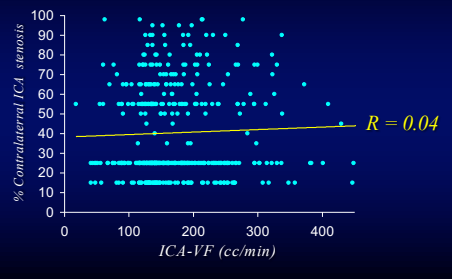
Morbidity & Mortality (18 pts)

Stroke	*3*	*16.6 %*
Death	*0*	*0 %*
Recovered	*15*	*83.3%*

Ipsilateral preop %ICA Stenosis vs Intraop, post-CEA ICA-VF (455 cases)



Contralateral %ICA Stenosis vs Intraop, post-CEA ICA-VF (455 cases)



Cerebral Hyperperfusion Syndrome

Intraoperative Hemodynamic Values

	CHS (19)	Non – CHS (831)
ICA-VF	170 ± 47	182 ± 81
ICA lumen	4.7 ± 0.7	4.6 ± 0.7

P = ns

Cerebral Hyperperfusion Syndrome

Intraop vs Symptoms

	intraop	symptoms	P - value
ICA-VF	170 ± 47	**481 ± 106**	< 0.001
ICA lumen	4.7 ± 0.7	5.9 ± 0.7	< 0.001

Cerebral Hyperperfusion Syndrome

During symptoms vs After symptoms

	symptomatic	Symptoms resolved	P - value
MICAVF	481 ± 106	213 ± 38	< 0.001
ICA lumen	5.9 ± 0.7	4.7 ± 0.6	< 0.001

Cerebral Hyperperfusion Syndrome

2 weeks postop: CHS vs non-CHS

	CHS	non - CHS	P - value
ICA-VF	213 ± 38	267 ± 87	< 0.01
ICA lumen	4.7 ± 0.6	5.1 ± 0.8	0.1

Cerebral Hyperperfusion Syndrome

Unilateral vs. Bilateral CEA

CEA	# cases	CHS	%
Unilateral	747	11	**1.5**
Bilateral	103	8	**7.8** *

* P < 0.001

Cerebral Hyperperfusion Syndrome

Interval Between CEAs (103 Cases)

Months	# cases	CHS	%
≥ 3 mo	67	2	**3**
< 3 mo	36	6	**17** *

* P < 0.03

Cerebral Hyperperfusion Syndrome

Simultaneous Bilateral Carotid Stenting (333 Cases)

A systematic review and meta-analysis of results of simultaneous bilateral carotid artery stenting

Check for updates

Zhichao Lai, MD,[a] Zhiwei Guo, MD,[a] Jiang Shao, MD,[a] Yu Chen, MD,[a] Xiu Liu, MD,[b] Bao Liu, MD,[a] *and* Chenyang Qiu, MD,[a] *Beijing, China*

ABSTRACT

Background: Although staged procedures to treat bilateral carotid artery stenosis are mainstream, a growing number of articles on simultaneous bilateral carotid artery stenting (SBCAS) have been published. Thus, this meta-analysis was performed to evaluate the efficacy and safety of SBCAS.

Methods: The PubMed and Embase databases were searched to identify all studies reporting SBCAS from January 1, 2000, to October 1, 2017. Patients' characteristics, comorbidities, technical success, deaths, and complications were

JVS 2019

CHS in SBCAS was higher (odds ratio, 1.99 [95% CI, 1.13-3.53]

Cerebral Hyperperfusion Syndrome

Systemic BP: Preop vs. Symptoms

	Preop	Symptoms
Systolic	147 ± 16	148 ± 19
≥ 160 mmHg	2/19	3/19

Intraoperative blood pressure lability carries a higher risk of headache after carotid endarterectomy

Daniel Lee, MD, Philip M. Batista, MD, Katherine K. McMackin, MD, Albert Ha, BA, Jose Trani, MD, Jeffrey P. Carpenter, MD, *and* Joseph V. Lombardi, MD, *Camden, NJ*

ABSTRACT

Objective: Cerebral hyperperfusion syndrome (CHS) is a rare but potentially devastating complication after carotid endarterectomies (CEA). Its symptoms range from new-onset unilateral headache (HA) to intracranial hemorrhage (ICH). Risk factors for CHS in the literature to date have not yet yielded a consensus. This study examines intraoperative and postoperative blood pressure variations as potential risk factors for HA.

Methods: A single-center retrospective review at a tertiary care center from January 2010 to November 2019 was performed. Inclusion criteria were all patients undergoing CEA for symptomatic or asymptomatic carotid disease. Patients with incomplete charts were excluded. Primary endpoints were new-onset unilateral HA or postoperative ICH. Data on intraoperative and postoperative mean arterial pressure (MAP), systolic blood pressure (SBP), the mode of endarterectomy, shunt placement, and contralateral carotid status were collected.

Results: There were 735 patients who met the inclusion criteria: 430 patients underwent modified eversion CEA (59%) and 305 patients for patch angioplasty (42%). The incidence of HA was 19% (n = 142) in our total cohort. Of the 19% with HA, 1.5% (n = 11) demonstrated no relief with analgesics and strict blood pressure control; noncontrast head computed

Cooper University
735 patients

No significant difference between postoperative MAP and CHS

Cerebral Hyperperfusion Syndrome

Not predictive of CHS

- *Critical ipsilateral stenosis*
- *Severe contralateral ICA stenosis*
- *Contralateral ICA occlusion*
- *Severe hypertension*

THANK YOU