

A Proposed Grading System for Assessment of Post-Surgical Hydrocephalus Risk in Microsurgically Treated Aneurysm Patients

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Introduction

A debilitating complication following microsurgical treatment of aneurysms is the development of post-surgical hydrocephalus. It is often difficult to predict which patients will suffer this post-operative complication. In this study, we identified risk factors for the development of postsurgical hydrocephalus and propose a grading system for identifying patients at high risk.

Methods

Solitary aneurysms microsurgically treated by the senior author (M.T.L.) were included from a database of patients treated between January 2010-April 2013 at a tertiary academic medical center. Follow-up on patients was performed up to 1 year after surgery.

Results

A total 353 patients were included in the study. Post-surgical hydrocephalus occurred in 7.1% (25/353) of patients; 17 (68%) of whom were identified before discharge, 5 (20%) at one-month follow-up, 1 (4%) at 6 months, and 2 (8%) at 1-year. Mean follow-up time was 2.5 months. Hydrocephalus occurred in a significantly greater proportion of patients who presented with a blood WBC =15,000 at presentation (41.7% vs. 11.8%, p-value=<.001), presented in poor neurologic status (64% vs. 18.9%, p-value=<.001), experienced post-operative vasospasm (60% vs. 25.7%, p-value=<.001), and had a HH score =2 (80% vs. 40.4%, p-value=.001); hypertension trended towards significance (76% vs. 55.9%, p-value=.05).

We devised a risk-point based grading system; Poor neurologic status at presentation (+3 Points), HH =2 (+3 Points), blood WBC=15,000 (+2 Points), vasospasm (+1 Point), and hypertension (+1). In the Low-Risk Grade group (Points <8), 3.9% (12/307) developed hydrocephalus, while in the High-Risk Grade (=8 Points) 28.3% (13/46) did (p-value=<.001). Using logistic regression, the High-Risk group was 9.68x more likely to suffer from hydrocephalus (p-value=<.001, AUROC=.71).

Table 1

Patient Summary	Number (%)
Number of Patients	353
Mean Age (years)	57.1
Age Range	5 - 89
Sex (Females)	264 (74.8)
HTN	200 (57.3)
Diabetes	37 (10.6)
Tobacco Use	154 (45.7)
Presented with a Subarachnoid Hemorrhage	159 (45.0)
Hunt and Hess Grade	
0	191 (54.7)
I	7 (2)
II	71 (20.3)
III	33 (9.5)
IV	25 (7.2)
V	22 (6.3)
Mean Aneurysm Size (mm)	7.5
Range (mm)	1.2 - 60
Large Aneurysm (>10 mm)	69 (20.7)
Location	
MCA	76 (22)
ACoM	78 (22.6)
PCoM	52 (15.1)
Basilar	24 (7)
Posterior Inferior Cerebellar Artery	15 (4.4)
Supraclinoid Internal Carotid Artery	27
Ophthalmic	21 (6.1)
Other	52 (15.1)
Posterior Circulation	56 (16.2)

Patient Summary

Conclusions

Our purposed grading system indicates almost 1 in 3 patients categorized as 'High Risk' will experience this post-operative complication up to 1-year after treatment. Future, prospective data is needed to validate the reliability of this grading system.

Learning Objectives

By the conclusion of this session, participants should be able to 1) identify risk factors associated with post-surgical hydrocephalus in patients treated with microsurgical clipping and 2) to be able to more quickly identify patients at risk for developing this complication.