



Introduction:

Blood blister-like aneurysm (BBA) is relatively rare, accounting for 0.3%–1% of intracranial aneurysms and 0.9%–6.5% of aneurysms of the internal carotid artery (ICA). BBA is a hemispheric bulge protruding from non branching sites in the dorsal surface of the supraclinoid internal carotid artery. They are often of small size with a fragile wall, a poorly defined broad-based neck and generally present with a rupture resulting in a high volume subarachnoid haemorrhage and high risk of morbidity and mortality.

Given the characteristics of BBA, these aneurysms frequently pose a management challenge to cerebrovascular neurosurgeons and interventionalists. There are a multitude of divergent approaches to these lesions described in the literature, with no clear consensus on which strategies are most appropriate.

Methodology:

A systematic review was conducted using qualitative and quantitative methods for all articles published between 1980 and 2012. An initial literature search focused on these keywords: Ruptured blister aneurysm, blister aneurysm, ICA blister aneurysm, supraclinoid blister aneurysm, ruptured aneurysm, dissecting aneurysm and cerebral aneurysm. Indexes were hand searched to increase article yield. We excluded all papers with incomplete or incompatible individual level data. For the outcome, a simplifying assumption was made to permit the combination of outcome measures and we used Hunt and Hess (H and H) classification as the standard outcome.

Results:

Of the 309 patients available from the 35 selected papers, we had sufficient data to analyze 204 patients. The blister aneurysm management options were broadly subgrouped into four categories (Fig. 1) and (Table 1).

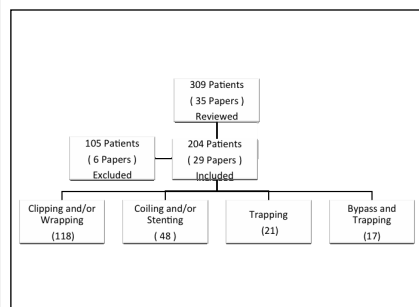


Fig 1: diagram demonstrating study design.

Clipping and/or Wrapping (118)	Clipping (65)	Wrapping with Clipping (46)	Wrapping (5)	Suturing (2)
Stenting and/or coiling (48)	Coiling (27)	Stenting (6)	Stenting with Coiling (15)	
Trapping (21)	Surgical Trapping (11)	Endovascular Trapping (10)		
Bypass and Trapping (17)	Bypass and Surgical Trapping (13)	Bypass and Endovascular Trapping (4)		

Table 1: illustrate blister aneurysm management options.

Patient demographics were typical for most of patients, the mean age was 52 years, the female to male ratio was 3 : 1 and the Right to Left ratio was 1 : 1 . Haemorrhage volumes were high as evidenced by the significant majority of Fisher 3 and 4 haemorrhages at 80%. As expected the rate of intraoperative and postoperative rupture were also high (30 % and 10 % respectively).

The clinical grade on presentation was also relatively poor compared with expected numbers for a cohort of subarachnoid haemorrhage patients receiving aneurysm repair.

Over two thirds were grade 3 or worse, while nearly half were grade 4 or 5. Despite this, many of the patients made reasonable recoveries, perhaps reflecting the bias inherent to self-reported case series. (Fig 2 and 3).

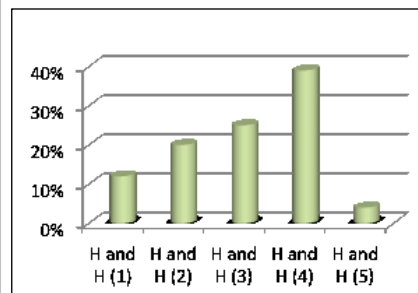


Fig 2: illustrate the clinical presentation

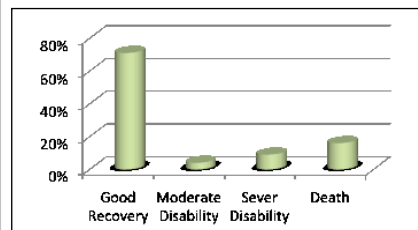


Fig 3: demonstrating the outcome

Relatively high rates of intraprocedural rupture occurred for all therapeutic approaches. Interventions involving direct surgical manipulation of the aneurysm (clipping or wrapping) had the highest rates, exceeding 30%.

Post-procedural rupture remained a significant concern for both open and endovascular procedures aiming at vessel preservation. Only trapping procedures eliminated the risk of post-procedural rupture,(Fig 4) .

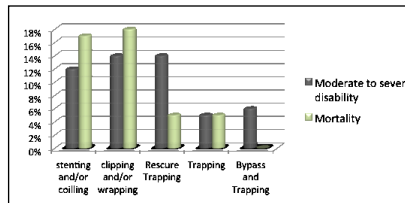


Fig 4: demonstrating the rate of intraprocedural and postprocedural rupture in all therapeutic options.

The rates of moderate to severe disability and mortality appear to be highest in procedures directed at surgical or endovascular vessel repair. There is no clear advantage between open or endovascular procedures aimed at preserving the parent vessel. Patients undergoing a trapping procedure with or without bypass, appear to have better overall outcomes. This is particularly true if one separates cases where trapping was used as a ‘rescue’ procedure.

In our results, the outcome for trapping and bypass are exceedingly favourable, and this is weighted by two studies showing extremely low complication rates. It should be noted that other papers, which did not meet the entry criteria for this study, do not support these results, (Fig 5).

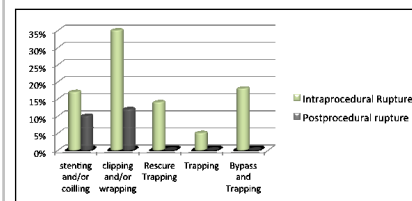


Fig 5 : illustrate the morbidity and mortality of all management options .

Conclusion:

We had numerous limitations in conducting this study, which attributed to the quality of the literature; we relied upon small self-reported series and most papers don't provide sufficient individual patient level data.

This study confirms the challenging nature of blister aneurysms of the internal carotid artery. These lesions result in relatively high grade and high volume haemorrhages. In addition, the pre- and post -procedural rupture rates are quite high.

Our study further confirms the need for better comparative studies looking at management options for these aneurysms.

Strategies using clipping or coiling to repair the aneurysm carry the highest risk of complication. Smaller studies suggest that trapping with or without bypasses may be a favorable alternative. Caution is needed, however, given the impact of vasospasm on these therapeutic approaches.

The relatively newer devices such as flow diverting stents have not yet been adequately analyzed.

References

1-Nancy McLaughlin, Mathieu Laroche, Michel W. Bojanowski, Surgical Management of Blood Blister-like Aneurysms of the Internal Carotid Artery, world neurosurgery, 74 [4/5]: 483-493, OCTOBER/NOVEMBER 2010.
 2-Koji Kamijo, M.D., and Toru Matsui, M.D., D.M.Sc. Acute extracranial-intracranial bypass using a radial artery graft along with trapping of a ruptured blood blister-like aneurysm of the internal carotid artery, J Neurosurgery / Volume 113 / October 2010.
 3- Mustafa K. Bas, Kaya, M.D., Azam S. Ahmad, M.D., Özkan Ates, M.D. and David Niemann, M.D, Surgical treatment of blood blister-like aneurysms of the supraclinoid internal carotid artery with extracranial-intracranial bypass and trapping, Neurosurgery Focus 24 (2):E13, 2008.