

Guidelines: EVD Placement for Acute ICH

Indications:

- Enlarged ventricles, +/- IVH
- Age < 80
- GCS Motor - flexor posturing or better)

Exclusions:

- ICH volume > 100cc
- Bilateral fixed unreactive pupils
- Age ≥ 80
- Brainstem ICH
- Prior poor health including dementia,
- stroke or weakness, life expectancy < 1 year, or an advanced directive

Surgical considerations, technique

- Standard frontal ventriculostomy with tunneling

Guidelines:

Hemicraniectomy for Ischemic Stroke

Indications (both):

- *developing malignant MCA syndrome as defined by Stroke team attending or fellow, AND*
- *Age \leq 60 years*

Exclusions (ANY):

- *Premorbid MRS $>$ 3*
- *advanced herniation (dilated pupils, loss of brainstem reflexes)*
- *Life expectancy $<$ 3 years or serious co-morbidities*
- *Known coagulopathy (INR must be \leq 1.4)*

Guidelines:

Hemicraniectomy for Ischemic Stroke

Surgical considerations, technique:

- For eligible patients:
 1. NSGY consulted within 24 hours
 2. Surgery done within 48 hours if:
 - a. Clinical: lethargy or worsening neurologic status
 - b. radiologic:
 - (1) $\geq 50\%$ of MCA territory is hypodense within 5 hours of ictus
 - (2) Complete MCA territory hypodense within 48 hours of ictus
 - (3) Midline shift >7 mm septal or >4 mm pineal
 3. Standard technique – large hemispheric decompression with dural opening
- Exceptional patients on individual case basis (i.e. late deterioration beyond 48 hours, age >60) as mutual decision between neurosurgery and stroke neurology:
- Post-operative ICP monitoring NOT mandated
- Surgically decompressed patients will not undergo another procedure in case of neuro worsening (i.e. NO lobectomies, expansion of hemicraniectomy, etc.)

Guidelines: ICH Management (by location)

1. Deep ICH

Indications (all of the factors below):

- Admission GCS 12-15 with later deterioration
- Age \leq 60 years
- ICH volume 20 - 70 cc with mass effect

Exclusions (any one of the factors below):

- Coagulopathy
- Admission GCS \leq 8
- Premorbid MRS >3
- Life expectancy <1 year

Guidelines: ICH Management (by location)

1. Deep ICH (cont.)

Surgical considerations, technique:

- **ALL PATIENTS SHOULD BE ADMITTED TO THE STROKE SERVICE**
- Once patient meets criteria, surgery should occur immediately
- Surgical technique: decompressive craniectomy +/- clot evacuation depending on ICH location, surgeon preference, other considerations
- ICP monitoring as necessary for IVH

Guidelines:

ICH Management (by location)

2. Lobar ICH

Indications (all of the factors below):

- admission within 48 hours and deteriorating due to mass effect
- ICH volume >50 cc
- Admission GCS ≥ 9
- Age ≤ 65 years
- No involvement in another clinical trial protocol

Exclusions (any one of the factors below):

- Unmanageable coagulopathy
- imaging or tissue proven amyloid
- Premorbid mRS > 3 (cannot ambulate independently, bed bound)
- Life expectancy <1 year
- Non-iatrogenic coma (GCS 3-5) > 1-2 hours

Guidelines: ICH Management (by location)

2. Lobar ICH (cont.)

Surgical considerations, technique:

- CTA prior to surgery to rule out AVM or aneurysm
- For eligible patients:
 1. Urgent intervention - stable patients
 2. Immediate intervention - deteriorating patients
- Exceptional patients on an individual case basis as a mutual decision between neurosurgery and stroke neurology
- Surgical technique: decompressive craniectomy +/- clot evacuation depending on ICH location, surgeon preference, other considerations

Guidelines: ICH Management (by location)

3. Anterior temporal ICH

Indications (all of the factors below):

- ICH volume > 30 cc
- Admission GCS \geq 9
- Age \leq 65

Exclusions (any one of the factors below):

- Unmanageable coagulopathy
- Premorbid mRS >3
- Life expectancy <1 year
- Comatose patient (GCS 3-5) for more than 1-2 hours

Guidelines: ICH Management (by location)

3. Anterior temporal ICH (cont.)

Surgical considerations, technique:

- CTA prior to surgery to rule out AVM or aneurysm
- Once patient meets criteria, surgery should occur immediately
- Temporal craniotomy including clot removal and anterior temporal lobectomy, incisural decompression +/- decompressive craniectomy

Guidelines: ICH Management (by location)

4. Cerebellar ICH

Indications (all of the factors below):

- Hematoma > 3 cm diameter
- Clinical and radiographic evidence of brainstem compression
- Decreasing level of consciousness

Exclusions (any one of the factors below):

- Coagulopathy
- Premorbid mRS >3
- Life expectancy <1 year
- GCS \leq 3 for more than 2 hours

Guidelines: ICH Management (by location)

4. Cerebellar ICH (cont.)

Surgical considerations, technique:

- CTA prior to surgery in some cases to rule out AVM or aneurysm
- Once patient meets criteria, surgery should occur immediately
- Suboccipital craniectomy with wide foramen magnum decompression including C1 arch, combined with patch duroplasty

Guidelines: ICH Management (by location)

The primary purpose of surgery for patients with deep ICH is to prevent death from mass effect and increased ICP. Patients with putaminal or thalamic ICH are poor surgical candidates. No surgery is indicated for HTN - related brainstem hemorrhage.

If Warfarin-Related and patient is surgical candidate, goal is to make INR normal ASAP:

- Standard treatment - Vitamin K and FFP
- Activated factor VII (Novo-seven) 40 µg/kg
 - Use if patient needs OR immediately
 - No contraindications
 - Repeat 1-2 times as needed