

# A Study of Outcome of Patients with Ruptured Intracranial Aneurysm Treated by Endovascular Embolization

## Research Article

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### Abstract

**Introduction:** In India, in the past 15 years, the growth of neurosurgery has been very rapid and a large number of neurological interventions are being attempted. The procedure of cerebral angiography has been widely accepted, But, the diagnosis of intra-cranial aneurysms is much less frequently made in India as compared to the western countries despite our current population of 132.42 crore.

**Aims and objectives:** To study outcome of patients with intracranial aneurysm treated by endovascular embolization.

**Methodology:** This was Prospective study carried out at database of all neuro-interventional cases performed by the interventional neurology team at AVBRH, Sawangi, Wardha in 6 Months period i.e. April 2018 to September 18 were included for the study. In the six month period there were 25 patients undergone for intracranial embolization for various types of intracranial aneurysm. All ages, both sexes were selected by non-probability sampling method. All patients with ruptured intracranial aneurysms were treated by endovascular treatment. The statistical analysis was done by SPSS 19 version software.

**Result:** The majority of the patients were in the age group of 40-50 were 36% followed by 50-60 were 28%, 30-40 were 20%, >60 were 12%. The majority of the patients were Male i.e. 68% followed by Female 32%. The most common symptoms were Headache in 76% followed by, Vertigo in 68%, Seizure in 44%, Tinnitus in 36%, Blurred image in 32%, Difficulty in speaking in 20%, Photophobia in 12%. The majority of the patients were having the GCS in 9-12 were 48%, followed by 12-15 were 28%, 6-9 were 16%, 3-6 were 8%. The average Fisher grade was  $13 \pm 3.21$ , Modified Rankin Scale was  $14.32 \pm 2.91$ , Hunt and Hess Classification was  $12.89 \pm 3.92$ . In our study we have seen that 56% has Cure, 32% no cure and 12% patients lost, the cure was highest to 1st session i.e. 28%, followed by 11<sup>th</sup> 12%, at 0; 8%. The majority patients get cure in 1<sup>st</sup> session as compared others, this observed difference was statistically significant ( $\chi^2 = 6.17, df=1, p<0.013$ ).

**Conclusion:** It can be concluded from our study that The majority of the patients were in the age group of 40-50 were, The most common symptoms were Headache followed by, Vertigo Seizure, Tinnitus etc. The overall cure rate was 56% and the majority patients get cure in 1<sup>st</sup> session as compared others, so it seems that this procedure is safe and should be performed whenever the intervention is indicated in the patients.

**Keywords:** Intracranial aneurysm; Endovascular Embolization; Outcome of endovascular embolization

### Introduction

In India, in the past 15 years, the growth of neurosurgery has been very rapid and a large number of neurological interventions are being attempted. The procedure of cerebral angiography has been widely accepted [1]. But, the diagnosis of intra-cranial aneurysms is much

less frequently made in India as compared to the western countries despite our current population of 132.42 crore [2].

Various causes of subarachnoid haemorrhage are trauma (with associated cerebral contusion): traumatic subarachnoid haemorrhage and spontaneous subarachnoid haemorrhage caused by ruptured

berry aneurysm, perimesencephalic haemorrhage, arterio-Venous Malformation (AVM), dural Arterio-Venous Fistula (DAVF), spinal arterio-venous malformation, venous infarction, intradural arterial dissection [3].

Aneurysmal Subarachnoid Hemorrhage (aSAH) commonly occurs due to rupture of saccular aneurysms and is the cause for an estimated 5-15% of all strokes [4]. A ruptured aneurysm quickly becomes life-threatening and requires prompt medical treatment. The key symptom of a ruptured aneurysm is a sudden, severe headache described as the worst headache ever experienced [5]. Considering the annual incidence of aneurysmal SAH between 6 and 16/100,000 population [6], about 76,500-204,100 new cases occur in India each year. Awareness and healthcare accessibility determines the diagnosis and management of these patients.

Cerebral angiography is the gold standard for diagnosis of cerebral aneurysm. However the diagnosis of unruptured AVM's and Aneurysm's is still difficult due to absence of symptoms that make the patient come to the hospital for check up and investigations. Our study is with aim of study of possible outcome and clinical features of patients with intracranial aneurysm treated by endovascular embolization.

## Methodology

This was Prospective study carried out at database of all neuro-interventional cases performed by the interventional neurology team at AVBRH, Sawangi, Wardha in 6 Months period i.e. April 2018 to September 18 were included for the study. In the six month period there were 25 patients undergone for intracranial embolization for various types of intracranial aneurysm. All ages, both sexes were selected by non-probability sampling method. All patients with ruptured intracranial aneurysms were included in the study and treated by endovascular treatment (Coiling). Patients protected by law, Patients already treated by endovascular approach for an intracranial aneurysm, Patients having a dissecting aneurysm, Poor surgical candidates were not included into the study. This data was prospectively collected during the study period and includes the Demographic information like: age, sex. The clinical characteristics of all the patients with aneurysmal subarachnoid haemorrhage was graded using the Hunt and Hess grading scale, Fisher grade, and Glasgow Coma Scale (GCS). Clinically, patients with intra-cranial Aneurysm present with intracranial hemorrhage, headaches, seizures and long-term disability etc. was noted. The various scale's used for grading was as depicted below. Prior to taking the patient for endovascular embolization, the patients were graded using these scales.

The features of the procedure like date of the procedure, aneurysm size, location and morphology, total radiation exposure, and endovascular devices were also collected. The coiling was performed on Philips Alura X per FD 20 machine. Post operative complications, both intra-procedural and peri-procedural (48h) were studied if present and classified into major and minor types. The various complications were categorized as - procedural complications - thromboembolic events, rupture/perforation and device related

problems b) disability at 1 month, studied by the modified Rankin scale (score >2). The modified rankin scale was used to grade the outcome of the treated patients with intracranial Aneurysm, assed in subsequent follow up.

All the patients that underwent endovascular coiling of ruptured intracranial aneurysms were enrolled in the above-mentioned database and incorporated into the prospective analysis. The statistical analysis was done by SPSS 19 version software.

## Result

In our study we have seen that 56% has Cure, 32% no cure and 12% patients lost, the cure was highest to I<sup>st</sup> session i.e. 28%, followed by II<sup>nd</sup> 12%, at 0 ;8%. The majority patients got cured in the I<sup>st</sup> session as compared to others, this observed difference was statistically significant ( $\chi^2 = 6.17$ ,  $df=1$ ,  $p<0.013$ ).

## Discussion

In general, there are two broad categories of intracranial aneurysms: (1) those that have already ruptured, causing subarachnoid hemorrhage, and (2) those that are unruptured. Typically, unruptured aneurysms are asymptomatic; however, rarely they may become symptomatic usually due to their size and subsequent mass effect. The management of these two types of lesions differs dramatically.

### Ruptured aneurysms

These lesions are almost always treated provided that the patient is neurologically and physiologically well enough to undergo therapy, either surgical clipping or endovascular coiling. Subarachnoid hemorrhage from aneurysm rupture is a devastating event with a case-fatality rate of 51% and a 50% rate of significant disability among survivors [8-10]. Treatment is typically carried out urgently rather than emergently, usually within 24 hours after the arrival of the patient to the hospital. Initially, there was considerable controversy with respect to the treatment modality that was best suited for the right of first refusal for therapy, however, much of this controversy was settled by the International Subarachnoid Aneurysm Trial (ISAT), which demonstrated that for aneurysms amenable to either therapy, patients undergoing coil embolization had better long-term outcomes than those who underwent open surgical.

Clipping although there were some concerns regarding the durability of coil embolization as a treatment modality [11-13], an analysis of the ISAT data demonstrated that the superiority of endovascular coiling was preserved for at least 7 years after treatment [14]. For this reason, at most institutions, endovascular coiling is granted the right of first refusal for ruptured aneurysms amenable to either treatment modality.

### Unruptured aneurysms

The vast majority of aneurysms discovered incidentally are completely asymptomatic. During the past decade, with the proliferation of noninvasive cerebro-vascular imaging studies ordered by referring physicians, we have begun to diagnose small, unruptured aneurysms with increasing frequency. The diagnosis typically is the

cause of great anxiety on the part of the patient and referring physician, resulting in immediate referral to a cerebrovascular interventionist for evaluation. At this point, the decision of whether to treat must be based on the best available evidence regarding the risk of rupture of an incidentally diagnosed cerebral aneurysm. Unfortunately, the available evidence and its interpretation are still actively debated, and these decisions are rarely straightforward. Ultimately, three options are typically provided-conservative management (with or without imaging surveillance), open surgical clipping, and endovascular coil embolization-with the patient making a final decision based on a fair and unbiased presentation of the available data regarding all treatment modalities. The largest study of the natural history of incidentally discovered unruptured intracranial aneurysms (The International Study of Unruptured Intracranial Aneurysms [ISUIA]) is highly controversial and indicated much lower rates of annual rupture than the majority of previous studies on this topic [14-21].

We have considered all points regarding the treatments we have found that , The majority of the patients were in the age group of 40-50 were 36% followed by 50-60 were 28%, 30-40 were 20%, >60 were 12%.

The majority of the patients were Male i.e. 68% followed by Female 32%. The most common symptoms were Headache in 76% followed by, Vertigo in 68%, Seizures In 44%, Tinnitus in 36%, Blurred image in 32%, Difficulty in speaking in 20%, Photophobia in 12%. The majority of the patients were having the GCS in 9-12 were 48%, followed by 12-15 were 28%, 6-9 were 16%, 3-6 were 8%. The average Fisher grade was 13±3.21, Modified Rankin Scale was 14.32±2.91, Hunt and Hess Classification was 12.89±3.92.

In our study we have seen that 56% has Cure, 32% no cure and 12% patients lost, the cure was highest to I<sup>st</sup> session i.e. 28%, followed by II<sup>nd</sup> 12%, at 0; 8%. The majority of patients got cured in the I<sup>st</sup> session as compared to others, this observed difference was statistically significant ( $\chi^2 = 6.17$ ,  $df=1$ ,  $p<0.013$ ). These findings are similar to Juan Carlos Puentes 35 et al. they found A higher cure rate was achieved with a single embolization session, where a 20% cure rate was attained with a single session in smaller lesions, compared to a 6% cure rate when up to three sessions were required for more complex lesions [21].

**Conclusion**

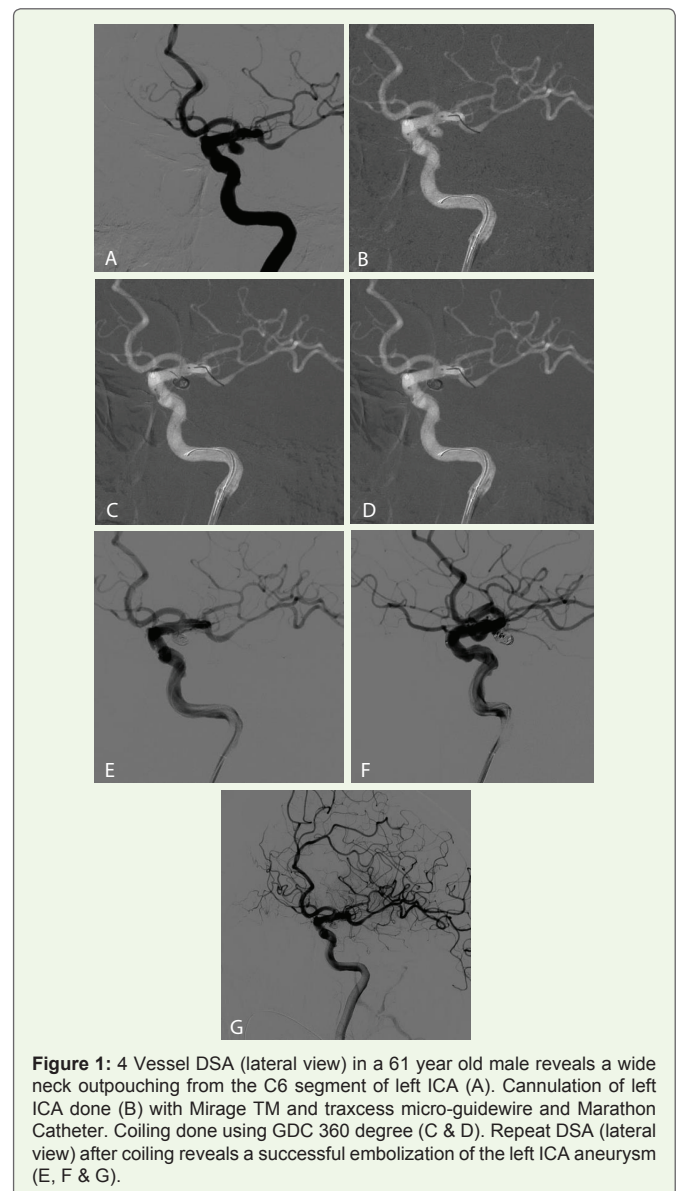
Endovascular intervention is an innovative, less invasive procedure used to treat problems affecting the blood vessels, such as an aneurysm, which is a swelling or “ballooning” of the blood vessel. The procedure involves puncturing the femoral artery with an 18G needle. Super-selective cannulation of the artery from which the aneurysm is arising is done using micro-catheters and micro-guidewires. Coiling is done for embolization. In the past, this condition was treated by open surgery, involving an incision in the side of the chest or breastbone and a long recovery period. Patients generally stay in the hospital for seven to 10 days following open surgery and undergo a three-month recovery. An alternative to open surgery, endovascular surgery offers many advantages, including a shorter recovery period, less discomfort, local or regional anesthesia instead of general anesthesia, smaller incisions, less stress on the heart and fewer risks for patients with other medical conditions. Also, the

overall cure rate in our study was 88.89% and the majority of patients got cured in the I<sup>st</sup> session, so it seems that Embolization is safe and should be performed whenever the intervention is indicated in the patients.

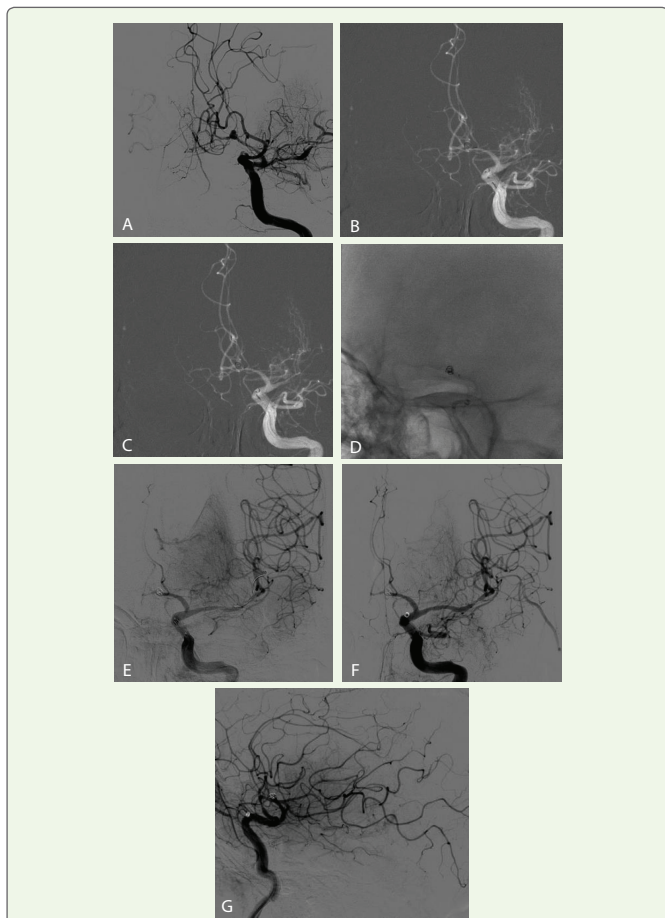
**Table 1:** Distribution of the patients as per the age.

Age	No.	Percentage (%)
20-30	1	4
30-40	5	20
40-50	9	36
50-60	7	28
>60	3	12
<b>Total</b>	<b>25</b>	<b>100</b>

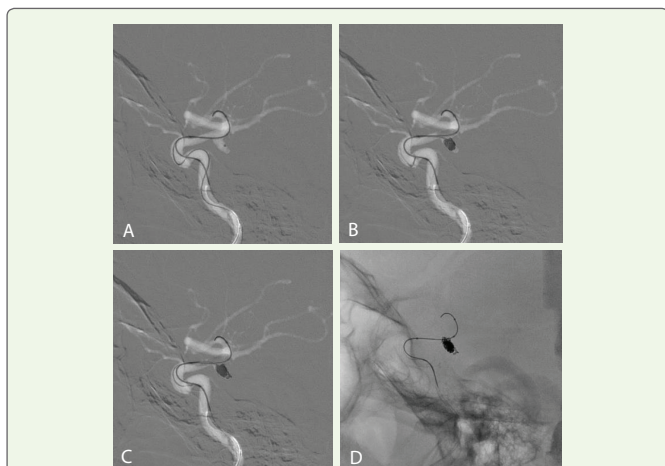
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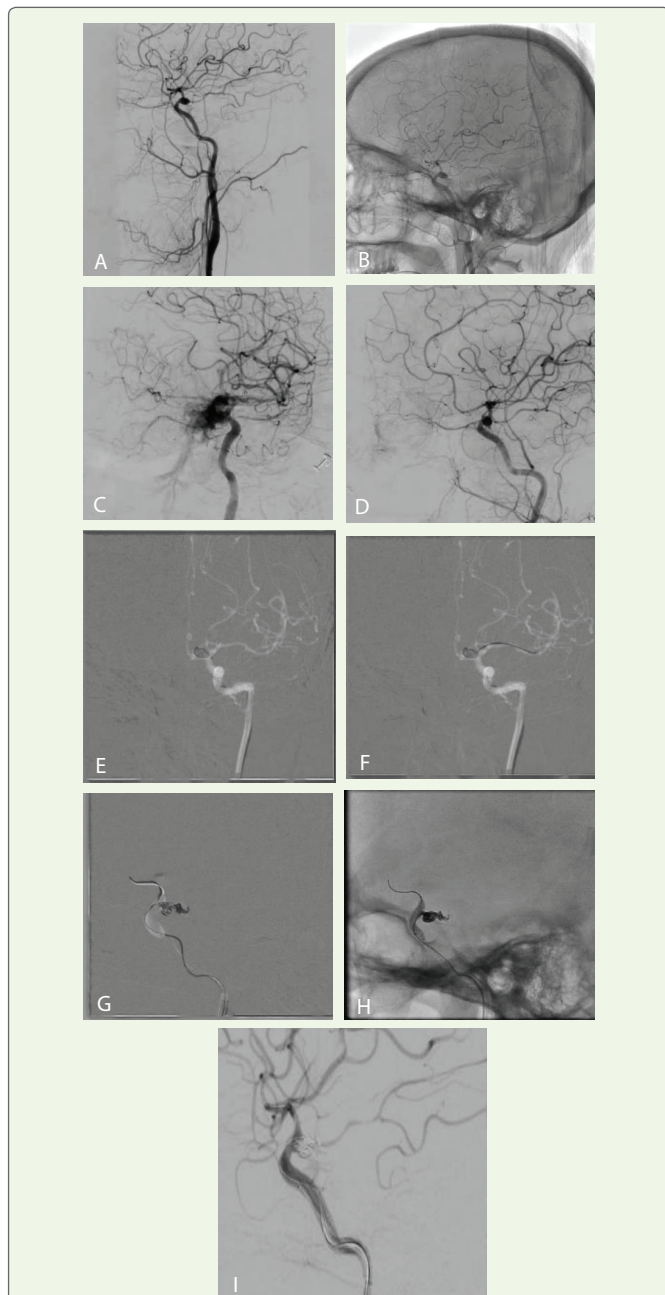
**Figure 1:** 4 Vessel DSA (lateral view) in a 61 year old male reveals a wide neck outpouching from the C6 segment of left ICA (A). Cannulation of left ICA done (B) with Mirage TM and traxcess micro-guidewire and Marathon Catheter. Coiling done using GDC 360 degree (C & D). Repeat DSA (lateral view) after coiling reveals a successful embolization of the left ICA aneurysm (E, F & G).



**Figure 2:** 4 Vessel DSA (A) in a 54 year old male reveals a wide neck outpouching in the anterior communicating artery. Coiling of the Acom aneurysm done using Mirage TM micro-guidewire, Marathon Catheter and Stryker bare platinum coils (B & C). Fluoroscopy, lateral view displays the coils (D). Repeat DSA taken after completion of the procedure (E, F & G) shows successful embolization of the Acom aneurysm.



**Figure 3:** 4 Vessel DSA (lateral view) in a 58 year old male reveals a wide neck outpouching from the C7 segment of left ICA (A). Cannulation of left ICA done (B) with Mirage TM and traxcess micro-guidewire and Marathon Catheter. Coiling done using GDC 360 degree (C). Repeat DSA (lateral view) after coiling reveals a successful embolization of the left ICA aneurysm (D).



**Figure 4:** 4 Vessel DSA (lateral view) in a 64 year old male reveals a wide neck outpouching from the C6 segment of left ICA (A, B and C). Aneurysmal rupture (intra-procedure) while performing 4 vessel DSA can be seen (D). Cannulation of left ICA done with Mirage TM and traxcess micro-guidewire and Marathon Catheter. Coiling done using GDC 360 degree (E, F, G and H). Repeat DSA (lateral view) after coiling reveals a successful embolization of the left ICA aneurysm (I).

**Table 2:** Distribution of the patients as per the sex.

Sex	No.	Percentage (%)
Male	17	68
Female	8	32
Total	25	100

The majority of the patients were Male i.e. 68% followed by Female 32%.

**Table 3:** Distribution of the patients as per the symptoms.

Symptoms	No.	Percentage (%)
Headache	19	76
Vertigo	17	68
Seizure	11	44
Tinnitus	9	36
Blurred image	8	32
Difficulty in speaking	5	20
Photophobia	3	12

(\* More than one symptoms present in the patients hence total more). The most common symptoms were Headache in 76% followed by, Vertigo in 68%, Seizures in 44%, Tinnitus in 36%, Blurred image in 32%, Difficulty in speaking in 20% and Photophobia in 12%.

**Table 4:** Distribution of the patients as per the cure per session of the embolization.

Sessions	Cure			Total
	Yes	No	Lost	
0	No.	2	0	3(12)
	%	8	4	
I	No.	7	1	8(32)
	%	28	4	
II	No.	3	3	8(32)
	%	12	12	
III	No.	1	2	4(16)
	%	4	8	
IV	No.	0	2	2(8)
	%	0	0	
Total	No.	14	8	25 (100)
	%	56	32	

(To compare 1<sup>st</sup> session with other all other session merged together and No cure and lost columns were merged).

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