Thursday, November 29th, 2018

Blood supply - oxygenation, etc., incredibly important for the brain.
The retina is the part of the brain which uses the most oxygen.
Lots of light + oxygen leads to reactive oxygen species and damage.
If the retina doesn't get enough oxygen it simply won't work.

Vision gets spotted & discolored when oxygen levels drop.
Fatigued, even though your muscles are at the same state - it's a brain thing not a peripheral thing.
Oxygen deficit, and also low pressure.
Can survive for up to 5min - beyond which you can sustain permanent damage.
The heart can last a much longer time.

CBF - Cerebral Blood Flow
Pressure in most organs is arterial minus venous (7mmHg) (pressure measured in mmHg)
This is not the case on the brain - why?
The cranium - the vault in the skull - puts an absolute limit on what the pressure could be.
Healthy skull pressure is 15mmHg
Cerebral perfusion pressure determines cerebral blood flow and is dependent on arterial minus intracranial pressure, NOT venous pressure. A change in these two pressures can mess us up.
Mean arterial pressure may decrease due to lack of volume in dehydration.
Increase in intracranial pressure can occur due to a hemorrhage, penetrating wound, tumor, ischemic stroke (blood in parenchyma is hemorrhagic stroke, blood vessel occlusion leads to lack of oxygen - ischemic stroke)

Syncope - a fancy term for fainting

Guillotine - instant death decreases suffering.
Did it in fact work?
"When I lose consciousness I'll stop blinking"
No perfusion pressure - no consciousness. The moment the blade cuts the carotids, you lack enough CBF, you've lost consciousness.

Syncope can also occur at high pressure, when (smaller) blood vessels burst
Blood pressure rises when you exercise, but the entire defended zone shifts to the right. You can have a higher arterial pressure and still be fine - the perfusion pressure will be accordingly reduced. But that's why it's a good idea to drink and have enough volume when you exercise.

Autoregulation is about the diameter of the blood vessels - they contract or expand to normalize the pressure.
As I stand up, I contract the smooth muscles in the arteries of the legs - this allows enough blood to get to my head. It's an accompaniment. When I exercise, there's a signal to autonomic neurons to change muscle diameter.

How do we get the blood to the brain?
Two sources - internal carotids enter frontally, vertebral arteries enter through brainstem.
Vertebral arteries form posterior circulation, internal carotids form anterior circulation.
Connector basilar artery btwn the two vertebral branches and the Circle of Willis in the brain. The carotids enter the top of the circle. Think of it like a traffic roundabout.
Anastomosis - process by which / location where blood vessels meet and share terrority
In humans and some higher primates, we have reversed the flow of blood. Most animals have blood flowing down from basilar, but ours flows up through basilar from vertebral.
Question of how large is the biomass that you're feeding oxygen to.

In fish, amphibians, and reptiles the basilar never touches the posterior circulation. So the only way blood is flowing in the basilar is anterior to posterior. Once we get to birds there's a tiny connection but blood flow in the basilar is still towards the posterior.

The circle btwn ACA, MCA, and PCA via PCoA and ACoA is the Circle of Willis and in the evolutionary lineage it first appears in reptiles.

In most mammals the blood flow still goes from anterior to posterior circulation.
Where do general anesthetics work to produce a loss of consciousness?
Administration of anesthesia only to goat brainstem/spinal cord required 1.5%.
Administration only to the forebrain required 8-9%.
The consensus is now that access to conscious experience is gated by the spinal cord.

The blood flow in humans and a number of primates comes from vertebrals into anterior circulation. You can get enough blood in this way to perfuse the entire brain - it's a lot of biomass.

We have three main cerebral arteries. The middle is the largest, and supplies most of the convexity of the brain with oxygen - the posterior supplies the posterior, and anterior supplies a tiny bit of the convexity but mostly the medial surface.

Egas Moniz - leucotomy. He received the Nobel for this, not for inventing the angiogram.
Walter Freeman. Lobotomymobile.

The circle of Willis suggests conceptually that blood can go around the circle, but tracing studies show that this is not the case. This is very interesting for hydrodynamicists. Blood meets in the middle but stays to its side because pressure is coming equally from both sides.

Tuesday, December 4th, 2018
Social Neuroscience

Behavior: ants will pick up injured colony-mates on the way home from battle (context-dependent)
Just bc we can recapitulate it as a chemical process, does that mean it is not social?