SPONTANEOUS INTRACRANIAL HEMORRHAGE

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HEMORRHAGE LOCATIONS

- 50% deep
- 35% lobar
- 10% cerebellar
- 6% brain stem
GENERAL OUTCOMES

• ICH causes 10-15% of initial strokes
• 30 day mortality 35-52% with half of these deaths occurring within the first 2 days of onset
• 50% of deaths occur in first 48 hours
• Death by location at 12 months
  – 51% for deep
  – 57% for lobar
  – 42% for cerebellar
  – 65% for brain stem
• 20% of all ICH victims are independent at 6 months
OUTCOME PREDICTORS

• Predictors for death at 30 days
  – Large Hematoma volume
  – Hydrocephalus
  – Non-cortical location
  – High fibrinogen levels
  – Poor GCS
OUTCOME PREDICTOR

• Strongest predictor of 30-day mortality is hematoma volume
• Volume >60cc and GCS <8
  – 30-day mortality is 91%
• Volume <30 cc and GCS >9
  – 30-day mortality is 19%
• Volume greater than 30 cc predicts inability to function independently at 30 days
CLINICAL PRESENTATION

• Focal neurologic deficit
• Headache
• Emesis
• Elevated blood pressure
• Headache
INITIAL EVALUATION

• Clinical Information
• Signs and symptoms
• Time of onset
• Patient age
• Past medical history
• Medications (anticoagulation)
• Family history
• Illicit drugs (cocaine, stimulants, IVDA)
INITIAL EVALUATION

• Physical examination
• Imaging
  – CT
  – MRI
  – Angiography
• Laboratory testing
  – Cell counts (platelet count)
  – Coagulation studies (PT, PTT, INR)
  – Toxicity screens
  – Pregnancy test
USEFUL SCALES AND SCORING SYSTEMS

• ABC/2 Formula
  – Permits estimation of hematoma size if CT scanner software cannot do calculation

• Intracerebral Hemorrhage (ICH) Score
  – Estimates mortality in ICH
OVERALL TREATMENT GOALS

• Reduce or eliminate bleeding
• Remove blood if necessary
• Control intracranial pressure
• Supportive care
  – Oxygenation
  – Maintain CPP
  – Nutrition
  – Prevention DVT
  – Seizure control
  – Electrolyte regulation
  – Pressure sore prevention
  – Management of infection
  – Fluid management
  – Therapy with early mobilization
MEDICAL MANAGEMENT

• Steroids
  – No benefits in randomized studies

• Recombinant Activated Factor 7
  – Stimulates thrombin formation and activates factor X on platelets. Thrombin converts fibrinogen to fibrin which stabilizes clot.
  – Dose 90 micrograms/kg
  – Half-life 2.6 hours
  – Randomized studies have shown improved survival and outcomes in those treated with F7
MEDICAL MANAGEMENT

• Blood Pressure Management Questions
  – Does elevated blood pressure cause increased bleeding or result from increased bleeding?
  – Does pharmacologic reduction of elevated blood pressure detrimentally reduce cerebral perfusion pressure (MAP – ICP = CPP)?
MEDICAL MANAGEMENT

• Blood Pressure Management
  – For primary ICH there is minimal evidence for specific blood pressure levels
  – General goal is to keep CPP >60-70 mm Hg
MEDICAL MANAGEMENT

• Hyperosmolar Treatment
  – No evidence that use of mannitol improves outcomes
Medical Management

• **Intracranial Pressure (ICP) Management**
  – IV Hyperosmolar agents (mannitol, urea)
  – Hyperventilation (reduces PaCO2 which reduces arterial dilatation and cerebral blood flow (CBF) and cerebral blood volume (CBV))
  – BP reduction
  – Barbiturates (reduce metabolic brain activity which reduces CBF)
  – Systemic cooling (reduces metabolism and CBF)
  – Each of these methods has benefits and detriments
  – Elevation of the head of bed (improves venous drainage)
  – Cerebrospinal fluid drainage
  – Pharmacologic paralysis

• **NO RANDOMIZED STUDY HAS DEMONSTRATED THE EFFICACY OF MONITORING ICP AND CPP IN THE SETTING OF ICH**
Medical Management

• High blood glucose upon presentation predicts an increased risk of 30 day mortality
• Unclear if elevated glucose is cause or effect
• May increase brain edema and cell death
Medical Management

• Seizures
  – 28% incidence of seizures (convulsive and non-convulsive) in first 30 days
  – Seizures more common with lobar hemorrhage
  – Prophylaxis with anticonvulsants should be considered
Medical Management

• Temperature Management
  – Aim for normothermic temperatures
  – No clear evidence that hypothermia is beneficial
RECOMMENDATIONS BASED ON EVIDENCE

• Class I
  – Benefits >>> Risks
  – Treatment/Procedure should be performed
  – “should; is recommended; is indicated; is useful/effective/beneficial”

• Class IIa
  – Benefits >> Risks
  – Reasonable to provide treatment but additional studies needed
  – “is reasonable; can be useful/effective/beneficial; is probably recommended or indicated”

• Class IIb
  – Benefits ≥ Risks
  – Procedure may be considered. More data needed
  – “may be considered; may be reasonable; effectiveness in uncertain”

• Class III
  – Risks > Benefits
  – No additional studies needed
  – “is not recommended; is not indicated; is not useful; may be harmful”
EVIDENCE SUPPORT

• Class I
  – Early recognition improves outcomes
  – Patient should be managed in an ICU
  – Treat clinical seizures
  – Fever should be treated
  – Early mobilization is beneficial
  – Use intermittent compression stockings to help prevent DVT in those with hemiparesis/hemiplegia
  – Treat hypertension to avoid recurrent bleeds
  – Protamine used be used to reverse heparin associated ICH
  – Warfarin should be reversed with IV vitamin K, FFP and other factors as indicated
EVIDENCE SUPPORT

• Class IIa
  – Treat elevated ICP and monitor BP to maintain CPP > 70 mm Hg
  – Persistent hyperglycemia >140 mg/dL during first 24 hours of stroke is associated with poor outcomes and should be treated
EVIDENCE SUPPORT

• Class IIb
  – Administer Factor 7 within first 3-4 hours to slow progression of bleeding
  – May use low dose subq heparin in patients with hemiplegia 2-3 days after cessation of bleeding
  – Inset IVC filter in patients with DVT or PE
  – Long term antithrombotic therapy may be used several weeks after the bleed taking into consideration likelihood of a recurrent bleed based on underlying etiology and risks
  – Reversal factors other than FFP may be beneficial but increase the risk of thromboembolism
  – For patients with high risk of rebleeding, antiplatelets may be better option than warfarin.
  – For patients at a very high risk of thromboembolism, may restart warfarin 7-10 days after the bleed
SURGICAL MANAGEMENT

• Class I
  – Cerebellar hematomas >3 cm diameter should have surgery ASAP if they are deteriorating, have brainstem compression, have hydrocephalus
**SURGICAL MANAGEMENT**

• Class II
  – Use of thrombolytics into the clot cavity to ease evacuation is not of benefit due to risks of rebleeding
  – Usefulness of minimally invasive approaches to clot evacuation are of unproven benefit
  – Lobar clot evacuation via craniotomy especially in patients that are worsening might be of benefit and/or hematomas that are within 1 cm of the cortical surface (may speed recovery)
  – Surgical evacuation is best done within 12 hours although ultraearly surgery may have a higher risk of rebleeding
  – Decompressive craniectomy is of unknown benefit
SURGICAL MANAGEMENT

• Class III

  – Routine evacuation of supratentorial hematomas within 96 hours of bleed is not recommended (evacuation is best based on exam)

  – Delayed clot evacuation by craniotomy offers little if any benefit and may worsen outcome by further damaging functional or recovering brain
PREVENTION OF RECURRENCE

• Class I
  – Treat hypertension
  – Eliminate smoking, heavy alcohol use, cocaine use