

# Spontaneous Intracerebral Hemorrhage

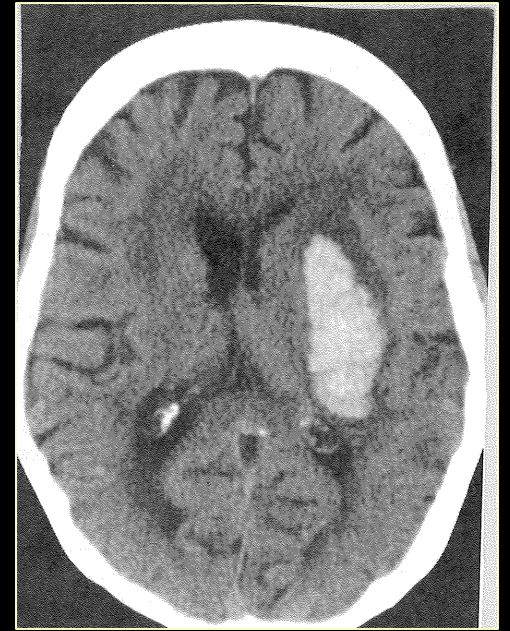
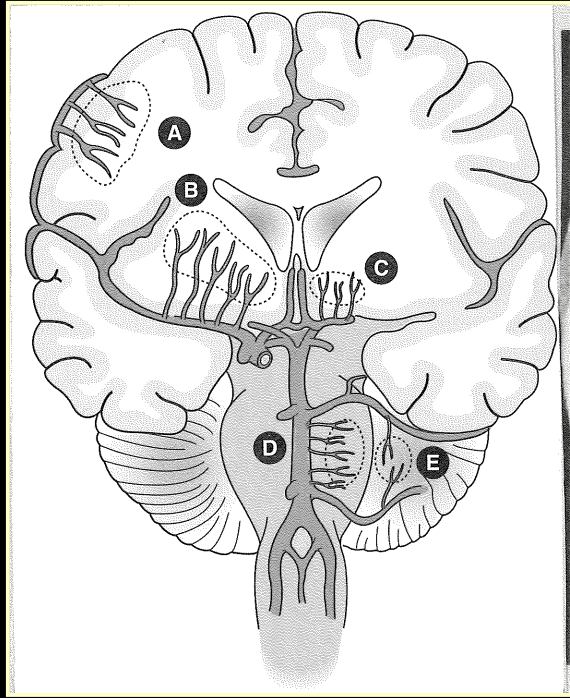
Peter C. Greco, M.D.

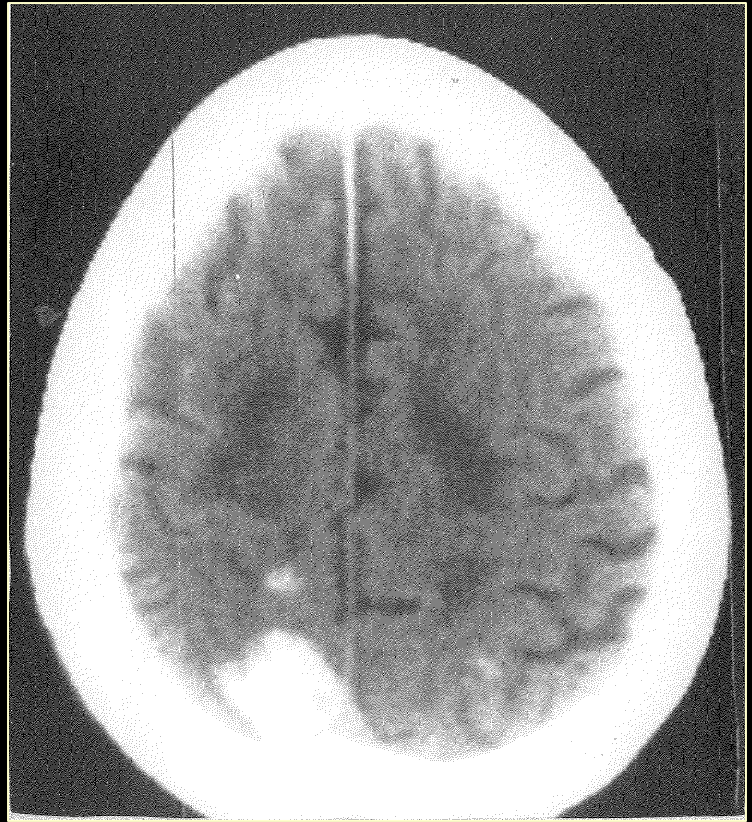
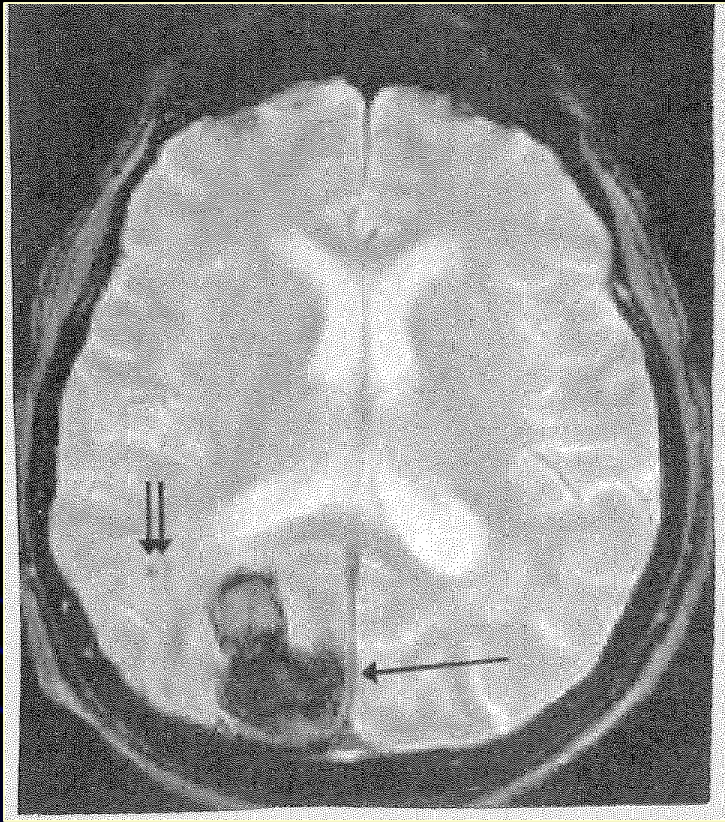
Director of Stroke Program

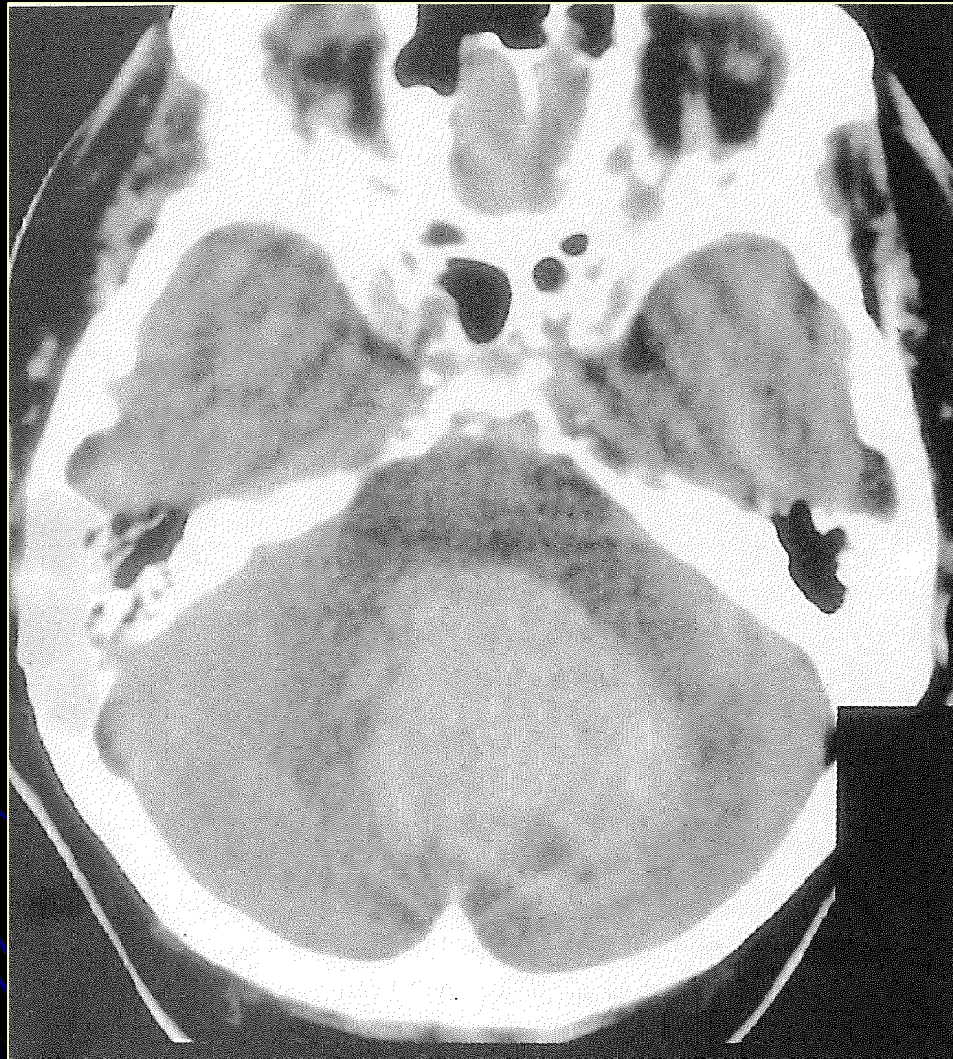
Saint Mary's Hospital

# Spontaneous Intracerebral Hemorrhage

- Deep Hemorrhage (Hypertensive – 65%)
- Lobar Hemorrhage (Amyloid angiopathy -10%)
- Hemorrhagic Stroke
- Vascular abnormalities (aneurysm, AVM)
- Coagulopathy
- Tumor (melanoma, renal cell ca, malignant glioma)
- Trauma (SDH, ICH, SAH)







# Spontaneous Intracerebral Hemorrhage

- 15% of stroke
- 30-40% mortality → STATS have not improved
- 80% left with severe morbidity
- Treatment often supportive only
- Non conclusive evidence for treatment regimens (i.e. surgery, hemostasis, BP management)

# ICH

## 30 Day Mortality

- Larger size, 30 ml → 60 ml
- Coma scale
- Infratentorial location
- Older age
- Rupture into ventricles and hydrocephalus
- Code status determination

# Epidemiology of ICH

- Poorly controlled HTN
- Trauma
- ETOH abuse, smoking, substance abuse
- Anticoagulation
- Asian and Afro Americans
- Cerebral amyloid angiopathy
- Systemic illness ( renal, hepatic)

# ICH

## Patient Stabilization and Treatment

- airway, cardiovascular stabilization
- Lab tests i.e. drug screen, coag studies
- Neuro-intensive care
- Address blood pressure issues
- Neurosurgery eval.
- Treat cerebral edema
- Seizure prophylaxis
- Treat fever and hyperglycemia
- Prevent complications (aspiration, DVT)

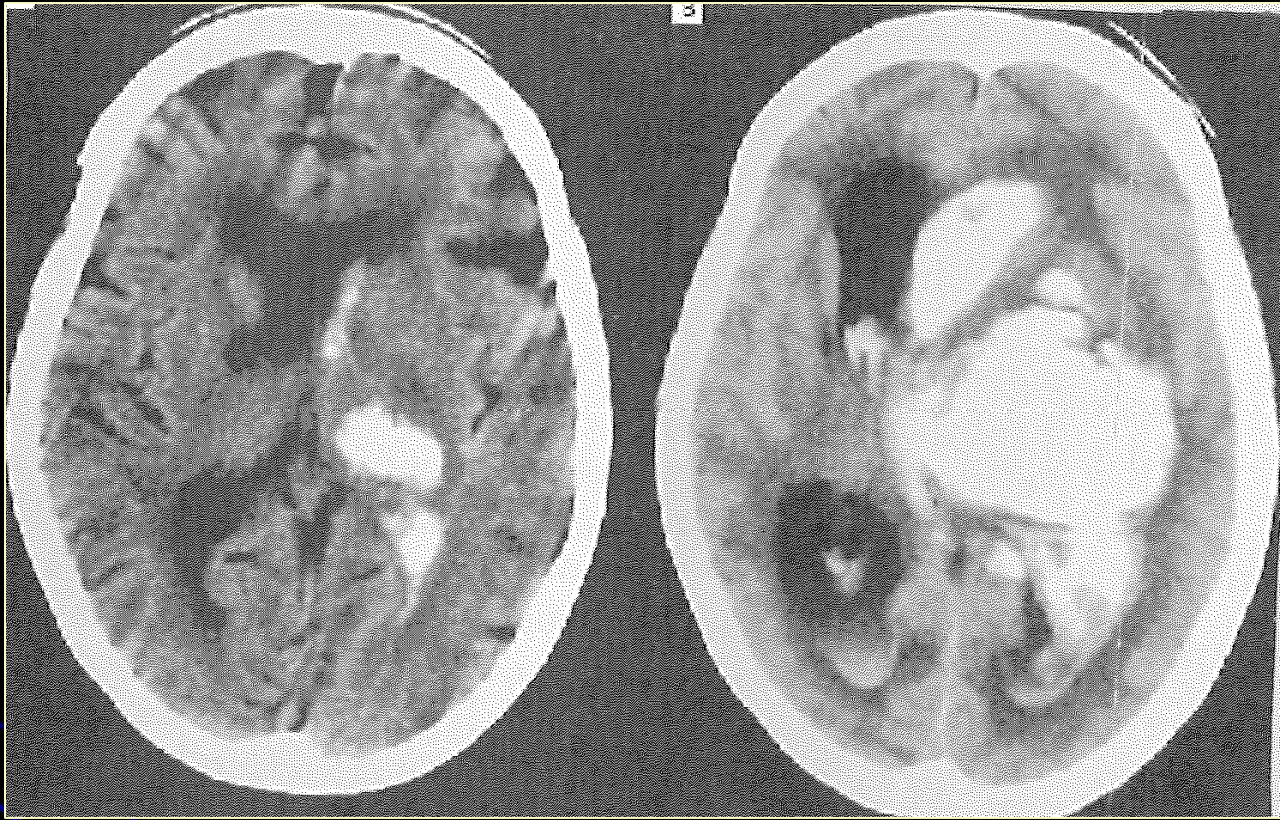
# ICH

## Reasons for Intubation

- Neurological deterioration
- Depressed consciousness
- Brain stem dysfunction
- Hypoxemia and hypercarbia
- Prior to hospital transport

# Neurointensive Care

- Monitor for hematoma expansion and change
- 30% enlarge by 30% in 3-4 hours (6 mls)
- Anticoagulated hemorrhage much worse
- Attempts at hemostatis (Factor VII, FAST TRIAL) Class II, Level B



# Etiology of HTN in ICH

- Maintain cerebral perfusion pressure in response to increased ICP pressure (cushing response)
- Chronic poorly controlled HTN
- Patient stopped blood pressure medications
- Stress and anxiety mediated
- Increase in brain natriuretic peptide (BNP)

# Reason to Treat Hypertension in ICH

- ? Is hypertension the cause or effect of hematoma enlargement
- Evidence suggests HTN may increase hematoma size also increase edema
- Extreme HTN may cause end organ damage

# Reasons to treat HTN in ICH

- Controlled blood pressure reduction (MAP) does not effect cerebral perfusion pressure and autoregulation
- Local autoregulation is preserved, no periclot ischemia
- Controlled lowering of blood pressure in ICH is considered safe

# General Approach to Lowering Blood Pressure in ICH

- Keep systolic blood pressure around 150mm and MAP around 110-120
- Treat elevated ICP if this is the driving force
- Preferred treatment regiments include:  
nicardipine and labetalol (no effect on ICP)
- Avoid vasodilators that may increase ICP  
(Nitrates, nitroprusside)
- Class II, Level C

**TABLE 2. Suggested Recommended Guidelines for Treating Elevated Blood Pressure in Spontaneous ICH**

1. If SBP is  $>200$  mm Hg or MAP is  $>150$  mm Hg, then consider aggressive reduction of blood pressure with continuous intravenous infusion, with frequent blood pressure monitoring every 5 minutes.
2. If SBP is  $>180$  mm Hg or MAP is  $>130$  mm Hg and there is evidence of or suspicion of elevated ICP, then consider monitoring ICP and reducing blood pressure using intermittent or continuous intravenous medications to keep cerebral perfusion pressure  $>60$  to 80 mm Hg.
3. If SBP is  $>180$  mm Hg or MAP is  $>130$  mm Hg and there is not evidence of or suspicion of elevated ICP, then consider a modest reduction of blood pressure (eg, MAP of 110 mm Hg or target blood pressure of 160/90 mm Hg) using intermittent or continuous intravenous medications to control blood pressure, and clinically reexamine the patient every 15 minutes.

SBP indicates systolic blood pressure; MAP, mean arterial pressure.

**TABLE 3. Intravenous Medications That May Be Considered for Control of Elevated Blood Pressure in Patients With ICH**

Drug	Intravenous Bolus Dose	Continuous Infusion Rate
Labetalol	5 to 20 mg every 15 min	2 mg/min (maximum 300 mg/d)
Nicardipine	NA	5 to 15 mg/h
Esmolol	250 $\mu\text{g}/\text{kg}$ IVP loading dose	25 to 300 $\mu\text{g} \cdot \text{kg}^{-1} \cdot \text{min}^{-1}$
Enalapril	1.25 to 5 mg IVP every 6 h*	NA
Hydralazine	5 to 20 mg IVP every 30 min	1.5 to 5 $\mu\text{g} \cdot \text{kg}^{-1} \cdot \text{min}^{-1}$
Nipride	NA	0.1 to 10 $\mu\text{g} \cdot \text{kg}^{-1} \cdot \text{min}^{-1}$
Nitroglycerin	NA	20 to 400 $\mu\text{g}/\text{min}$

IVP indicates intravenous push; NA, not applicable.

\*Because of the risk of precipitous blood pressure lowering, the enalapril first test dose should be 0.625 mg.

# Agents to Treat HTN in ICH

- Labetalol
  - Avoid in acute heard failure
  - Bronchial astma
  - Bradycardia
  - Heart block
  
- Nicardipine
  - Tachycardia
  - Headache
  - Flushing
  - Phlebitis
  
- Nitroglycerine
- Nitroprusside
  - May increase ICP
  - (numerous)

# Intracranial Pressure Management

- Causes include mass effect, edema, hydrocephalus
- Raise head, mid position, avoid jugular compression
- Sedation and analgesia
- Maintain euvolemia, avoid hypo-osmolar fluids
- Osmotherapy- mannitol, hypertonic saline
- Controlled hyperventilation (CO<sub>2</sub> to 30-35)
- Neurosurgical evaluation (ICP monitor, ventriculostomy)
- Pentobarbitol, hypothermia
- Avoid steroids
- Class II, Level B

# Osmotherapy

- Mannitol 1-2g/kg followed by 0.25-0.5g/kg q4h. Osmolality to 300-320
- Hypertonic saline 3% 2ml/kg q 4h or 23% 30ml q 1-6 hrs.

# Neurosurgical intervention

- Cerebellar hemorrhage (3cm)
- Hydrocephalus
- Large non- dominant hemorrhage (lobar)
- STITCH Trials
- New Trials

# Fever Management

- Elevated core temperature common
- Intraventricular hemorrhage (90%)
- Predictor of poor outcome
- Class I, Level C

# Hyperglycemia in ICH

- Worsen neurological outcome
- Exacerbates edema and neuro damage
- Tight management (80-110) may improve outcome
- Class II, Level C

# Seizures and ICH

- 30 day risk 8%
- EEG demonstrates non-convulsive seizures in 28% of patients in coma
- Lobar locations are at high risk
- Prophylactic treatment uncertain, Class II Level C
- Consider Rx anticonvulsant for large supratentorial bleed or lobar bleed

# Prevent Complications

- Aspiration
- DVT prophylaxis
- GI prophylaxis
- Early nutrition
- Early rehabilitation

# Management of the Anticoagulated related ICH

- Increased incidence with increase usage of anticoagulants
- Risks: age, prior CVA, amyloid angiopathy, HTN, excessive anticoagulation
- Hematoma expansion more common over longer period
- Mortality rates in excess of 50%

# Warfarin-Associated ICH

- Fresh Frozen Plasma- 15 ml/kg, 4-6 units, watch for volume overload, hours to normalize INR, viral risk, allergy, pulmonary Edema

Or - prothrombin complex concentrate 15-30u/kg, watch for DIC, thrombotic events,

Class II, Level B

And - vitamin K 10mg IV or SQ may take 1 day to normalize INR

- Factor VII 20-30 ug/Kg and may cause thromboembolic disease

# Heparin Associated ICH

## Protamine Sulfate

1mg per 100 units/heparin OR 1mg of enoxaprin  
flushing, bradycardia, hypotension, anaphylaxis

## Platelet Dysfunction and Thrombocytopenia

Platelet transfusion 5-10 units

Volume overload and transfusion reaction

## Thrombolytic Therapy – Associated

Cryoprecipitate 6-8 units

Platelet transfusion

# When to Restart Anticoagulation after ICH

- Depends on risks of future arterial OR venous thromboembolism
- i.e. Afib no prior CVA-low risk of rebleed
- i.e. amyloid- high risk of rebleed
- i.e. mechanical heart valve – high risk
- i.e. Afib with prior CVA- high risk