This quiz is being published on behalf of the Education Committee of the SNACC.
1. A 79 Y/O MALE PATIENT WITH HISTORY OF HYPERTENSION, HYPERLIPIDEMIA, DIABETES TYPE 2 PRESENTS TO THE IR SUITE WITH ACUTE ISCHEMIC STROKE WITH FLUCTUATING LEFT ARM WEAKNESS, BILATERAL GAZE PALSY, DYSARTHRIA. WHICH OF THE FOLLOWING STATEMENTS IS TRUE REGARDING THE DIAGNOSIS OF THIS PATIENT:

A. **Vertebral artery dissection.**
B. **Basilar artery occlusion.**
C. **Basilar artery branch disease.**
D. **Subclavian artery stenosis.**
A. VERTEBRAL ARTERY DISSECTION.

Usually patients with vertebral artery dissection present with neck pain, trauma to the neck, headache along with vertebra basilar symptoms of diplopia, ataxia, vertigo, visual field loss.
Patients with basilar artery occlusion, usually present with fleeting or stuttering vertebro-basilar symptoms. Proximal lesions usually present as fluctuating and progressive, whereas distal and mid basilar artery lesions present as abrupt without any prodromal signs.
Patients with patent basilar artery presenting with fluctuating sensory or motor symptoms, opthalmoplegia, dysarthria, usually have a basilar branch artery disease leading to ventral pontine infarction. This was coined as “Pontine warning syndrome” by Saposnik and colleagues.

Patients would usually present with unilateral arm pain with exertion along with vertebro-basilar insufficiency symptoms.

2. A 59-year-old female patient with history of obesity, hypertension, dyslipidemia was brought to the hospital after collapsing at her home. MRA findings suggest left middle cerebral artery stroke. All are true of hypothermic protocol except:

A. Temperature is best lowered by an endovascular heat exchange catheter.
B. Patients have to be always sedated, intubated, and paralyzed to achieve significant hypothermia.
C. Antishivering methods help achieve hypothermia faster.
D. Selective brain cooling can achieve similar outcomes as whole body cooling.
A. Temperature is best lowered by an endovascular heat exchange catheter.

Endovascular heat exchange catheters can be used alone or with TPA within 6 hours of onset of stroke symptoms and achieve a temperature of 33 degrees an average of 77 minutes faster than surface cooling.
B. Patients have to be always sedated, intubated and paralyzed to achieve significant hypothermia. Hypothermic protocol can be employed in awake patients without any neuromuscular blockade and mechanical ventilation. (COOL AID 2, ICTuS-L STUDY)
C. Anti-shivering methods help achieve hypothermia faster

ICTuS-L (Intravenous Thrombolysis Plus Hypothermia for Acute Treatment of Ischemic Stroke)-randomized feasibility study in which endovascular cooling along with TPA was employed in awake patients within 6 hours of stroke. Shivering was prevented by using meperidine alone or in combination with buspirone. The latter showed more effective cooling.
D. Selective brain cooling can achieve similar outcomes as whole body cooling.

The right axillary artery is accessed for achieving selective brain cooling which can provide similar effects of hypothermia without the hypothermic side effects of shivering and fewer neurologic complications.

Tsai et al; Moderate hypothermia during aortic arch surgery is associated with reduced risk of early mortality. J thorac Cardiovasc Surg. 2013;146(3):.
3. 75 y/o patient with a history of hypertension, diabetes mellitus presents with TIAs, left hemiparesis for emergent right MCA (middle cerebral artery) thrombectomy. He is on Candesartan. All are true about patients on Angiotensin receptor blockers except;

A. Patients can have exaggerated hypotension after induction of anesthesia.
B. Treatment of hypotension with norepinephrine is similar to the treatment with vasopressin analogs.
C. Patients are usually in a parasympathomimetic state.
D. Candesartan may not necessarily improve outcome.
A. Patients can have exaggerated hypotension after induction of anesthesia.

Usually body compensates for anesthesia induced hypotension by activating the sympathetic nervous system (SNS), renin angiotensin system and vasopressinergic system. Patients on angiotensin receptor blockers are unable to compensate for hypotension as induction of anesthesia effects the SNS, reduced vascular tone and blunting of the reflex tachycardia.

B. Treatment of hypotension with norepinephrine is similar to the treatment with vasopressin analogs.

Vasopressin analogs seem to show a more rapid effect than Norepinephrine. In a study by Morelli et al., they showed that trelipressin increased mean arterial pressure faster than norepinephrine.

Bocarro G et al; Terlipressin vs norepinephrine to correct refractory arterial Hypotension after general anesthesia in patients chronically treated with renin-angiotensin System inhibitors. Anesthesiology. 2003;98(6):1338-1344
C. Patients are usually in a parasympathomimetic state.

Patients on angiotensin receptor blocker are usually in a parasympathomimetic state with a blunting of reflex sympathetic response to hypotension.

D. Candesartan may not necessarily improve outcome

In a randomized double-blind study patients were randomized to receive candesartan/placebo. The candesartan group showed no benefit to the end points—death, recurrent stroke, myocardial infarction at a 6 month period. In fact, there was a higher risk of poor functional outcome.

4. A 62 YEAR OLD MALE IS UNDERGOING INTRARTERIAL THROMBECTOMY FOR ACUTE STROKE UNDER MONITORED ANESTHESIA CARE. ALL ARE TRUE ABOUT INTRACRANIAL HAEMORRHAGE IN ENDOVASCULAR TREATMENTS, EXCEPT:

A. Protamine should be given
B. Maintain systolic blood pressure > 140 mmHg.
C. Rapid lowering of blood pressure to prevent bleeding.
D. Should be converted to GA
A. Protamine should be given.

ICH can occur during endovascular treatments of stroke either iatrogenically due to vessel trauma or due to hemorrhagic conversion of the infarct. Protamine should be given to reverse the heparin. If intraarterial TPA was given then FFP, cryoprecipitate and platelets would have to be given.

B. Maintain systolic blood pressure > 140 mmHg

Per the SNACC consensus, the recommendation is to maintain the systolic blood pressure > 140 after an ICH.

Talke PO et al
C. Rapid lowering of blood pressure to prevent bleeding

After an acute stroke rapid lowering of blood pressure could prove harmful. Nicardipine and/or labetolol should be used to keep MAP < 140 mmHg.
After an ICH, airway should be protected to prevent hypoxia and hypercarbia, and to be able to manage increased intracranial pressure.
5. A 45 year old male undergoes an emergent endovascular coiling under monitored anesthesia care, receives 6L of intravenous fluids during a 5 hour procedure by the anesthesia and the interventional teams, along with escalating doses of phenylephrine infusion. He had to be emergently intubated for a drop in oxygen saturation to 85% and frothy secretions in the mouth. Possible causes could be all except:

A. Neurogenic pulmonary edema
B. Cardiogenic pulmonary edema
C. Volume overload
D. Aspiration pneumonia
Neurogenic pulmonary edema can occur in 30-70% of patients with SAH. Considered to be sympathetically mediated. Some may develop a stunned myocardium. Altered pulmonary vascular resistance and capillary permeability lead to edema. Lack of increases in JVP and a cardiac gallop should suggest the diagnosis.

\[
\text{SAH} \rightarrow \text{ICP}^\uparrow \rightarrow \text{Sympathetic stimulation} \rightarrow \text{Vasoconstriction} \]

\[
\text{Pulmonary} \rightarrow \text{PVP}^\uparrow \rightarrow \uparrow \text{PCP} \rightarrow \uparrow \text{pulmonary capillary permeability} \rightarrow \text{Neurogenic pulm edema} \]

\[
\text{Systemic} \rightarrow \uparrow \text{MAP} \rightarrow \downarrow \text{Lt ventr compliance} \rightarrow \uparrow \text{LAP} \rightarrow \uparrow \text{PCP} \rightarrow \uparrow \text{PCP permeability} \rightarrow \text{NPE} \]

B. Cardiogenic pulmonary edema

CPE is caused either in a preexisting cardiac dysfunction or secondary to direct myocardial damage due to increased catecholamine surge. Sometimes in emergent situations past medical history may be missing.

C. Volume overload

Patients can sometimes inadvertently (as in this case) or intentionally (to prevent vasospasm) receive aggressive hydration which in itself can lead to pulmonary edema. If the patient had a h/o cardiomyopathy with decreased myocardial contractility and reduced cardiac output, the fall in cardiac output stimulates sympathetic activity and blood volume expansion by activating the renin-angiotensin-aldosterone system, which causes deterioration by decreasing LV filling time and increasing capillary hydrostatic pressure.

D. Aspiration pneumonia

Aspiration may occur in obtunded patients but it is not likely here because the signs and symptoms of aspiration occur much later, unlike this patient. Neurogenic pulmonary edema occurs more rapidly than aspiration pneumonia.