

The EM Educator Series

Not all head bleeds are alike – Spontaneous Intracerebral Hemorrhage

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Case #1:

A 68-year-old male with a history of atrial fibrillation and hypertension presents with altered mental status. His wife found him on the couch groaning, unable to answer questions. His VS include RR 12, HR 82, BP 188/99, T 37C, and Sats 96%. His GCS is 10. CT demonstrates intracerebral hemorrhage.

Questions for Learners:

- 1) What are the risk factors for spontaneous ICH?
- 2) What are the clinical presentations and four major locations?
- 3) What are your goals concerning management of blood pressure, serum glucose, and temperature?
- 4) What are your considerations regarding the airway? When should you intubate, what medications are preferred, and what should you use for post-intubation analgesia/sedation?
- 5) What should you consider for anticoagulation reversal?
- 6) How do you manage increased ICP in the setting of spontaneous ICH?
- 7) What can neurology and neurosurgery assist with? When should they be consulted?
- 8) Controversies: When is seizure prophylaxis needed? What about platelets?

Suggested Resources:

- ✓ Articles:
 - [emDOCs – Critical Intracranial Hemorrhage: Pearls and Pitfalls in Evaluation and Management](#)
 - [LITFL – Intracerebral Haemorrhage](#)
 - [ALiEM – Update on the ED Management of Intracranial Hemorrhage: Not All Head Bleeds Are the Same](#)
 - [ALiEM – Podcast Follow-up: Interview with Dr. Debbie Yi Madhok, Co-Author of “Update on the ED Management of Intracranial Hemorrhage”](#)
 - [CORE EM – Intensive Blood Pressure Lowering in Intracerebral Hemorrhage \(ATACH-2 Trial\)](#)
 - R.E.B.E.L. EM
 - [Intensive Blood Pressure Control Doesn’t Benefit Patients with Acute Cerebral Hemorrhage \(ATACH-2\)](#)
 - [The PATCH Trial: Hold the Platelets in Spontaneous Intracerebral Hemorrhage?](#)
 - [Radiopaedia – Intracerebral Haemorrhage](#)

- ✓ Podcasts:
 - [EM Cases – Ep 104 Emergency Management of Intracerebral Hemorrhage – The Golden Hour](#)

Answers for Learners:

1) What are the risk factors for spontaneous ICH?

- Hypertension
- heavy ethanol intake
- cocaine use
- advanced age
- male
- African-American
- Japanese
- ?low cholesterol
- ?smoking

Long-standing hypertension, resulting in hypertensive vasculopathy, is the most significant risk factor. Other causes include cerebral amyloid angiopathy, underlying vascular malformations (including arteriovenous malformations (AVMs) and aneurysms), hemorrhagic infarction (including venous sinus thrombosis), septic or mycotic aneurysm, tumors, blood dyscrasias, hemorrhagic transformation of ischemic stroke, Moyamoya disease, and drug intoxication (particularly sympathomimetics, such as cocaine and amphetamines)

2) What are the clinical presentations and four major locations?

Unlike subarachnoid hemorrhage, symptoms are not classically maximal at onset. Headache and nausea/ vomiting only occur in about half of cases, and when they do they are typically gradual in onset rather than “thunderclap.” Patients with ICH may present identically to those with ischemic stroke, and these two processes cannot be reliably differentiated from each other without imaging.

Neurologic signs reflect hemorrhage location (Table 1). Bleeding into the putamen is the most common, followed by the subcortex, cerebellum, thalamus, and pons.^{1,3}

Table 1. Clinical presentation corresponding to intracranial hemorrhage location

Putamen	Hemiplegia, hemisensory loss, homonymous hemianopsia, gaze palsy, stupor, coma
Cerebellum	Gait imbalance, vomiting, headache, neck stiffness, gaze palsy, facial weakness
Thalamus	Hemiplegia, hemisensory loss, transient homonymous hemianopsia, aphasia or neglect, upgaze palsy with miotic unreactive pupils that look toward tip of nose, are skewed, or point toward the weak side
Pons	Total paralysis, pinpoint reactive pupils, absent horizontal eye movements, deep coma within minutes of onset
Subcortex	Most commonly affect parietal (contralateral lower extremity hemiplegia) or occipital (contralateral homonymous hemianopsia) lobe; highest incidence of seizure

3) What are your goals concerning management of blood pressure, serum glucose, and temperature?

Treat hyperthermia with antipyretics, and titrate insulin dosing to maintain a target serum glucose level to avoid both hyper- and hypoglycemia (optimal glucose level is not agreed upon).

Based on the INTERACT2 and ATTACH2 trials our experts suggest that for those patients with ICH with GCS scores >7, lowering BP to 140/80 is not harmful and may be minimally beneficial.

The **INTERACT2 trial** of 2013 was an RCT of 2839 patients with spontaneous ICH within 6 hours and elevated systolic BP, who were randomized to intensive treatment (<140) vs guideline-recommended therapy (<180). Outcomes were modified Rankin scale of 3-6 (death and major disability) at 90 days. They found no significant difference in primary outcomes. Note that this was an ordinal analysis with its inherent problems.

The ATTACH-2 RCT compared a lower systolic BP target of 110 to 139 mm Hg with a standard target of 140 – 179 in 1,000 patients using IV labetalol, diltiazem or urapidil. Patients were eligible if they had at least one episode of SBP > 180 mm Hg between symptom onset and 4.5 hours. The trial was stopped early for futility, with no difference in the primary outcome of death or disability (intensive group 38.7% vs control 37.7%). There was also no difference in haematoma expansion (18.9% vs 24.4%) or treatment-related serious adverse events. This trial was criticized for being underpowered.

Hypotension (MAP <75-80) should be avoided at all costs in patients with ICH.

4) What are your considerations regarding the airway? When should you intubate, what medications are preferred, and what should you use for post-intubation analgesia/sedation?

These patients are at especially high risk of deterioration in mental status requiring endotracheal intubation to secure patent and protected airway. Short-acting sedatives are advisable in intubated patients to facilitate serial neurological examinations.

First divide patients into two categories:

1. Those that require immediate airway protection: herniating, apneic, very low GCS, soiled airway
2. Those that are slowly declining whom you deem candidates for airway protection

For those patients in category one, perform a standard RSI.

For those patients in category two, perform a neurocritical care protective intubation.

Ensure good neurologic exam before paralyzing the patient if time permits.

1. Get equipment to bedside

2. Keep head of bed elevated at least 20 degrees throughout to prevent spike in ICP
3. Have nicardipine or labetalol as well as push dose epinephrine ready at the bedside to manage any extreme deviations in BP
4. Titrate SBP to 140-160 preferably with an arterial line in place
5. Consider fentanyl 3-5micrograms/kg pretreatment 3 minutes before intubation (beware apnea)
6. Etomidate or Ketofol (in a 25% ketamine, 75% propofol mixture) for induction
7. Rocuromium or succinylcholine
8. Post intubation analgesia should start with fentanyl if you haven't given already and for sedation use propofol or dexmetatomidine
9. Ventilation: Lung protective ventilation 7mL/kg, +/- lowest PEEP to achieve O2sat 95%, normocapnea at PaCO2 of about 40 unless herniating (target PaCO2 30-35 or ETCO2 27-30 if herniating).

Avoid hypoxemia in ICH at all costs

5) What should you consider for anticoagulation reversal?

Reversal of Warfarin in ICH

Any patient taking Warfarin who presents to the ED with ICH should receive IV 4 factor PCCs 1,500 units (Octaplex, Beriplex or Kcentra) as soon as possible and IV Vitamin K in 50mL of NS over 10 mins before the INR result comes back, as hematoma expansion typically occurs within the first hour in patients taking Warfarin.

The INR should be repeated 15 mins and 5-6 hours after PCCs are administered to assess for repeat dosing if necessary. Target an INR of 1.5.

Current recommendations for 4 factor PCCs dosing based on INR:

INR 1.6-3: 1000 units PCC

INR 3-5: 2000 units PCC

INR >5: 3000 units PCC

Reversal of Low Molecular Weight Heparin (LMWH) and UFH with protamine sulphate in ICH

For dalteparin: IV protamine sulphate 1mg for every 100 units dalteparin to maximum dose of 50mg over 15 mins

For enoxaparin taken within 8 hrs: IV protamine sulphate 1mg of every 1 mg enoxaparin to maximum dose of 50mg over 15 mins. For enoxaparin taken 8-12hrs ago, give protamine sulphate 0.5mg per 1mg of enoxaparin (maximum single dose 50mg).

For UFH: IV protamine sulphate 1mg for every 100 units of UFH given in the previous 2-3hrs to a maximum single dose of 50mg). A repeat dose of 0.5mg of protamine per 100 units of UFH may be given if the PTT remains elevated.

2nd line: Factor VIIa

Reversal of dabigatran in ICH

Idarucizumab 5g over 15-20mins is the reversal agent of choice for dabigatran

If idarucizumab is not available consider FEIBA (Factor Eight Inhibiting Bypass Activity)

If FEIBA is not available consider 4 factor PCC (Octaplex, Beriplex or Kcentra)

Reversal of Xa Inhibitors in ICH

For Xa inhibitors (e.g. apixaban, rivaroxaban) 4-factor PCC (Octaplex, Beriplex, Kcentra) at a dose of 50 IU/kg up to 3,000 units is the reversal agent of choice based on limited evidence.

Note that if you highly suspect a Xa inhibitor intracranial bleed before obtaining a CT head, it is reasonable to give 1,500 units of 4 factor PCC on speculation.

Andexanet Alfa is a decoy antigen; it competitively binds rivaroxaban and apixaban and is given as an ongoing infusion. The evidence is not convincing for its effectiveness and it is currently not available in Canada as of this publication date.

Reversal of thrombolytics in ICH

Time is of the essence. Careful monitoring of your ICH patient should allow rapid identification of post-lytic ICH. Any change in mental status or signs of increasing ICP should trigger an immediate CT scan to look for ICH. The sooner you start treatment, the better.

The most recent guidelines for treatment of post-thrombolytic ICH are the 2016 Neurocritical Care Society & Society of Critical Care Medicine Guidelines for Reversal of Antithrombotics in ICH. Based on limited evidence, they recommend cryoprecipitate (10 units initial dose). If cryoprecipitate is contraindicated or not available in a timely manner, they recommend tranexamic acid 10–15 mg/kg IV over 20 min. However, our experts recommend caution with the use of tranexamic acid for ICH because of concerns of inducing thrombosis. As such it should be used only as a last resort.

It is important to check the fibrinogen level after administration of reversal agents. If the fibrinogen level is < 150 mg/dL, they suggest administration of additional cryoprecipitate.

Update 2018: A randomized placebo-controlled trial involving 2325 adults with ICH from acute stroke, demonstrated no significant difference in functional status at 90- days between those receiving TXA versus placebo, though there was a reduction in early deaths and adverse events in the TXA group. (TICH-2 trial) Abstract

6) How do you manage increased ICP in the setting of spontaneous ICH?

- Head of the bed elevation between 30 and 45° with the head kept midline
- Appropriate analgesia and sedation

- Normocapneic ventilation or hyperventilation if herniating
- Hypertonic solutions (e.g. hypertonic saline or mannitol)

7) What can neurology and neurosurgery assist with? When should they be consulted?

All patients with ICH require neurosurgery consult for possible surgical intervention, including extraventricular drain (EVD) placement.

Surgical intervention for subdural hemorrhages

Width > 10 mm

Midline shift > 5 mm

GCS < 9 or GCS change \geq 2 since injury

Surgical intervention for epidural hemorrhages

Hemorrhage volume > 30 cm³

GCS < 9 with asymmetric pupils

8) Controversies: When is seizure prophylaxis needed? What about platelets?

Indications for seizure prophylaxis in traumatic ICH

- GCS \leq 10 (phenytoin is the agent of choice)
- Depressed skull fracture
- Subdural or epidural hematoma
- Hemorrhagic contusion
- Penetrating head trauma
- Seizure within the first 24 hours

There is also no indication to give seizure prophylaxis in atraumatic head bleeds. This is important, because in this patient population, these medications are associated with elevated temperature, vasospasm – and with phenytoin in particular – worse cognitive outcomes 90 days after injury.

There remains some controversy regarding the use of platelets in patients with traumatic brain injury and current use of aspirin, clopidogrel, or other antiplatelet agents. The PATCH trial corroborated the practice of many neurointensivists – avoiding transfusion in patients presenting with an atraumatic or spontaneous ICH while already on an antiplatelet agent at home. Anecdotally, however, many surgeons find that a platelet transfusion can help control intra-operative bleeding. Therefore, it is still important to have a conversation with the neurosurgical team about the risks and benefits of a transfusion in patients with spontaneous ICH.