

## Review Article

### Management of Aneurysmal Subarachnoid Hemorrhage: A Brief Outline of The Present Guidelines

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#### Abstract

Aneurysmal subarachnoid hemorrhage is one of the significant causes of major morbidity and mortality throughout the world. Early diagnosis and management have considerably reduced the mortality. American Heart Association and American Stroke Association have recently compiled the guidelines for the management of aneurysmal subarachnoid hemorrhage. This article gives a brief overview on the management of aneurysmal subarachnoid hemorrhage, based on the above guidelines.

**Key Words:** Aneurysms, subarachnoid hemorrhage, management of aneurysms

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#### Introduction

Aneurysmal subarachnoid hemorrhage (aSAH) is a common cerebro-vascular problem, presenting acutely, with often devastating sequelae. Early diagnosis and management are imperative to reduce the mortality. Advances in the diagnostic modalities, improved surgical techniques and endovascular procedures have resulted in significant reduction in mortality in aSAH. In many countries, aSAH is regarded as a major public health problem and this has resulted in increased awareness among the healthcare professionals. It is essential that every medical professional is aware of this problem and principles in the management. Recently, American Heart Association and American Stroke Association have compiled the present day recommendations in the management of aSAH in the form of guidelines, based on literature search and metaanalysis<sup>1,2,3</sup>. A brief outline of management of aSAH based on these guidelines is discussed in the following.

#### Risk Factors and Prevention of aSAH

Hypertension is considered as a major risk factor in the development of aneurysm and aSAH. Treatment of hypertension and consumption of vegetable rich diet may reduce the risk of aSAH. Tobacco and alcohol consumption are known risk factors of aSAH.

#### Natural History and Outcome of aSAH

The clinical grading systems proposed by Hunt and Hess and World Federation of Neurological Surgeons (WFNS) provide accurate determination of severity of

aSAH and they also help in planning treatment and predicting outcome. Since the risk of rebleeding in the first 24 hours and in the first week is very high, urgent evaluation and management of aSAH is recommended.

#### Clinical Manifestations and Diagnosis of aSAH

Any patient presenting with acute onset severe headache ("thunderclap" headache) should be suspected to be having aSAH and all measures are to be undertaken to diagnose/exclude aSAH in these patients. Diagnostic workup should include noncontrast CT scan. Lumbar puncture is indicated when the CT is non-diagnostic. 64 slice CT angiography (CTA) may be used for the diagnostic work up of aneurysm and planning treatment. When CTA is inconclusive, Digital Subtraction Angiography (DSA) is recommended. Fluid-attenuated inversion recovery (FLAIR), proton density and diffusion-weighted MRI may be used for the diagnosis of aSAH when the CT scan is negative. DSA with 3-dimensional rotational angiography is the gold standard and indicated for detection of aneurysm in patients with aSAH and for planning treatment, except when the aneurysm has already been diagnosed with a non-invasive angiogram.

#### Medical Measures to Prevent Rebleeding After aSAH

The blood pressure should be controlled with titratable agent to keep the systolic pressure <160 mm Hg to prevent the risk of rebleeding, stroke and to maintain the cerebral perfusion. Short term use for less than 72

hours, of tranexamic acid or aminocaproic acid may be considered to prevent the risk of early aneurysm rebleeding, when there is unavoidable delay in the definitive management of aneurysms.

## Surgical and Endovascular Methods for Treatment of Ruptured Cerebral Aneurysms

Measures to obliterate aneurysms (clipping or coiling) should be undertaken as early as possible to prevent rebleeding after aSAH. A multidisciplinary approach involving both cerebrovascular surgeons and endovascular specialists, is required for planning the treatment of aneurysms based on the patient factors and the anatomy. If the aneurysm is equally amenable to neurosurgical clipping and endovascular coiling, then coiling should be considered. In patients presenting with large (>50 ml) intraparenchymal hematomas and middle cerebral artery aneurysms, neurosurgical clipping is preferred. In the old patients (>70 years of age), in those presenting with poor-grade (WFNS grade IV and V) aSAH, and in those with aneurysms of the basilar apex, endovascular coiling is preferable. Stenting of a ruptured aneurysm is associated with increased morbidity and mortality, and should only be considered when less risky options have been excluded.

## Management of Cerebral Vasospasm and Delayed Cerebral Ischemia after aSAH

Oral nimodipine has been shown to improve neurological outcome and is strongly recommended in aSAH. Maintenance of euvolemia is recommended to prevent delayed cerebral ischemia (DCI) in contrast to the earlier recommendation of triple H therapy (hypervolemia). Use of the other agents like statins, endothelin-1 antagonists (clazosentan), magnesium sulphate, etc., has not found much favour. Prophylactic balloon angioplasty before the development of vasospasm is not recommended. Transcranial Doppler for monitoring the development of vasospasm, perfusion imaging with CT or MRI to identify the regions of potential brain ischemia may be used. Induction of hypertension (triple H therapy) is recommended in patients with DCI, unless the blood pressure is already elevated or the cardiac status is a contraindication. Cerebral angioplasty and/or intra-arterial vasodilator therapy is indicated in patients with symptomatic vasospasm not responding to hypertensive therapy.

## Management of Hydrocephalus associated with aSAH

Acute symptomatic hydrocephalus is managed by external ventricular drainage (EVD) or lumbar drainage depending on the clinical picture. Chronic symptomatic hydrocephalus should be treated by shunting. Routine fenestration of lamina terminalis has no value in preventing hydrocephalus and is not recommended.

## Management of Seizures Associated With aSAH

Use of prophylactic anticonvulsants is recommended in the acute phase of aSAH and in the long-term for patients with prior seizure, intracerebral hematoma, infarction, middle cerebral artery aneurysm, etc.

## Management of Medical Complications Associated With aSAH

Hyponatremia is a very common condition after aSAH, commonly due to cerebral salt wasting syndrome and this affects the outcome adversely. The use of hypertonic saline and fludrocortisone is recommended in the management of hyponatremia. Avoidance of hypoglycemia and aggressive control of fever in the acute phase aSAH is advocated.

## Conclusions

The management of aSAH is complex and involves multi-disciplinary approach. The knowledge about pathophysiology and management are continuously evolving and requires periodic updating.

## References

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