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Novel Case of X-configured Stenting in India for the Treatment of Wide-Necked Anterior Communicating Artery Aneurysm along with Anterior Communicating Artery Complex Reconstruction

Case Report

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Abstract

A 39-year-old male presented with a severe holocranial headache and vomiting since 1 day. CT showed diffuse SAH, DSA depicted an extremely wide-necked anterior communicating artery aneurysm incorporating bilateral A2 segment origins. The aneurysm measured 8x6x7mm, with a neck measuring 7mm. It was directed infer medially with a part of fundus superior to the anterior communicating artery region.

Attempt to cannulate the ipsilateral A2 segments from each of the A1 segments was unsuccessful. Due to wide-neck, acute A1-A2 angle and bilateral incorporation of the A2 segments, treatment plan was changed to X-stenting. Wire was cannulated from right A1 to left A2, and second microcatheter was placed from left A1 to right A2. Another microcatheter was negotiated from the left ACA into the aneurysmal sac. 2 stents measuring 3x18mm and 3x24mm were deployed in an 'X'-fashion. Subsequently, aneurysm was coiled through jailed microcatheter with 3 detachable platinum coils.

Post-procedural angiography showed minimal residual opacification of inferior sac with patent stented segment and distal ACAs. There was good reconstruction of the anterior communicating artery complex.

Repeat angiography on day 7 showed exclusion of the inferior sac of the aneurysm with minimal neck residual opacification.

Follow-up CT angiography done at three months showed good patency of stents. Control DSA at 6 months showed complete exclusion of aneurysm with patent stents. At two years, patient was clinically stable and asymptomatic.

This case illustrates the advantage of X-stenting for embolization of large, wide-neck, bilobed aneurysms with acute A1-A2 angle as an alternative to traditional treatment modalities.

To the best of our knowledge, this is the first reported case of 'X-stenting' for anterior communicating artery aneurysm in India.

Keywords: X-Stenting; Cross-Stenting; Anterior Communicating Artery Aneurysms; Acomaa; Endovascular Techniques

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Case Report

A 39-year-old male presented with a severe holocranial headache and vomiting since 1 day. On observation, no focal neurological deficits were present. Computed Tomography showed diffuse subarachnoid haemorrhage, and Digital Subtraction Angiography depicted an extremely wide-necked anterior communicating artery aneurysm incorporating the origin of bilateral A2 segments. The aneurysm measured approximately 8 x 6 x7 mm in diameter with a neck measuring about 7mm. It was directed predominantly inferomedially with a part of the fundus superior to the anterior communicating artery region.

The patient was prepared for stent implantation and coil embolization. Two hours preoperatively, the patient was put on 2 tablets of Ticagrelor 90mg and 150mg of aspirin. Under general anaesthesia, a short 8F sheath was placed in the groin, through which 6F Neuron Max Long sheath (80 cm) and Neuron Max 070 introducer were guided to the right common carotid artery from right transfemoral approach; and to the left common carotid artery from left transfemoral approach respectively. Neuron guiding catheter was placed in both cervical internal carotid arteries. Headway 17 micro catheter was negotiated into the A1 segments bilaterally.

An attempt to cannulate the ipsilateral A2 segments was made from each of the A1 segments. Due to the wide neck of the aneurysm, acute A1-A2 angle and bilateral incorporation of the A2 segments, the treatment plan was changed to X-stenting. So instead, the wire was cannulated from right A1 to left A2, and another microcatheter was placed from left A1 to right A2. A third microcatheter was negotiated from the left anterior cerebral artery into the aneurysmal sac. 2 stents measuring 3mm x 18 (Microvention Terumo Lvis Junior) and 3mm x 24 (Microvention Terumo Lvis Junior) were deployed in

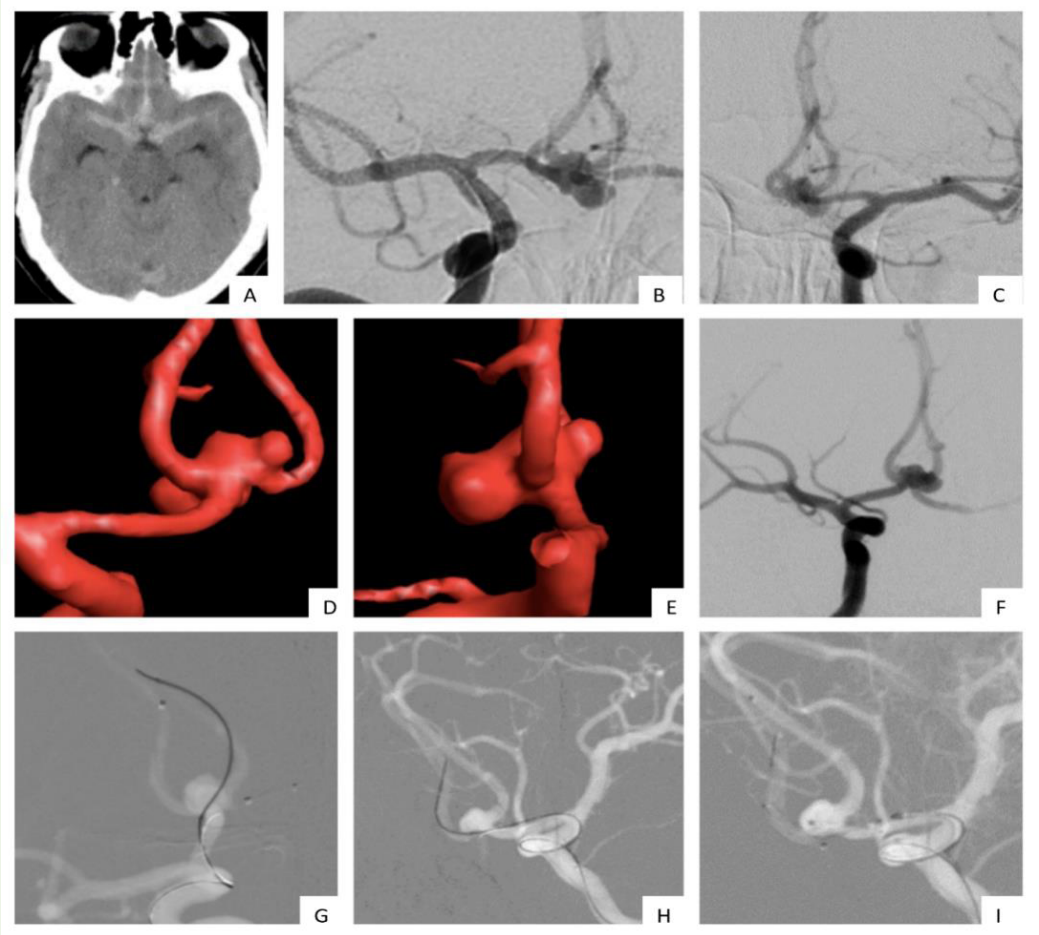

Figure 1: Plain CT brain in axial section depicts diffuse subarachnoid hemorrhage (Figure 1A). Right (Figure 1B) and left (Figure 1C) internal carotid artery angiogram shows a bilobed aneurysm – with the lobes extending superiorly and inferiorly. Internal carotid angiogram in anteroposterior view (Figure 1D) and lateral view (Figure 1E) demonstrate extremely wide necked anterior communicating artery aneurysm measuring 8x6x7mm. Internal carotid angiogram in anteroposterior view shows working projection for unsuccessful attempt to negotiate wire and catheter into the ipsilateral A2 segment (Figure 1F). Hence, the plan was changed to X stenting. 2 catheters were negotiated from left A1 segment to right A2 segment (Figure 1G) and right A1 segment to left A2 segment respectively (Figure 1H). A third catheter was placed into the aneurysmal sac for jailing of micro catheter (Figure 1I).

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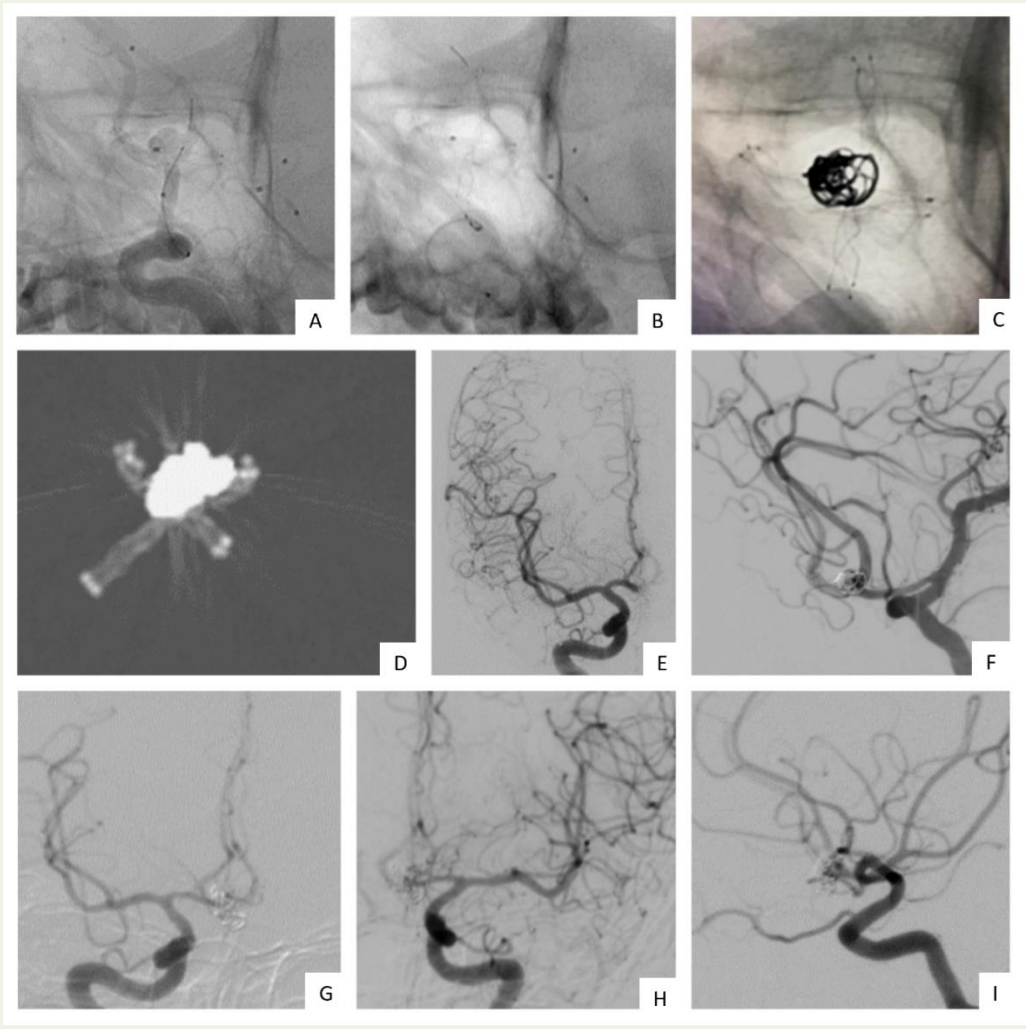

Figure 2: Internal carotid angiogram in anteroposterior view shows deployment of stent from right A2 segment to left anterior cerebral artery (Figure 2A). The second stent was deployed from left A2 segment to right anterior cerebral artery with jailing of microcatheter (Figure 2B). Subsequently, coiling was performed via jailed microcatheter. Figure 2C depicts coils within the aneurysm. (Figure 2D) is a reconstructed CT image showing X configuration of the stents and coils within the aneurysm. Final right (Figure 2E) and left (Figure 2F) internal carotid artery angiograms show good reconstruction of the anterior communicating artery complex and bilateral A2 segments, along with a small residual filling of the inferior portion of the sac. Control angiography done after 6 months (Figure 2G) – Right ICA angiogram, (Figure 2H) – Left ICA angiogram) shows complete exclusion of aneurysm from circulation.

an 'X' fashion. Subsequently, coiling was performed through jailed microcatheter using three detachable platinum coils (Microplex, Microvention Terumo). Hemostasis at the puncture site was achieved by direct compression.

Post-procedural angiography showed minimal residual opacification of the inferior sac with good patency of the stented segment and distal anterior cerebral arteries. There was good reconstruction of the anterior communicating artery complex. The patient was extubated without complications and monitored in the ICU for a week.

Repeat angiography was done on day seven at the time of discharge and showed exclusion of the inferior sac of the aneurysm with minimal neck residual opacification.

Follow-up CT angiography was done at three months and showed good patency of stents. Control DSA at six months showed complete exclusion of aneurysm with patent stents. At two years, the patient was clinically stable and asymptomatic.

Discussion

Anterior communicating artery aneurysms are the most commonly occurring intracranial aneurysms, accounting for 23-40% of all ruptured aneurysms and 12-15% of unruptured aneurysms [1].

Due to their complex arterial relationships with perforators and higher potential of cognitive dysfunction with microsurgical clipping, endovascular therapy has become the treatment of choice for these aneurysms [2]. Wide aneurysmal neck has been identified as a limiting

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factor for endovascular coiling. This difficulty has been tackled by using remodeling neck techniques (using balloons), simultaneously deploying 2 coils at the beginning of framing of the aneurysm, or by use of multiple stents [3]– as seen in our case.

A small increase in aneurysmal diameter leads to a fourfold increase in neck surface area. Because of the significantly larger neck surface area in wide necked aneurysms – coils seek the path of least resistance and herniate into the parent vessel if simple endovascular coiling is attempted – hence, methods such as X-stenting must be employed in these cases. Wide-necked aneurysms are more likely to require retreatment because of coil compaction on follow-up – this is due to the inability to protect the parent vessel and, therefore, the inability to densely pack the aneurysm [4].

Moon et al. reviewed the long term prognosis of patients enrolled in the Barrow Rupture Trial(BRAT) and found that 16.9% of the 39 patients included in the endovascular group had to be transferred to the surgical clipping group due to embolization difficulties [5].

The small length of the AcomA along with the acute angle of adjacent vessels make it very difficult to use balloon- or stent-assisted techniques. This limitation is because the inability to reach parent vessel at aneurysmal neck and loops in internal carotid arteries may prohibit stent or balloon navigation. Additionally, if the aneurysm is extremely wide-necked as in our case, a balloon would not be enough to prevent coil protrusion in the parent artery [2].

In a study comparing stent-assisted coiling and balloon-assisted coiling for wide neck aneurysms conducted in 101 consecutive patients, Chalouhi et al. found that the use of stents was associated with lower rates of retreatment, and higher rates of aneurysm obliteration and progression of occlusion at follow-up [6].

Self-expanding stents can be used for complex, wide necked aneurysms to achieve more durable long-term results.They are preferred for not only the scaffold they provide, but they also achieve better initial occlusion rates while sparing parent artery lumen and to decrease likelihood of re-growth – this is due to the alteration they create in intraaneurysmal hemodynamics [7].

Saatci et al. conducted X-stenting in 5 wide necked AcomAAincolving both A1-A2 junctions, with 100% technical success and no re-growth on follow up at 6 months.

In our study, the attempt to cannulate ipsilateral A2 from A1 was made but was unsuccessful due to the wide neck, sharp A1-A2 angle and bilateral incorporation of A2 segments. Hence, this plan of "opposite L configurations" was abandoned and X-stenting was preferred. Alteration of flow direction at the aneurysmal neck, which is found to have an impact on long term re-growth rates, is more efficient with X-stenting rather than "opposite L" configurations [7].

Another advantage of X-stenting is that the patency of the reconstructed AcomA is preserved. Conversely, it is only an option for patients with good sized A1s on either side. If there is hypoplastic A1 on one side, Y-stent placement through the large-sized A1 is the treatment of choice [7].

In acute/subacute phase of rupture – there is moderate to severe vasospasm, hence the stent should be oversized. Open-cell design stents show increased opening of cells and outward prolapse of struts into aneurysmal neck, thereby reducing largest diameter of aneurysmal sac – hence, coils should be undersized [2].

We used the 'jailing of micro catheter' technique – which permits stabilization of the coil during delivery. This technique is unsuitable for cases with small diameter of ACA [2].

In our patient, X-configured stent assisted coiling was used successfully for a very wide neck aneurysm with bilateral incorporation of A2 segments. This techniqye creates a different flow status change, which is postulated to decreased re-growth or recurrence of the aneurysm.

Control DSA at six months showed complete exclusion of aneurysm with patent stents. At two years, the patient was clinically stable and asymptomatic.

X-configured stent-assisted coiling is technically feasible in the treatment of wide necked AcomAA with acute A1-A2 angle and bilateral incorporation of A2 segments.

To the best of our knowledge, this is the first reported case of 'X-stenting' for anterior communicating artery aneurysm in India.

Ethical Considerations

A. Ethical approval: All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

B. Informed consent: Informed consent was obtained from the individual included in the study.

C. Conflict of interest: The authors have nothing to disclose

References

1. Chen J, Li M, Zhu X,Chen Y, Zhang C, et al.(2020) "Anterior Communicating Artery Aneurysms: Anatomical Considerations and Microsurgical Strategies." Frontiers in Neurology 11: 1020.
2. Huang Q, Xu Y, Hong B, Zhao R, Zhao W, et al. (2009) "Stent-Assisted Embolization of Wide-Neck Anterior Communicating Artery Aneurysms: Review of 21 Consecutive Cases." American Journal of Neuroradiology 30: 1502-1506.
3. Gonzalez N , Sedrak M, Martin N, Vinuela F, (2008) Impact of Anatomic Features in the Endovascular Embolization of 181 Anterior Communicating Artery Aneurysms. Stroke 39: 2776-2782.
4. Levy DI (1997) Embolization of Wide-Necked Anterior Communicating Artery Aneurysm: Technical Note. Neurosurgery 41: 979-982.
5. Moon K, Levitt MR, Almefty RO, Nakaji P, Albuquerque FC, et al. (2015) Treatment of Ruptured Anterior Communicating Artery Aneurysms: Equipoise in the Endovascular Era? Neurosurgery 77: 566-571.
6. Chalouhi N,Starke RM, Koltz MT,Jabbour PM,Tjoumakaris SI, et al. (2013) Stent-Assisted Coiling versus Balloon Remodeling of Wide-Neck Aneurysms: Comparison of Angiographic Outcomes. AJNR. American Journal of Neuroradiology 34: 1987-1992.
7. Saatci I, Geyik S, Yavuz K, Cekirge S (2011) X-configured stent-assisted coiling in the endovascular treatment of complex anterior communicating artery aneurysms: a novel reconstructive technique. AJNR: American Journal of Neuroradiology 32: E113-E117.

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