Regional Anesthesia for Vascular Surgery

IN NEEDLES & LOCAL WE TRUST?

KYLE MARSHALL, MD
ASSISTANT PROFESSOR
ANESTHESIOLOGY
UNIVERSITY OF COLORADO

Disclosures

I have no financial relationships or conflicts of interest.

Objectives

1. Identify surgical cases which may be facilitated by the addition of regional anesthesia.
2. Decipher whether your patient is best suited for a regional, general, or a combined anesthetic and choose the best choice to minimize adverse outcomes.
3. Assess patients whom may benefit from avoiding general anesthesia with the intent of differentiating whom is a candidate from those with contraindications.
4. Implement evidence-based regional approaches that can lead to improved surgical and post-operative anesthetic outcomes.

Overview

The role of Regional Anesthesia in:

- Carotid Endarterectomy
- Abdominal Aortic Aneurysm Repair
- Arterio-venous fistula creation

First off, Thank you Vascular Surgeons!

You don’t judge...
You bail us out from our vices... or try to!
- Smoking?
- Sugar?
- And my favorite food...

BACON!

Halloween, 2011
NYC
It’s Hollywood after all…
Handsome, Diva
Classical Music
Blood. Lots of it.

“COUNT VASCULA”

2 Vertebral Arteries
2 Internal Carotids

Superficial Cervical Plexus +/- Deep Cervical Plexus
Surgeon Infiltration
The good-old ET Tube
AWAKE CAROTID?
- Who would ever want that?
  - Surgeons – who trained with the technique
- Disadvantages – Many
- Advantages – ONE BIG ONE

Carotid Endarterectomy
- The gospel
  - GA = LA from a safety standpoint
- Where did it come from?

Carotid Endarterectomy
- The GALA Trial – Lancet, 2008
  - Multi-center, Randomized, Controlled
  - >3,500 patients
  - GA = LA from a safety standpoint

GALA
- Randomized to GA (1,753) vs LA (1,773)
- June 1999 to October 2007
- 95 Centers in 24 Countries
- Primary Outcome:
  - Stroke, Myocardial Infarction, Death
  - GA – 84 (4.8%) LA – 80 (4.5%)

GALA Further:
- 80% Smoking history
- 70% Male
- 70% Hypertension
- 35% Coronary Artery Disease
- 25% Diabetes
- 10% COPD
- 9% Contralateral Carotid Occlusion
  - 65% were ASA II

GALA Further:
- Baseline Surgical Risk
  - 50% were low risk
  - 41% were medium risk
  - 9% were high risk
I like to do Regional

▸ I am not alone!

Lomivotorov, et al. 2018

▸ Reduced rate of peri-operative Myocardial infarction
▸ Reduced rate of pneumonia
▸ Reduced rate of aspiration
▸ Reduced rate of peri-op blood transfusion
▸ No difference in 30 day mortality or Stroke


Liu et al, 2014

Retrospective NSQIP data trials

Retrospective Vascular Quality Initiative Data

<table>
<thead>
<tr>
<th>Event</th>
<th>GA</th>
<th>LA/RA</th>
<th>p-test</th>
<th>OR</th>
<th>95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Myocardial Infarction</td>
<td>0.5%</td>
<td>0.2%</td>
<td>p=0.01</td>
<td>1.95</td>
<td>1.06-3.95</td>
</tr>
<tr>
<td>Acute CHF</td>
<td>0.5%</td>
<td>0.2%</td>
<td>P&lt;0.001</td>
<td>3.92</td>
<td>1.84-8.34</td>
</tr>
<tr>
<td>Hemodynam. Instability</td>
<td>27%</td>
<td>20%</td>
<td>P&lt;0.001</td>
<td>1.8</td>
<td>1.44-1.66</td>
</tr>
</tbody>
</table>


▸ I TOLD YOU REGIONAL WAS BEST!!

▸ I wish I could say that…
▸ No difference in Mortality or Peri-op Stroke

VQI/JVS Conclusion:
▸ The incidence of cardiac complications is so low, they deemed it “clinically irrelevant.”

So… What should I do for my patients?

▸ It’s not a mind blowing conclusion
▸ Do what fits the case/patient and your skills
▸ Differences are mostly non-significant
▸ The significant differences are not necessarily clinically relevant
▸ While GALA remains imperfect, there’s nothing better… yet.

A Vascular Surgeon

▸ Was hec
▸ Wouldn’t
▸ Mumble
▸ Said not!
Abdominal Aortic Aneurysm Repair

- High Risk Surgery
- High Morbidity and Mortality
  - 30 day Morbidity – 12-26%
  - 30 day Mortality – 4-6%
    - Post-op bowel ischemia – 50% mortality

Thoracic Epidural for Open AAA

- Commonly performed for elective cases
- When epidural used intra-operatively
  - Reduced stress response
  - Blunts sympathetic outflow
    - Reduced Afterload
    - Increased visceral/splanchnic perfusion

Open AAA Repair

- Again, ELECTIVE Open AAA Repair
- There are two primary reasons some anesthesiologists will forego Epidural:
  - “I’m concerned about surgical bleeding.”
  - “They will anti-coagulate.”

Open AAA Repair/Anti-coagulation

- ASRA Guideline, 2018
- Heparin IV
  - Restart Medication After Procedure?
    - 1 hour

Although the occurrence of a bloody or difficult neural needle placement may increase risk, there are no data to support mandatory cancellation of a case. Direct communication with the surgeon and a specific risk-benefit decision about proceeding in each case are warranted.

Epidural and Mortality

Impact of Epidural Analgesia on Mortality and Morbidity After Surgery

Systematic Review and Meta-analysis of Randomized Controlled Trials

- Daniel M. Phipps, MD, * Nadia Elias, MD, MLS | Hugo K. Rue, MD, MB, Emmanuel Marret, MD, * Stephan A. Schlegl, MD, Peter Kraus, MD, MB, LLB, PHD, Michael Weil, MD, * and Martin R. Travers, MD, DPHIL
  
  Annals of Surgery, 2014
Epidural in Abdominal Surgery

Advantages (less of this)

- Mortality
  - 3.1% vs 4.9% - OR 0.6
- Allergic, SVT
- DVT
- Respiratory depression, pneumonia
- Nausea

Disadvantages (more of this)

- Arterial hypotension
- Pruritus
- Urinary Retention

Epidural and Mortality

<table>
<thead>
<tr>
<th>Outcome</th>
<th>Epidural 30%</th>
<th>No Epidural 30%</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mortality</td>
<td>3.1%</td>
<td>4.9%</td>
<td>0.002</td>
</tr>
<tr>
<td>Afib, SVT</td>
<td>6.5%</td>
<td>7.8%</td>
<td>0.44</td>
</tr>
<tr>
<td>DVT</td>
<td>4.6%</td>
<td>3.2%</td>
<td>0.66</td>
</tr>
<tr>
<td>Respiratory Depression, Pneumonia</td>
<td>2.1%</td>
<td>3.7%</td>
<td>0.30</td>
</tr>
<tr>
<td>Ileus</td>
<td>0.8%</td>
<td>1.4%</td>
<td>0.18</td>
</tr>
</tbody>
</table>

Thoracic Epidural After Open AAA

Meta-analysis of 1498 patients from 1987-2009
Looking at pain management.
- Post-op only, no intra-op information...
- Primary endpoint – 30d mortality
- No long term mortality endpoint
- Several Secondary endpoints

Thoracic epidural vs IV Opioids

Significant Difference

- Improved:
  - Pain management
- Reduced:
  - Myocardial Infarction
  - Time to Extubation
  - Respiratory Failure
  - GI Bleed
  - ICU Length of stay

No Difference

- 30 Day Mortality

Elective Open AAA Repair

Combined Epidural-General Anesthesia vs General Anesthesia Alone for Elective Abdominal Aortic Aneurysm Repair

- 1540 patients from 2003-2011 – 560 (GA only) vs 980 (EA-GA)
- Retrospective analysis of prospectively collected data
- Vascular Society Group of New England (VSGNE)

Primary outcome: All-cause Mortality
Results

**Significant Difference**
- Re-operation rate, <30d
- Bowel Ischemia
- Pulmonary Complications
- Dialysis Requirement

**No difference**
- 30d Mortality
- Cardiac Complications
- Wound Complications

Conclusions

- There is a significant long-term survival benefit when adding Epidural analgesia to General anesthesia for elective open AAA.
- This survival benefit is possibly due to significantly reduced rates of immediate major post-operative complications.
- “Epidural Analgesia in addition to GA should be strongly considered in suitable patients undergoing elective AAA Repair.”

A Surgeon in Boston

- “He didn’t do bypasses”
- “He didn’t do endarterectomies”
- “I don’t remember him doing anything else.”

THE CHOP-SHOP

Arterio-Venous Fistula Creation

- Vs. Tunneled Caths
- Reduced Mortality
- Reduced Sepsis
- Reduced Failures
- Still, Fail often...

AVF Creation

- Anesthesiologist’s view:
  - Sick patients with multiple co-morbidities
  - Can be sensitive to fluids
  - Don’t clear medications/alter plan
  - “Their Potassium is WHAAAT?”
At University of Colorado Hospital

- We block nearly all:
  - Primary Arterio-venous fistula creations
  - Secondary Arterio-venous fistula creations
  - Arterio-venous fistula exploration/revisions
  - MAC + Block

**WHY DO WE BLOCK AV Fistula CASES?**

- 1. “Post-operative Pain.”
- 2. “Reducing opioids.”
- 3. “Patient co-morbidities.”
- 4. “Avoiding General Anesthesia.”

What do surgeons care LEAST about?

- 1. “Post-operative Pain.”
- 2. “Reducing opioids.”
- 3. “Patient co-morbidities.”
- 4. “Avoiding General Anesthesia.”

What do surgeons care MOST about?

- *** IMPROVED SURGICAL CONDITIONS***
  - Vaso-dilation
  - Reduced pulsatility index (PI)
  - Great success

**Improved Surgical Conditions**

<table>
<thead>
<tr>
<th>Fibrillography Index (PI)</th>
<th>Prior to meds</th>
<th>5 mins after meds</th>
<th>10 mins after meds</th>
<th>PI Ratio – PI-10/PI-0</th>
</tr>
</thead>
<tbody>
<tr>
<td>Regional – Axillary BPB</td>
<td>6.53</td>
<td>4.38</td>
<td>3.35</td>
<td>0.51</td>
</tr>
<tr>
<td>Local infiltration</td>
<td>5.68</td>
<td>5.0</td>
<td>5.23</td>
<td>0.91</td>
</tr>
</tbody>
</table>


**Improved Surgical Conditions, cont.**

- Veno-dilation

<table>
<thead>
<tr>
<th>Anesthesia Type</th>
<th>Cephalic Vein Diameter T=0 (mm)</th>
<th>CV Diameter @ 5 min post meds (mm)</th>
<th>CV Diameter @ 10 min (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Regional – Axillary BPB</td>
<td>6.4</td>
<td>7.8</td>
<td>8.7</td>
</tr>
<tr>
<td>Local infiltration</td>
<td>6.3</td>
<td>6.4</td>
<td>6.6</td>
</tr>
</tbody>
</table>
Ultrasound-guided infraclavicular brachial plexus block enhances postoperative blood flow in arteriovenous fistulas

J. Vascular Surgery, 2011

**Post-op Fistula Blood Flow**

**Fistula Flow Rate (mL/min)**

<table>
<thead>
<tr>
<th></th>
<th>3Hrs</th>
<th>7days</th>
<th>8wks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Infraclavicular</td>
<td>69.6 +/- 7.9</td>
<td>210.6 +/- 30.9</td>
<td>680.6 +/- 96.7</td>
</tr>
<tr>
<td>Local Infiltration</td>
<td>44.8 +/- 13.8</td>
<td>129 +/- 36.1</td>
<td>405.3 +/- 76.2</td>
</tr>
</tbody>
</table>

*P < 0.001 P < 0.001 P < 0.001*

- No statistical difference in Primary Patency or Primary Failure
- 2 failed in ICV group
- 5 failed in Local infiltration group

**Study design**

- Observer-blinded Randomized controlled trial – 126 pts (63LA vs. 63RA)
- Glasgow, UK – 3 University Hospitals
- Primary Radiocephalic or Brachiocephalic fistulas
- Supraclav - Experienced regionalists +/- directly supervised senior residents

**Primary Endpoint**: fistula patency at 3 months.

**Secondary**: immediate patency at Discharge, functional patency at 3mos

**Results**

<table>
<thead>
<tr>
<th>ALL AVF Patency</th>
<th>Immediate</th>
<th>Primary @ 3 months</th>
<th>Functional @ 3 months</th>
</tr>
</thead>
<tbody>
<tr>
<td>Regional Anesthesia</td>
<td>92%</td>
<td>84%</td>
<td>41%</td>
</tr>
<tr>
<td>Local Infiltration</td>
<td>73%</td>
<td>62%</td>
<td>29%</td>
</tr>
</tbody>
</table>

*P 0.005 P 0.005 P 0.15*

**From ASRA 2018...**

- The same research group presented their data from 1 year follow up.

**ALL AVF Patency**

<table>
<thead>
<tr>
<th></th>
<th>Functional @ 1 year</th>
</tr>
</thead>
<tbody>
<tr>
<td>Regional Anesthesia</td>
<td>81%</td>
</tr>
<tr>
<td>Local Infiltration</td>
<td>56%</td>
</tr>
</tbody>
</table>

*P < 0.001*
Meta-analyses of RA for AVF Creation

- “The use of regional anaesthesia is associated with lower AVF failure rates when compared with local anaesthesia in patients undergoing primary forearm AVF formation for haemodialysis.”

- RA is now the anesthetic technique of choice for fistula construction after solid proof by a randomized controlled trial that unequivocally demonstrated that the beneficial effects of BPB are translated into improved outcomes in the clinical setting.
  - Shemesh, et al. (2017) - J. of Vascular Access

Thank You!


vectorstock.com

gomerblog.com