

## IS THE CLINICAL PRESENTATION OF THE RUPTURED ANEURYSM ARE DIFFERENT FROM THE UNRUPTURED ANEURYSM – A PROSPECTIVE STUDY

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### Abstract

**Background:** An aneurysm was defined as an abnormal focal bulge or diffuse swelling of the blood vessel wall. It can involve any part of the circulatory system and can be potentially fatal if it ruptures. The incidence of IA is 3–5% in the population. Ruptured and unruptured aneurysms present with varied clinical presentations. Most patients with unruptured IA [UIA] are clinically asymptomatic or present with nonspecific symptoms. The most common presentation of a ruptured aneurysm is thunderclap headache. This study aimed to determine the differences between the clinical characteristics of RIA and UIA in an Indian subset of the population. **Aim:** To find a difference in clinical characteristics difference between ruptured and unruptured intracranial aneurysms at the time of presentation. **Material & Methods:** The present prospective observational descriptive study was conducted in Tamil Nadu Government Multi Super Specialty Hospital, Chennai, for a period of 9 months. All patients who visited the hospital with imaging features of intracranial aneurysm during the study period and met the inclusion and exclusion criteria for the study period were included in the study. **Results:** ??? **Conclusion:** The mean age of the ruptured group was lower than that of the unruptured group. The time interval between the onset of symptoms and presentation was significantly longer in the unruptured group than in the ruptured group. The mean GCS at the time of presentation to the department is nearly the same in both groups.

## INTRODUCTION

An aneurysm was defined as an abnormal focal bulge or diffuse swelling of the blood vessel wall. It can involve any part of the circulatory system and is potentially fatal if it ruptures.<sup>[1]</sup> Aneurysms can also occur in intracranial circulation [Intracranial Aneurysm-IA]. The incidence of IA is 3–5% in the population.<sup>[2]</sup> The prevalence is approximately 0.4% and 3.6% in retrospective and prospective autopsy studies and 3.7% and 6.0% in retrospective and prospective angiographic studies, respectively.<sup>[3]</sup> There are four main types of IA: saccular, fusiform, dissecting, and mycotic. Of these, 70% were single, 85% occurred around the circle of Willis, and 90% were saccular.<sup>[3]</sup> They can remain stable, grow slowly over time, or rupture at any time. Ruptured

aneurysms can cause significant morbidity and mortality in patients.

Most patients with unruptured IA [UIA] are clinically asymptomatic or present with nonspecific symptoms. The most common clinical presentations of unruptured IA [UIA] are headaches, vertigo, and cognitive and visual disturbances.<sup>[4]</sup> Other rare symptoms include limb weakness and cranial nerve deficits.<sup>[5]</sup> The clinical features of ruptured IA [RIA] are sudden, severe, and worst headache, vomiting, loss of consciousness, hemiparesis, meningeal irritation, and seizure.<sup>[6,7]</sup>

This study aimed to determine the differences between the clinical characteristics of RIA and UIA in an Indian subset of the population.

### Aim

To identify differences in clinical characteristics between ruptured and unruptured intracranial

aneurysms at the time of presentation to the interventional radiology department of a tertiary government hospital.

## MATERIALS AND METHODS

The present study is a prospective observational descriptive study conducted in Tamil Nadu Government Multi Super Specialty Hospital, Chennai, for a period of 9 months. All patients who visited the hospital with imaging features of intracranial aneurysm during the study period met the inclusion and exclusion criteria for a period of 9 months. The sample sizes were 30 cases of RIA and 30 cases of UIA. Non-probability convenience sampling was performed.

The inclusion criteria are Patients with a CT/CT angiogram or MRI/MRA imaging diagnosis of an intracranial aneurysm. The exclusion criteria were as follows: 1. DSA shows features of multiple aneurysms. 3. All non-saccular, fusiform,

thrombosed, or dissecting aneurysms 4. The patient was unwilling to participate in this study. Ethical committee clearance was obtained from the Institutional Ethical Committee on 28 September 2022. Informed Consent was obtained from the patients or their relatives using the bilingual consent form.

The presenting complaints of the patient, such as headache, seizure, and LOC, were noted. A history of aneurysms present in families within the first-degree relatives was previously noted. of hypertension, diabetes mellitus, ischaemic heart disease, and seizure disorder were also noted.

The Modified Fisher Scale (mFS) was used for grading subarachnoid haemorrhage (SAH) in the initial plain CT brain taken after IA rupture. Both ruptured and unruptured patients were clinically classified at the time of presentation by Hunt-Hess grading and using the standard Glasgow Coma Scale (GCS).

**Table 1: Modified Fisher Scale (mFS)**

Grade	CT features
1	Focal or diffuse thin SAH with no IVH
2	Focal or diffuse thin SAH with IVH
3	Focal or diffuse thick SAH with IVH
4	Focal or diffuse thick SAH with IVH

**Table 2: Hunt Hess grade**

Grade	Clinical Presentation
0	Aneurysm not ruptured
1	Asymptomatic with minimal headache and slight nuchal rigidity
2	Moderate to severe headache, nuchal rigidity, no neurological deficit other than cranial nerve palsy
3	Somnolence, confusion, and focal defects
4	Stupor, hemiparesis, early decerebrate rigidity, vegetative disturbance.
5.	Deep coma, decerebrate rigidity, and moribund appearance

In this study, qualitative data, encompassing variables such as aneurysm status, sex, education, and clinical presentation, were analyzed using the chi-square test or Fisher's exact test, with continuity correction for  $2 \times 2$  tables. Ordinal data, like the Hunt Hess grade, were expressed as mean  $\pm$  SD and median with IQR. Quantitative data, including age, aneurysm dimensions, and morphological features, were presented as mean  $\pm$  SD or median with IQR. Statistical comparisons between ruptured and unruptured aneurysms were conducted using either the unpaired t-test for normally distributed data or the Mann-Whitney U test for non-normally distributed data, as determined by the Shapiro-Wilk test.

## RESULTS

In the ruptured group, the mean age was  $48.5 \pm 8.6$  years, which was less than that in the unruptured group,  $51.6 \pm 15.2$  years. However, the difference was not statistically significant. The minimum and maximum ages in the ruptured group were 23 and 66 years, respectively, while those in the unruptured group were 6 and 84 years, respectively.

The time interval between the onset of symptoms and presentation to the department is  $9.6 \text{ days} \pm 8.6$  days in the ruptured group and  $220 \text{ days} \pm 479.1$  days in the unruptured group. The difference in the time interval between the onset of symptoms and presentation was statistically significant between the two groups. The mean GCS score at the time of presentation to the department was nearly the same in both groups: ruptured (14.7) and unruptured (14.8). The mean Hunt Hess scale and Modified Fischer scale (mFS) scores in the ruptured group were  $1.300 \pm 0.535$  and  $1.867 \pm 1.279$ , respectively. [Table 3]

65% of the total study population belonged to the 40–59 years age group. Two-thirds of the patients in the ruptured group belonged to this age group, whereas less than 50% of the patients in the unruptured group were in the same age group.

Headache was present in 96.7% of the patients in the ruptured group and absent in 50.0% of those in the unruptured group. There was a statistically significant difference in the presence of headaches between the ruptured and unruptured groups. Vomiting was present in 43.3% of the patients in the ruptured group and absent in 86.7% of those in the

unruptured group. There was a statistically significant difference in the presence of vomiting between the ruptured and unruptured groups. A brief period of loss of consciousness (LOC) was present in 13.3% of the patients in the ruptured group and absent in 100% of those in the unruptured study group. There was no statistically significant difference between the ruptured and unruptured groups in the presence of loss of consciousness. Ocular symptoms, either in the form of gaze palsy or visual impairment, were present in 33.3% of the patients in the unruptured group and absent in 100% of those in the ruptured study group. There was a statistically significant difference in the presence of

ocular symptoms between the ruptured and unruptured groups. Giddiness was present in 46.7% of the patients in the ruptured group and absent in 83.3% of those in the unruptured group. There was a statistically significant difference in the presence of giddiness between the ruptured and unruptured groups.

Transient ischaemic attack (TIA) or stroke was present in 10% and 100% of patients in the unruptured and ruptured study groups, respectively. There was no statistical difference between the ruptured and unruptured groups in terms of history of stroke or TIA. [Tabl3 4]

**Table 2:**

Clinico-Demographic Variable	Ruptured Group	Unruptured Group	p-Value
Age	48.567±8.653	51.667±15.280	0.338
Duration of presentation in days	9.667±8.656	220.967±479.119	<0.0001
GCS	14.767±0.935	14.800±1.095	0.330
Hunt Hess grade	1.300±0.535	NA	NA
Modified Fisher Scale	1.867±1.279	NA	NA

**Table 3:**

Clinical Presentation	Ruptured Group-Yes	Ruptured Group-No	Unruptured Group-Yes	Unruptured Group-No	Pearson Chi-Square- p value
Headache	29(96.7%)	1(3.3%)	15(50.0%)	15(50.0%)	<0.0001
Vomiting	13(43.3%)	17(56.7%)	4(13.3%)	26(86.7%)	0.01
LOC	4(13.3%)	26(86.7%)	0(0.0%)	30(100.0%)	0.038
Ocular Symptoms	0(0.0%)	30(100.0%)	10(33.3%)	20(66.7%)	0.0005
Giddiness	14(46.7%)	16(53.3%)	5(16.7%)	25(83.3%)	0.012
TIA, or stroke	0(0.0%)	30(100%)	3(10.0%)	27(90.0%)	0.076

## DISCUSSION

The mean age of presentation in this study was 50.1 years, which is comparatively less than that in multiple studies conducted by Vitošević et al.6 [mean age 57] and Zhai et al,<sup>[7]</sup> [mean age 57.6], and most of the studies were conducted outside the Asian continent. The Indian study population may have an early predisposition to aneurysms compared to other countries, which may be due to genetic or environmental factors. 65% of the study population were in the age group of 40 to 59 years. Morbidity and mortality in this age group can cause significant disabilities in the family and society.

The majority of unruptured aneurysms are discovered incidentally; most unruptured cases have long intervals between the onset of symptoms and presentation to the hospital.<sup>[8]</sup> The duration of presentation to the hospital after ruptured aneurysms was shorter than that in the unruptured group. The average number of days from the onset of complaints to presentation to the hospital varied significantly between the two groups. (9.6 ± 8.5 days vs. 220 ± 479 days). Morita A et al. reported that 91% of UIA cases are asymptomatic or present with nonspecific symptoms and are discovered incidentally in imaging studies performed for various reasons.<sup>[9,10]</sup>

The mean GCS scores at admission in the ruptured group are 14.7, and for the unruptured groups were

14.8. The unruptured group had a slightly better GCS score than the ruptured group. According to Bae et al,<sup>[11]</sup> the mean GCS at the time of admission in the ruptured group was 12.1 ± 3.7 (ranging, 4–15), which is lower than that in our study. A significant decline in GCS score is associated with increased morbidity and mortality rates.<sup>[13]</sup> Predicting the outcome after SAH is difficult, but very important for management. According to Bae et al,<sup>[11]</sup> the mean modified Fischer scale (mFS) at the time of the initial CT scan was 3.2 ± 1.0 (median 4; range 1–4). In our study, the mFS score was comparatively low (1.86 ± 1.27). The mFS was lower, and the mean GCS was comparatively better than those in the study by Bae et al.<sup>[11]</sup> Patients with lower mFS scores will have better GCS.

In this study, 73% of the patients had Hunt Hess Grade 1, 23% of patients had Hunt Hess Grade 2, and only 4% of the patients were in Grade 3. None of the patients had grade 4 or 5 disease. Patients had a better clinical presentation at the time of hospital admission when compared to the study by Dolati et al.<sup>[12]</sup> Where, Grade 1 patients are 26 (34%), Grade 2 patients are 24 (31%), Grade 3 patients are 15 (20%), Grade 4 patients are 8 (10%), and 4 (5 %) grade 5 cases. The higher the grade, the higher the chance of mortality, delayed cerebral ischaemia, and cerebral infarction.<sup>[14]</sup>

The typical clinical picture of RIA is a sudden, severe headache, which is the worst headache in

life. Other clinical presentations of ruptured IA include nausea, vomiting, altered mental status, loss of consciousness, seizures, focal neurological deficits, and stroke.<sup>[10]</sup> Nearly 100 percent of the ruptured group had headache, while it was present in half of the study population in the unruptured group. Vomiting was more common in the ruptured group than in the unruptured group (43.3% vs. 13.3%), and the difference between them was statistically significant. Transient loss of consciousness was present in 13.3% of the patients in the ruptured group. Owing to meningeal irritation of the neural structures, the ruptured group had clinical features of vomiting and transient loss of consciousness, and the difference was statistically significant. Similarly, giddiness due to CNS instability was seen more commonly in the ruptured group than in the unruptured group (46.7% vs. 16.7%), and the difference was statistically significant. Ocular symptoms were observed in 33.3% of the patients in the unruptured group and not in the unruptured group. Visual symptoms are caused by the pressure effect of an unruptured intracranial aneurysm on the visual pathway. The incidence of visual symptoms varies depending on the origin of intracranial aneurysms. Kim et al,<sup>[15]</sup> stated that aneurysms arising from ICA, especially the ophthalmic segment, can have incidences of up to 25% of the visual complaints. In this study, the percentage of involvement in the unruptured group was higher than that reported by Kim et al.<sup>[15]</sup> Fukuyama et al,<sup>[16]</sup> in their case report of a 54-year-old female with left painless optic neuropathy due to an unruptured ACA aneurysm had regained her vision after coil embolization of the aneurysm. A transient ischaemic attack or stroke was present in 10% of patients in the unruptured group and was not observed in the ruptured group. Stroke is one of the symptoms of an unruptured aneurysm, as mentioned by Su et al,<sup>[17]</sup> and Akhaddar et al.<sup>[18]</sup> However, the difference between the ruptured and unruptured groups concerning the incidence of stroke among the patients with intracranial aneurysms is not statistically significant, similar to the analysis done by Chen et al.<sup>[19]</sup>

## CONCLUSION

The mean age of the ruptured group was lower than that of the unruptured group. The time interval between the onset of symptoms and presentation was significantly longer in the unruptured group than in the ruptured group. The mean GCS score at the time of presentation to the department was nearly the same in both the groups. Vomiting, LOC, giddiness, and headaches were significantly more common in the ruptured group. Ocular symptoms were significantly more common in the unruptured group. Smoking or alcoholism was more common in the ruptured group than in the unruptured group, but the difference was not statistically significant.

## Limitation

The relatively small sample sizes and single-centre data collection are important limitations of this study. Multicentre data collection with large, long-term studies is required for further evaluation.

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