Interpretation of the ICP waveform

The EVD catheter is zeroed at the level of the external auditory meatus (equivalent to the circle of Willis)
The vascular ICP waveform correlates with the arterial blood pressure waveform
The respiratory ICP waveform correlates with the respiratory cycle

A reasonable maximum ICP to tolerate is 25.

What the hell is causing these waves?
- Experts disagree.
- It is theorized that the P1 and P2 waves are arterial and P3 is venous
- Generally, it is thought that the pulsations of the intracranial vessels are transmitted to the CSF via the choroid plexus, the vessels themselves, and the brain parenchyma
- But, in general, nobody really knows what exactly generates these waveforms

Interpretation of the ICP waveform trends:
These are patterns in intracranial pressure over several minutes

“A” waves, or plateau waves:
- Cerebral perfusion is severely compromised due to increased intracranial pressure
- One ought to get on the phone to the neurosurgeon

ICP as high as 70mmHg
ICP stays high for ~ 20 minutes
### Interpretation of ICP waveforms

#### My ICP trace is flat

- Your EVD is clogged or kinked.
- Your patient has died.

#### Increased (or decreased) amplitude of all waves (unchanged waveform components)

- Increasing CSF volume (or decreased);
- if you drain off a large volume of CSF, the waveform won't change shape, but it will decrease in amplitude.
- This will also happen in a patient with a missing bone flap.

#### Prominent P1 wave

- The systolic BP is too high
- The ICP trace looks a lot like the art line trace

#### Diminished P1 wave

- If the systolic BP is too low P1 decreases and eventually disappears, leaving only P2.
- P2 and P3 are not changed by this

#### Prominent P2 wave

- The mass lesion is increasing in volume
- This trace means the intracranial compliance has decreased; you can also get this with an inspiratory breath hold (as ICP will also rise)

#### Diminished P2 and P3 waves

- This happens in a hyperventilated patient

#### Rounded ICP Waveform

- ICP is critically high

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**When to pull the EVD out?** Once there is CT evidence of resolution of cerebral oedema, and provided there is improvement of ICP (i.e. it is consistently under 20-25)

Or… if the EVD is infected.