Special Section: Guidelines for the MANAGEMENT OF ANEURYSMAL SUBARACHNOID HEMORRHAGE
I. DIAGNOSIS OF SUBARACHNOID HEMORRHAGE (SAH)
Clinical – may present with sudden, severe headache (thunderclap headache), loss of consciousness or adult-onset seizures.
Neurological examination – signs of meningeal irritation (i.e., neck rigidity), altered or decreased level of consciousness, CN III or VI nerve palsy. Patients may or may not have focal neurological deficits
Emergent referral to a neurologist/neurosurgeon and transfer to a facility with capabilities of managing acute stroke are recommended.

II. NEURODIAGNOSTIC EXAMINATIONS
1. Non-contrast cranial CT scan should be done and interpreted immediately. Hyperdense blood in the basal cisterns is usually diagnostic, but parenchymal clot in the temporal or basal frontal, and intraventricular hemorrhage are also suggestive of an underlying aneurysm.

2. Lumbar tap with CSF analysis in the absence of focal neurological signs is an option in the following cases:
   - Cranial CT scan is negative
   - Cranial CT scan is unavailable
   - Special circumstances (e.g., issues with CT scan cost)
   Multiple specimens (at least 3 tubes) should be collected to rule out traumatic tap. Opening pressures should be measured.

3. Cerebral angiogram is the gold standard in determining the cause of SAH. Early angiography should be performed in all cases, whether poor- or good-grade SAH. If the initial angiogram is negative, a repeat angiogram should be performed after 2 weeks.

4. Good-quality CT angiogram and MR angiography are other options.

III. SAH GRADING
1. Hunt and Hess Classification is recommended for the clinical grading of SAH.

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<th>Grade</th>
<th>Description</th>
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<tr>
<td>1</td>
<td>Asymptomatic, or mild headache, slight nuchal rigidity</td>
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<tr>
<td>2</td>
<td>Moderate to severe headache, nuchal rigidity, no neurologic deficit other than cranial nerve palsy</td>
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<tr>
<td>3</td>
<td>Drowsiness, confusion, or mild focal signs</td>
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<tr>
<td>4</td>
<td>Stupor, moderate to severe hemiparesis, possibly early</td>
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2. Fisher grading may be used as a guide in considering therapeutic options.

**Table 10: Fisher Grading**

<table>
<thead>
<tr>
<th>Grade</th>
<th>Description (Blood on CT)</th>
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<tr>
<td>1</td>
<td>No subarachnoid blood detected</td>
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<tr>
<td>2</td>
<td>Diffuse or vertical layers &lt; 1 mm thick*</td>
</tr>
<tr>
<td>3</td>
<td>Localized clot or vertical layer &gt; 1 mm thick*</td>
</tr>
<tr>
<td>4</td>
<td>Intracerebral or intraventricular clot with diffuse or no SAH</td>
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**“Vertical layer” refers to blood in the subarachnoid spaces including in the interhemispheric fissure and cisterns**

IV. GENERAL SYMPTOMATIC TREATMENT
1. Absolute bed rest in a quiet, comfortable environment
2. Cardiac monitoring and frequent assessment of neuro-vital signs
3. Soft diet for alert patients, nasogastric-tube (NGT) feedings if with impaired consciousness
4. Analgesics, including opiates for headache. Avoid aspirin and other NSAIDs
5. Paracetamol and cooling blankets, if febrile
6. Maintenance of euglycemia
7. Sedatives, if agitated
8. Antiemetics, as needed for nausea and vomiting
9. Stool softeners

V. EARLY SPECIFIC TREATMENT
1. Nimodipine: A systematic review showed a significant reduction in poor outcomes with calcium antagonists for SAH. The evidence rests mainly on one large trial with oral nimodipine. It is uncertain whether nimodipine acts through neuroprotection or through reduction of the frequency of vasospasm, or both. Nimodipine 60 mg every 4 hours by mouth or NGT for 3 weeks is recommended.
2. Anticonvulsants: Short-term anticonvulsants are recommended for patients with documented seizures in the acute phase of SAH. Although no randomized trial has proven that prophylactic anticonvulsants in SAH is effective, they can be considered in patients with significant cortical damage, thick cisternal clot, parenchymal hemorrhage, or those in coma. Phenytoin is the recommended anticonvulsant, given as a 15 mg/kg IV loading dose followed by 3 to 5 mg/kg/day in divided doses.
3. Steroids: Corticosteroids have no proven role and are not recommended for use in SAH.
4. Antifibrinolytic agents are not recommended. Although they reduce the risk of rebleeding, they are associated with a higher rate of cerebral ischemia.
5. Manage increased ICP
6. BP management: Although the best antihypertensive agent and BP remains unsettled, IV nicardipine to a target SBP<150 in the pre-operative phase is reasonable.

VI. PREVENTION AND MANAGEMENT OF VASOSPASM
1. Monitoring: Serial transcranial Doppler (TCD) is recommended for the diagnosis and monitoring of vasospasm.
2. Maintenance of euvolemia: Evidence on the use of blood volume expansion alone or in combination with induced hypertension and hemodilution (triple H therapy) in the prophylaxis and management of secondary ischemia (vasospasm) following aneurysmal SAH is lacking.
3. Endovascular angioplasty (chemical +/- mechanical) is an effective way of managing vasospasm. Intervention has to be early before clinical signs suggesting irreversible infarction (i.e., hemiplegia) are present.
4. Treatment strategies undergoing current investigation include intravenous magnesium sulfate and statins.

VII. TREATMENT OF SAH
Excluding the aneurysm from the circulation is the main goal of treatment. Obliteration the aneurysm can be achieved through surgical clipping or endovascular coiling.

VIII. TIMING OF SURGERY
1. Definitions:
   Early surgery is surgery performed within 72 hours from ictus
   Late surgery is surgery performed more than 3 days from ictus.
2. Indications:
   a. Early, immediate surgery is recommended for good- to moderate-grade (Hunt and Hess I-III) aneurysmal SAH patients to minimize the chance of a devastating rebleed.
   b. For poor grade patients (Grade IV-V), early surgery is recommended in the presence of:
      – Hematoma
      – Hydrocephalus

Surgery may be delayed in the presence of:
   – Ischemia or infarction
   – Severe angiographic vasospasm
Casted ventricles
Diffuse SAH (Fisher Grade III) Complex aneurysm on angiography.

c. A maximum cut-off age for early surgical management (for the elderly) is not recommended in the absence of organ failure.

IX. COILING
1. Can be performed early in both good- and poor-grade patients.
2. Reduces the rebleed rate for poor-grade patients who would otherwise be treated conservatively.
3. Vasospasm is not a contraindication and can be dealt with endovascularly during coiling
4. Can be performed under local anesthesia if needed.

X. WHERE TO ADMIT
SAH patients should be admitted at the Stroke Unit or Intensive Care Unit. In the absence of an ASU/ICU, patients may be placed in a quiet, regular room with very close monitoring.

XI. NURSING ISSUES:
SOLICITUDE, THOUGHTFULNESS, PROTECTIVENESS
1. Acute Phase
   a. Care must be exercised to prevent further ICP increase
   b. There should be close monitoring of fluid status and for possible secondary cardiac, respiratory or metabolic insults.
   c. Persistent headache, deteriorating level of consciousness, other signs of increased ICP and development of focal neurological deficits should be recognized for urgent referral to a neurologist or neurosurgeon.

2. Convalescent Phase
   a. Presence of sensory or perceptual alterations, motor deficits, and impaired verbal communication and physical mobility should be addressed in nursing care.
   b. Feelings of depression should be monitored. Emotional support and encouragement should be provided.
   c. Upon discharge, patients and relatives should be educated on continuity of care, medication intake and follow-up

XII. REHABILITATION
1. Supportive rehabilitation is done initially in the pre-operative phase.
Early rehabilitation is recommended for all SAH patients in the post-operative period.

**Bibliography**


