



INTRODUCTION

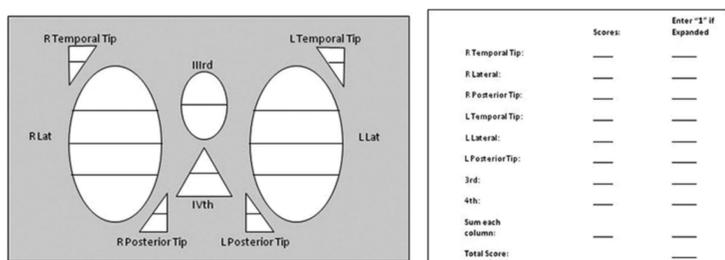
Subarachnoid haemorrhage (SAH) often bears a grim diagnosis with high rates of morbidity and mortality. Some aspects of the pathophysiology and subtle intricacies in its management remains inscrutable. In the emergent setting, SAH is commonly managed with external ventricular drain (EVD) insertion for monitoring and treatment of elevated intracranial pressure. Multiple EVDs could theoretically be inserted for increased drainage potential. However, the efficacy of such a practice has been less well described in current literature. Intraventricular haemorrhage (IVH) can also accompany aneurysmal ruptures, lending more complexity to management.

In clinical practice, there is universal acceptance of the usage of neurological status and features within the initial CT scan as a prognostic indicator for SAH. Examples include the modified Fisher Scale or the World Federation of Neurosurgical Societies grading systems.

The extent of aneurysmal IVH has been shown to be associated with more complications and poorer outcomes in SAH¹. The degree of resultant disability and mortality is often measured using the modified Rankin Scale (mRS, Table 1). A reliable way of quantifying the extent of IVH can be obtained using the modified Graeb Score (mGS, Fig 1). It is a semiquantitative scale for IVH volume measurement used in clinical practice and research as a quick and reliable prognostic tool.

Grade	Modified Rankin Score
0	No symptoms at all
1	No significant disability: despite symptoms, able to carry out all usual duties and activities
2	Slight disability: unable to perform all previous activities but able to look after own affairs without assistance
3	Moderate disability: requiring some help but able to walk without assistance
4	Moderately severe disability: unable to walk without assistance and unable to attend to own bodily needs without assistance
5	Severe disability: bedridden, incontinent and requiring constant nursing care and attention
6	Death

Table 1 Modified Rankin Scale (mRS) is used to measure the degree of disability in patients who have had a stroke



Scores for each ventricle

% of blood	R Temp Tip	R Lateral	R Post Tip	L Temp Tip	L Lateral	L Post Tip	Illrd	IVth
None	0	0	0	0	0	0	0	0
≤25%	1	1	1	1	1	1	2	2
>25% to ≤50%	1	2	1	1	2	1	2	2
>50% to ≤75%	2	3	2	2	3	2	4	4
>75% to 100%	2	4	2	2	4	2	4	4
Expanded	1	1	1	1	1	1	1	1

Figure 1 The Modified Graeb Score (mGS); items are scored by presence of blood and hydrocephalus

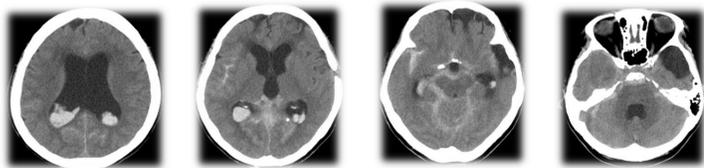


Figure 2 CT axial views of IVH in the lateral ventricles, occipital horns, temporal horns, third ventricles, and fourth ventricles

METHODOLOGY & OBJECTIVES

A retrospective review of 100 patients who had undergone catheter embolization after a diagnosis of SAH. Those with concurrent IVH were selected. A total of 37 cases were included.

Outcomes reported:

- ❖ Report on the cases where multiple EVDs were inserted
- ❖ To comment on likely predictors of poorer outcome
- ❖ Common complications of SAH with IVH
- ❖ Timing and rate of conversion to ventriculoperitoneal shunt

FINDINGS

CASE DESCRIPTIONS

Case 1

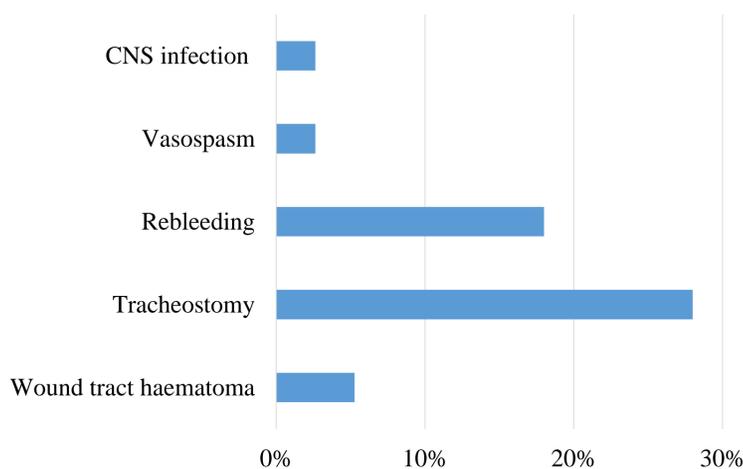
- ❖ M/43, mRS = 0 presented with headache + collapse
- ❖ CT angiogram showed R vertebral artery aneurysm
- ❖ CTB showed mGS = 11
- ❖ Right frontal EVD followed by stent insertion and embolization (index operation)
- ❖ EVD blockage post-op day 3
- ❖ Left frontal EVD inserted post-op day 4
- ❖ Removal of left EVD post-op day 10 (poor waveform)
- ❖ Right parietal VP shunt post-op day 210
- ❖ Removal of right EVD post-op day 214
- ❖ Total 174 days hospitalised
- ❖ mRS = 2 at 6 months, 5 at 12 months

Case 2

- ❖ F/65, known HTN, mRS = 0 presented with headache + dizziness + vomiting
- ❖ CTB showed mGS = 23
- ❖ Right frontal EVD insertion (index operation)
- ❖ Post-op day 2 posterior fossa haematoma with right PICA aneurysm same day clipping of aneurysm
- ❖ EVD blocked x 2, post-op day 4, 5; bilateral EVDs inserted, later removed post-op day 10
- ❖ Scalp MRSA abscess, requiring I&D
- ❖ VP shunt day 232 for hydrocephalus
- ❖ mRS = 3 at 6 months and 12 months
- ❖ Total 100 days hospitalised

The average age at diagnosis was 58 days. The number of multiple EVD insertions were n = 2, 0.5%. Of the 37 cases recorded, n = 11, 28% received VP shunts. The timing and rate of conversion to VP shunt was 98 days on average and 28% respectively. The average hospital stay was 71 days.

NOTABLE COMPLICATIONS



CONCLUSION

Multiple ventricular drains insertions are a rare occurrence in our local practice. In the two cases documented, multiple drains were inserted primarily for drain blockage and had other additional complications. Multiple EVD insertions did not appear to shorten the overall time of drain removal and shunt conversion.

It would be interesting to see if the placement of multiple drains prophylactically will prevent drain blockage; however this decision will have to be based on additional clinical parameters beyond the scope of this review

The majority of patients are first presentations with good past health and no prior known risk factors that are known predictors of poorer outcome (e.g. no hypertension, diabetes mellitus, history of stroke).

The most notable complications post EVD are tracheostomy for prolonged intubation and rupture aneurysm which resulted in rebleeding.

REFERENCES AND ACKNOWLEDGEMENTS

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1. Darkwah Oppong M, Gembruch O, Herten A, et al. Intraventricular Hemorrhage Caused by Subarachnoid Hemorrhage: Does the Severity Matter? World Neurosurg. 2018;111:e693-e702. doi:10.1016/J.WNEU.2017.12.148

