

# Outcomes of CEA performed with General Anesthesia in a practice with a bias towards Regional Anesthesia



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# Disclosures

Veer Chahwala, MD	None
Kelly Huban, BS	None
PHI Quality Group	None
PHI Vascular Group	None



## Regional vs. General Anesthesia Our Approach

- Regional anesthesia is the default choice at Piedmont Atlanta Hospital
- Emory University Training Bias
  - Surgeon dependent
    - degree of utilization of the default choice varies by surgeon
    - definite training bias exists
- Potential advantages of regional anesthesia
  - Active measurement of neuro response (awake testing)
  - Identification of cerebral hypoperfusion facilitating selective shunt as well as response to the shunt
  - Less hemodynamic instability
  - Potentially less cardiac morbidity
  - Shorter room times
  - Less time, less monitoring, potentially less costly



## Regional vs. General Anesthesia Our Approach

Some factors do favor general anesthesia for carotid endarterectomy even in an institution with a bias towards regional anesthesia

Factors Given by PHI Vascular Surgeons		
High lesions	Poor neck domain	Surgeon preference
Reoperative CE	Patient anxiety	Case urgency
Pre-existing cranial nerve dysfunction	Obstructive sleep apnea	Neurologic instability
Extensive endart anticipated - Possible use of interposition vein graft	Cardiac co-morbidity	Mandatory shunt anyway

## Training and Experience Bias

Surgeon	Residency	Fellowship	Practice experience before PAH	Bias
Bathey	Emory	Emory	none	Regional
Powers	MUSC - general	Baylor - general	none	Regional
Ben-Arie	NYU - general - routine shunt	Emory -regional	none	Regional
Ross	Vanderbilt -general - routine shunt	LSUHC-NO - general - routine EEG - selective shunt	Before Piedmont, 1200+ carotids - >95% gen - Neuro monitoring	General - selective shunt
Unzeitig	UTSW - general	UTSW -general	none	General
Chahwala	Miami - regional	Emory - regional	none	Regional



## Regional vs. General Anesthesia GALA Trial

### GALA Trial (Lancet 2008; 372: 2132-2142)

- multicenter, randomized controlled trial
- 3526 patients; GA vs LA
- combined primary outcome of stroke, MI or death (30 days) 4.8% GA vs 4.3% LA
- no difference
  - quality of life
  - length of stay
  - primary outcome stratified by age, contralateral occlusion, baseline surgical risk

### GALA Limitations

- MAE was lower than expected; possibly inadequately powered to show difference
- Influence of statin use was not assessed
- No set philosophy on shunts – so shunt practice and shunt types varied

## Regional vs. General Anesthesia Additional data

**Anesthetic type and hospital outcomes after carotid endarterectomy from the Vascular Quality Initiative database.**

**Aridi et. Al. JVS 2017**

**Retrospective 2003-2017**

**75,319 CEAs**

Patients undergoing CEA under GA have higher odds of postoperative MI, acute CHF, and hemodynamic instability compared with those undergoing CEA under RA/LA.

They are also more likely to stay in the hospital for >1 day.

*However, the overall risk of cardiac adverse events after CEA was low, which made the differences clinically irrelevant.*

## Outcomes of CEA performed with General Anesthesia in a practice with a bias towards Regional Anesthesia

### Objectives/Methods

- Compare PAH Vascular Surgery outcomes from day-to-day practice captured in the VQI Jan 2017 – June 2019
- 207 carotid endarterectomies
  - 92 general anesthesia
  - 115 regional anesthesia
- Exclusions
  - CEA-CABG combinations
- Forensic adjudication
  - Chart review of all cases with LOS > 3 days
- Statistical analysis: t-test
- Limitation
  - retrospective review





# Results

characteristic	all	general	regional
Total operations	207	92	115
Age (average)	70.95	69.33	72.25 <span>p=0.008</span>
Male	122	48	74
Female	85	44	41
Prior neuro event	81	41	40
Avg. modified Rankin	0.28	0.40	0.19
# Asymptomatic	126	51	75 <span>P=0.155</span>

Patients in the regional group were more likely to be male and were older



## Patient characteristics and co-morbidity

characteristic	all	General	Regional
BMI	29.00	29.90	28.27
DM	84	43	41
IDDM	36	20	16
COPD	29	14	15
COPD – home O2	1	0	1
Creatinine	1.05	1.07	1.03
On dialysis	2	0	2

## Technical Factors and Timing

characteristic	all	General	Regional
Anatomic high risk	12	6	6
Prior neck surgery	12	6	6
Prev. radiation	3	2	1
Contralateral Occ	6	3	3
Elective	179	77	102
Urgent	27	14 (15%)	13 (11%)
Emergency	1	1	

Cardiac Co-morbidity

CHF	27	16	11
- asx, history	16	7	9
- mild	10	8	2
- severe	1	1	
CAD	86	38	48
Hx of MI	58	29	29
Hx MI<6 mos	7	3	4
Angina stable	15	5	10
Angina unstable	6	1	5
Prior PCI	79	33	46
< than 5 years	47	19	28
> 5 years	32	14	18
CABG	43	19	24
< 5 years	16	7	9
> 5 years	27	12	15



### Case Data

characteristic	all	general	regional
Conventional	184	80	104
Eversion	17	10	7
Unspecified	6	2	4
Shunt	72	50 (55%)	22 (19%)
Intraop Indication	31	16	15
Preop indication	27	24	3
Routine	14	10	4
Preop ASA	181	77	104
Preop Plavix	78	41 (45%)	37 (32%)
Procedure Time	125 min	132 min	118 min

P<.005

## Surgeons and Anesthesia

Surgeon	all	general	regional
Battey	35	4	31
Powers	20	8	12
Ben Arie	49	27	22
Ross	60	33	27
Unzeitig	27	17	10
Chahwala	16	3	13

*Shunt dominance in general group relates to Ben Arie (routine shunter) as well as those who select general anesthesia when they plan to use a shunt*

## Outcomes

characteristic	all	General	Regional
Postop LOS	2.43 days	2.29 days	2.55 days
Median LOS	1 day	1 day	1 day
Postop LOS $\geq$ 3 days	25	16	9
CN injury	2	0	2
Takeback	6	1	5
- neuro	1	0	1
- bleeding	5	1	4
Postop new neuro event	4	2	2
Postop death	2	1	1

## LOS > 3 days: Why

characteristic	all	General	Regional
Postop LOS	2.43 days	2.29 days	2.55 days
Median LOS	1 day	1 day	1 day
Postop LOS $\geq$ 3 days	25	16	9
Anticoag	3	3	0
Resp	5	4	1
Drain output	2	1	1
Hemodynamic instability	3	1	2
Obstinance/ frailty	2	2	0
Stroke	4	2 (2.2%)	2 (1.7%)
Death	1	1	0*

\* 1 regional death occurred POD#3 at home from ICH





## Stroke – Death: Deep Dive

Stroke	Anes.	What happened?
1	gen	Preop CVA but postop SAH (limited)
2	gen	CE + LCCA stent
3	reg	Intraop embolization
4	reg	CE while on IABP with cardiac ischemia
Death		
1	gen	Symptomatic, critical carotid; Liver abscess
2	reg	Hyperperfusion ICH (at home, POD #3)

## Summary

1. Both general and regional anesthesia are safe and effective for CEA at PAH
2. Choice of anesthesia may be individualized to the patient and the surgeon
  - data suggest good decisions in our practice
3. No significant difference in stroke, cardiac events, or death.
4. For surgeons who are compelled to use shunts when using general anesthesia –  
..... regional anesthesia results in decreased shunt utilization

### Additional Comments

1. We did not access cost data but we assume general is more costly
  - more complexity, longer case and room times, etc.
2. The VQI is an outstanding tool for “quality-checks” for a vascular practice
  - individual deep dives stimulate discussion and sharing

