What is postoperative visual loss (POVL)?

- Example:
  - After cardio pulmonary bypass, patient wakes up with unilateral visual loss caused by atheromata dislodged into central retinal artery.
- ~1990s
  - As spinal instrumentation became more complex and procedures became longer and bloodier, patients woke up with bilateral visual loss.
- 1999
  - In response, American Society of Anesthesiologists established a POVL registry.
- POVL Group
  - Analysis from the group by [Lee et al in 2006](#) on 93 spine surgery cases identified many factors associated with POVL, which was then followed up with a multicenter case-controlled study in [2012](#).

What leads to POVL?

- Central retinal artery occlusion (CRAO)
  - On cardiopulmonary bypass
    - Positioning of catheter can send showers of emboli stimulating inflammatory response
- Anterior ischemic optic neuropathy (AION)
  - Optic globe pressure → transmit pressure to optic disc where nerves enter
- Posterior ischemic optic neuropathy (PION)
  - Theory:
    - Everything crammed together → ↑ intraabdominal pressure → ↑ intrathoracic pressure → ↑ JVD → ↑ intraocular pressure → venous congestion/compartment syndrome
- Damage to occipital lobes
  - Central blindness
  - Stroke
  - Cardiac surgery → showering of clots (recall: why pH stat for pediatrics)

What do studies show?

- Based on 2006 study (slightly different than reported in episode)
  - Of 93 spinal cases, 83 led to ION
    - 25 used Wilson frame (30%)
      - Wilson frame - ↑ venous back pressure → ↑ posterior optic neuropathy
    - 22 used Jackson spinal table (27%)
    - 16 used Mayfield pins (19%).
    - 60% PION
    - 20% AION
The 10 CRAO cases, 3 used horseshoe headrests. Mayfield pins were not used in any of the CRAO cases.

- Horseshoe
  - Fine for supine
  - Prone
  - Pressure on anterior chamber of eye
  - Hard to avoid both eyes
  - Avoid by using tongs, T cutout, pins

- Obesity
  - Overall ↑ intraabdominal pressure → transmitted to eye
  - Jackson table allows more spreading of weight

- Male
- Estrogen exerts protective effects
  - Hormonal effects on vasculature?

- Age > 50 years
- ↑ Blood loss
  - 82% of cases with 1 or more liters of estimated blood loss
  - Don’t let hemoglobin fall quite as low as other case
    - 8-9 Hb, very dependent on patient/conditions
  - Send for Hb levels periodically
  - Utilize tromboelastogram (TEG)
    - Specifies clotting dysfunction
    - If TEG widens once clot starts to form, and narrows too soon, this suggests fibrinolysis → give anti-fibrinolytic (such as tranexamic acid (TXA))
    - > 6 hours duration for cases
  - 94% of cases
  - Segment these cases!

- MAP > 70
- Avoid pressors
  - Favor blood and colloids

Should we limit crystalloids to reduce swelling of face and risk of ION?

- Doesn’t correlate as strongly with posterior eye
- Limited crystalloid and used more blood and colloids to oncotic pressure of vasculature to prevent extravasation around optic nerve

Cases

- Female in early 40s with no history of glaucoma underwent a gynecological procedure. She always had PONV so she received a scopolamine patch. Institutional guideline is to remove patch end of phase 2 but was missed. She took off the path herself and developed acute close angle glaucoma. Her intraocular pressure was increased. Eye surgeons delayed in putting a hole so she suffered visual loss.
  - Similar case report in 1997
- Male in postoperative period reported diminished vision, found to be 20/80, with pressures of 190/100. Ultrasound revealed shrunken kidneys. Fundoscopic exam revealed flamed hemorrhage, cotton wool macular edema. Aggressively treated
with antihypertensive. Over 6 weeks, brought pressure to normal level, and normal fundoscopic. Vision improved to 20/30. This episode of acute angle glaucoma was precipitated by scopolamine.

Any concerns of succinylcholine due to transient ↑ intraocular pressure?
- With respect to open globes, more worried about extravasation of ocular contents
- Neuroanesthesiologists more likely to use nondepolarizing agents.
  - Not related to optic neuropathies

PION (the 67% of all ION cases in Registry)
- Major risk factors
  - Long bloody cases
- Old thinking:
  - Did not transfuse until end because will bleed out again
  - Kept pressures lower
  - Not standard of practice to give colloids, so used pressors to further compromise blood supply to this area
  - Head way down for less bloody field
  - Wilson frame available then (↑ venous back pressure)
  - Not recognizing that people have anatomic risk factors
  - Not understanding that this process is permanent visual loss

Prevention and protection from posterior optic neuropathy
- Consent:
  - Mention visual loss, rare but real
- Consider reported risk factors
- Pins vs Mayfield to ↓ AION? Avoid Wilson frame for longer cases, fine for shorter cases like single disc. Moving towards using Jackson table to ↓ PION.
- Avoid head down (Trendelenburg) to ↓ venous pressure
- Maintain oxygenation to that area
  - Transfuse more liberally
  - Mean arterial pressure (MAP) ≥ 70 mmHg
  - Colloids to maintain fluids in vessel
    - Colloids (5% albumin, or 2% Normal saline)
  - Blood available [don’t play catchup]
    - FFP, platelets, Cell Saver
- Anti-fibrinolytic
  - TXA if bloody
    - Similar to aminocaproic acid
  - Attenuate some bleeding
  - Will see widening of TEG

Occurrence with level of spine?
- Usually thoracic/lumbar
- Not much with cervical because bones aren’t as big → not as much bleeding
- See Table 3 from 2006 study:
Most common cause of permanent POVL in adults after non-ocular surgery? Prone spine surgery?
  - PION

Most common cause of retinal visual loss after non-ocular surgery?
  - CRAO

What would you see on fundoscopic exam?
  - Cherry red macula

Most cases of PION found in what kind of surgeries? AION? (source)
  - PION: spine surgery
  - AION: cardiac surgery

**Giant Cell Arteritis**
  - Arteritic ION
  - Nonarteritic ION = AION, PION
  - Treat with massive dose of methylprednisolone
  - Look for
    - Vasculitic etiologies
    - Autoimmune process
    - Lab tests
    - Fundoscopic exam

Comments or suggestions? Please email accrac@accrac.com or leave a comment on the website.  
Fan of the show? Please take a moment to leave a comment and a rating to help others find the show!  
Want to support the show? Patreon.com/ACCRAC to become a patron and support the making of the show.  
Notes by Brian Park.