VOLUME-9, ISSUE-5, MAY -2020 • PRINT ISSN No. 2277 - 8160 • DOI : 10.36106/gjra

Original Research Paper

Neurosurgery

AICA-PICA ANEURYSMS:REVIEW OF CASES.

Dr. Dinesh Jaluka Assistant Prof. Neurosurgery, RG Kar Med.College Hosp, kol, india

Dr. Parthasarathi Datta* Associate Prof. Neurosurgery, NRS Med.College Hosp, kol, india *Corresponding Author

ABSTRACT **Background:** Aneurysms of the posterior circulation are 10 – 15% of all aneurysms. Amongst the posterior circulation aneurysms, anterior inferior cerebellar artery (AICA) aneurysms account for 1 -2 % and amongst the AICA aneurysms, even more rare is AICA – PICA variant aneurysms. Only 13 cases are reported in literature (Table 1). **Objective:** The aim of the present study was to evaluate the management strategy of these rare aneurysms. **Materials and Methods:** We reviewed previous 8 studies comprising of 13 patients and our study comprising of 2 patients to find a novel method of treatment and complications pertaining to the different treatment modalities. **Results:** Endovascular and microsurgical procedures can be done to treat these aneurysms but endovascular treatment appear simpler than microsurgical treatment for aneurysms located at the meatal and post meatal portion of AICA. **Conclusion:** In AICA – PICA variant aneurysms, parent vessel occlusion is very detrimental as the whole brain area of PICA supply is supplied by AICA. Endovascular treatment is better option for meatal and post meatal segments of AICA.

KEYWORDS : Anterior inferior cerebellar artery (AICA), Posterior inferior cerebellar artery (PICA), Aneurysms, Variant.

Aneurysms of the posterior circulation account for only 10 – 15% of all intracranial aneurysms. Amongst the posterior circulation aneurysms, AICA aneurysms account for only 1 – 2%. AICA aneurysms can be associated with arterio-venous malformations (AVM), cerebello-pontine angle tumors, moya-moya disease or may be AICA PICA variant. Agenesis of the PICA leads to a well-developed AICA so that it can supply the areas that would have been perfused by the absent vessels. This is known as "AICA-PICA variant" with an overall prevalence rate of 20 – 24 % in literature. As the aneurysms of the AICA-PICA variant are concerned, the exact cause is not known. The aneurysms may develop due to increased blood flow in the variant or a vascular injury such as dissection.[1]

AICA originates from basilar artery and encircles the pons near the pontomedullary sulcus. After coursing near and sending branches to the nerves entering the acoustic meatus and the choroid plexus protruding from foramen of luska, it passes around the flocculus to reach the surface of the middle cerebellar peduncle and terminates by supplying the lips of the of the cerebellopontine fissure and the petrosal surface of cerebellum. AICA usually bifurcates near the facial and vestibulocochlear nerves to form a rostral and caudal trunk. The rostral trunk courses along the middle cerebellar peduncle to supply the upper part of the petrosal surface and the caudal trunk passes near the lateral recess and supplies the lower part of the petrosal surface. The trunk of AICA is divided into three segments: the pre meatal, meatal and post meatal segments. The Pre-meatal segment begins at the basilar artery and courses around the brainstem to reach the region of the meatus. The Meatal segment is located in the vicinity of the internal acoustic meatus. The post meatal segment begins distal to the nerves and courses medially to supply the brainstem and cerebellum. The meatal segment after forms a laterally convex loop, the meatal loop, directed towards or into the meatus. The branches of AICA are labyrinthine (internal auditory) arteries which supply the facial and vestibule-cochlear nerves and adjacent structures; the recurrent perforating arteries which supplies the brainstem and the subarcuate artery which enters the subarcuate fossa to end in the bone below the Superior canal but it may infrequently supply the distal territory of the labyrinthine arteries.

Anatomical variants of the AICA and the PICA occur. They are classified into four types,

According to their origin and distribution of blood supply. Type 1 is a single trunk originating from proximal basilar artery (BA), BA with 2 peripheral branches that act as an AICA and PICA. Types II is a bifid PICA originating from an intradural segment of ventral artery (VA).Type III is a bifid PICA, originating from vertebro-basilar junction and type IV is a PICA without an AICA. Depending on its origin, the AICA-PICA covers different territories. Aneurysms arising from the AICA-PICA variant are extremely rare, there are only 13 cases reported in literature.

CASE HISTORY:

Case I: A 47 years old lady presented with headache, vomiting, transient loss of consciousness.

There was no history of any co-morbid illness like hypertension, diabetes, mellitus, or bleeding diathesis etc. On examination, her GCS was E1 V2 M 5 ,neck rigidity was present. Initial CT scan brain revealed subarachnoid hemorrhage in the prepontine cistern with extension into left cerbello pontine cistern. Digital subtraction angiography (DSA) revealed an aneurysm from left AICA having a size of 4mm and 2mm with well – defined neck. 3-D CT angiogram revealed the aneurysms arising from the meatal segment (Fig 1).it was evident from DSA that PICA was absent and AICA was dominant. AICA-PICA variant (Fig 2).the aneurysms was clipped by; left retro sigmoid sub-occipital craniotomy (Fig 3).postoperatively the patient developed transient VIIth cranial nerve palsy which resolved over a span of 5 months and mild sensorineural hearing loss on the left side.

Case II: A 51 years old lady presented with headache and neck pain of sudden onset. There was no co-morbid illness. On examination her GCS was 15 without any neck rigidity. Initial CT scan brain revealed subarachnoid hemomhage.3-D CT Angiography of brain revealed left AICA aneurysms in the meatal segment with neck partially within the meatus. PICA on the both sides were absent. The aneurysms was clipped by left retrosigmoid sub-occipital craniotomy and drilling of the meatus. Post operatively there was transient VII cranial nerve palsy.

DISCUSSION:

AICA aneurysms are rare. Published series indicated 47 AICA aneurysms in the literature (Table 2).These aneurysms arise in relation to AVM, moya-moya disease, dissection or AICA –

PICA variant. There are considerable variations in the anatomy of the vertebra-basilar system. The most common variation is agenesis of the right PICA followed by agenesis of the left PICA as reported in literature. An inverse relationship between the sizes of the AICA and PICA is thought to exist. Agenesis of PICA leads to well developed AICA so that it can supply the areas that would have been perfused by the absent vessels. This is AICA-PICA variant with an overall prevalence rate of 20 -24% as reported in literature. only 13 cases of AICA-PICA variant aneurysms have been described in literature(Table-2).7 of these aneurysms were treated microsurgically,6 were treated by endovascular method. As far as the aneurysms of the AICA-PICA variant are concerned, the exact cause is not known. The aneurysms may have developed due to increased blood flow in the variant artery or a vascular injury such as dissection. Anatomical variations of AICA-PICA are classified into 4 types (TABLE-3)

AICA has 3 segments: Pre meatal, meatal and post meatal segment. AICA aneurysms has a prediction for meatal segment. Management of these aneurysms need DSA and or 3D CT angiography of brain to see the location of the aneurysm in relation to the internal auditory meatus. Microsurgical treatment has been mainstay in the management of AICA aneurysms since the first surgical treatment of these aneurysms by Gonzalez[2] and Schwartz[3]. Micro surgical treatment consists of direct clipping, trapping, trapping with bypass and resection with end to end anastomosis[12].Endovascular management consists of coiling, stent assisted coiling or occlusion of AICA using coils,n-butyl cyanoacrylate (NBCA), onyx. The management strategies for treatment differ according to the location and configuration of the aneurysms[13].as most pre-meatal aneurysms arise proximally, micro-catheter navigation into the aneurysms dome is often feasible and lies in a confined narrow space in the pre-pontine cistern, there by restricting surgical treatment. Meatal and post meatal aneurysms are often wide neck or fusiform, making these type of lesions difficult to preserve the parent artery, either by clipping or coiling. These efforts yield VII / VIII cranial nerve deficits and cerebellar infraction. These aneurysms can be technically difficult to manage surgically because of tight adhesion to the surrounding structures Including nerves complex. Because of the small space, in situ clipping is difficult. The inter auditory artery, the location of which may vary, was not identified during surgery. although several cases with pre-operative eight cranial nerve deficit showed improvement after surgery, there are no outcome differences between surgery and endovascular treatment. The Endovascular treatment appears simpler than surgical treatment for aneurysms located at the meatal and post meatal portion of AICS.

Surgical corridors:

To most important factors in choosing a surgical approach are:

a)The craniocaudally location of the aneurysms in relation to the clivus and

b) Medio-lateral location, along with the course of the artery.

High riding aneurysms may be reached by the orbito – zygomatic approach, although this approach is limited by the need to perform posterior clinoidectomy. This may cause morbidities related to cranial nerve paresis.

An alternative method that may be selected for high riding AICA aneurysms would be a sub-temporal middle fossa approach with divisions of the tentorium combined with petrosectomy as popularized by Drake and colleagues[14]. In addition to the removal of petrous apex, the use of sub-temporal transtentorial approach involves opening the tentorial edge, posing hazard to cranial nerve IV[13].

The retrosigmoid route with or without partial petrosectomy is the simplest and straight forward way to expose AICA region. The retrosigmoid approach can be combined with either a medical petrosectomy in high riding aneurysms or a far lateral approach when require to expose low lying aneurysms near vertebro basilar junction[16,17].

Transpetrosal approaches (Transcochlear and translabyrinthine) provide the most direct route to the brain stem[18,19,20,21]. However these approaches are associated with significant morbidity, such as deafness, facial nerve palsy and CSF leakage and are rarely perform in the absence of giant AICA aneurysms. The suprastentorial infratentorial presigmoid approach allows various degrees of resection involving the semicircular canals, vestibule and cochlea. Transoral transfacial approaches to AICA aneurysms have been reported but are not routinely used because of their high morbidities.

CONCLUSION:

Aneurysms of AICA are very rare only 47 cases are reported in literature. They present with clinical features pertaining to sub-arachnoid hemorrhage like sudden headache, Vomiting, loss of consciousness, seizures. CT scan brain reveals SAH,IVH, DSA of cerebral vessels detects the aneurysms. 3 D-CT angiography of brain with superimposed bony windows give a clear delineation with bones and internal auditory meatus. Microsurgical and endovascular modalities of treatment achieve similar outcomes. Complications of microsurgical treatment are VII/VIII cranial nerve palsy, cerebellar symptoms.

One variety of AICA aneurysm is "AICA-PICA Variant" where agenesis of the PICA leads to a well-developed AICA so that it can supply the areas that would have been perfused by the absent vessels. The special concern in the variety is that, the distal flow should be preserved while treating the aneurysm either be microsurgical or endovascular means as a large anatomical area is supplied by a single artery.

Table 1: Review of literetue of AICA- PICA Vertebral aneurysm

Legend : F= Female,CA=cerebral angiogram;VA=Vertebral artery;DSA= digital substration angiography; SAH= Subarachanoid hemorrhage; CP=cerebello-pontine; BA=basilar artrery; MSOC&C= Mid line subocipital craniotomy and clipping; RMSOC=Retra mastoid subocipital craniotomy and clipping;CT= computed toography; * = not available;HCP =hydrocephalus;

Author	Number of cases	Age (yrs)	Sex	Presenting feature reported	Imaging	Location	Size	Origin of trunk as ascertained	treatment	Out come
Kojima et al[4] 1996	1	67	F	Reported in japanese cant be deciphered.						
Elsra et al [5]1999	1	62	F	Sudden on set of headache, nuchalgia	CT=SAH,IVH CTA-left AICA-PICA	Distal	Small	BA	MSOC&C	HCP,LC NP,cer ebellar ataxia
Baskaya et al[6] 2006	1	44	F	Sudden severe headache, vomiting	CT=IVH, SAH, CA-saccular area Rt PICA. Saccular area LtAICA-PICA Variant.	Distal	Small	BA	MSOC&C	Good
Gopala Krishnan et al[7] 2009	2	68 63	F F	Headache,vomiting, altered sensorium Headache, vomiting	CT=IVH,HCP CA=Rt AICA-PICA CT=SAH,IVH CA=Lt AICA-PICA	Distal Distal	Small Small	BA	MSOC&C RMSOC	Hemod ynamic ally stable, vegetat ive state Good
Suh et al[8] 2011	5	67 71 26 72 46	F F F F F	Headache Headache Headache Headache Headache	SAH SAH SAH Incidental Incidental	All Proximal	Small Small Small Small Large(15mm)	*	Endovascular coiling for all cases	Good Good Good Good Good
Colgesw et al[9] 2015	1	42	M	Rt facial sensory loss,Lt hemi ysesthesia	MRI=Rt cp mass;DSA=Rt AICA-PICA aneurysm	Distal	Large(30mm)	BA	Endovascular coiling and surgical thrombectomy	Good
Akhtar et al[10] 2016	1	35	F	Headache and nuchalgia	CT=IVH,HCP CA=absence both PICA	*	Small(3mm)	*	MSOC&C	Good
Assari et al[11] 2018	1	26	F	Mass effect	CA= RT common trunk AICA-PICA	Proximal	Large(18mm)	VA	RMSOC	Good
Our cases 2018	2	47 61	F F	Headache Headache	PICA absent ,AICA dominant	Meatal Meatal	Small(4mm) Small(2mm)	VA-BA &junction	RMSOC	Good Good

Table 2: Summary of AICA aneurysms in the literature

	Total	Pre meatal	meatal	Post meatal
Number	47	16	21	10
Men age (years)	53	54	52	53
Female	32	14	12	06
Presentation • SAH • SAH + V/VI/VIII/LCNP • V/VII/VIII • Incidental	27 09 06 05	09 02 01 04	10 07 04 00	08 00 01 01
Surgical Management • Clipping • Trapping • Trapping + Bypass • Resection + end to end suture	08 10 1 2	0 4 0 0	8 5 1 2	0 1 0 0
Endovascular Management • Coiling • Stent Assisted Coiling • PAO using Coils / NBCA	4 3 14	3 3 4	0 0 4	1 0 6

Table 3: Variations of AICA and PICA AICA – anterior inferior cerebellar artery, SAH – subarachnoid hemorrhage, LCNP – Lower Cranial Nerve Palsy , PAO – Parent Artery Occlusion , NBCA – n-dutyl cyanioacrylate.

I	Single Trunk Originating from basilar artery with 2 peripheral brunches as AICA and PICA
II	Bifid PICA originating from vertebral artery
III	Bifid PICA originating from vertebrobasilar junction
IV	PICA without an AICA

REFERENCES

1. Xianli Ly, Huijian Ge, Hongwei He, Chuhan Jiang, Youxiang Li. Anterior inferior Cerebellar artery aneuryams : Segments and results of surgical and endovascular Managements. IntervNeuroradical 2016 Dec, 22 (6): 643-48
2. Gonzalez LF, Alexander MJ, McDougall CG et al. Anterior inferior cerebellar artery aneuryams : Surgical approaches and outcome – a review of 34 cases. Neurosurgery 2004; 55: 1025-35
3. Schwartz HG. Arterial aneuryams of the posterior fosss. J Neurosurgery 1948; 5: 312-16
4. Kojima A, Nakamura T, Takaysma H, Haroda S, Takamiya Y. A case of de novo Ameurysms of the distal posterior inferior cerebellar artery with inraventricular Hemorrhage. No ShinkeiGeka 1996; 24: 469-673
5. Ebara M, Tanaka T, Sawanchi S, Morooka S, Yukhi K, Abe T. A ruptured ameurysm Of the anterior and posterior inferior cerebellar artery: a case report. No ShinkeiGeka 1999; 27: 1013-17
6. Baskaya MK, Coscarella E, Jea A, Morcos J. Aneurysm of the anterior inferior cerebellar Artery-posterior inferior cerebellar artery variant : case report with anatomical description in the cadaver. Neurosurgery 2006; 58: E 388 (discussion E)
7. Gopalakrishan CV, Menon G, Nair S. Aneurysm of the anterior inferior cerebellar artery - posterior inferior cerebellar artery variant: two case reports and review of literature. Br. J Neurosurgery 2009; 23: 554-56
8. Suh SH, Kim DJ, Kim DJ, Kim BM, Chung TS, Hong CK et al. Management of anterior inferior Cerebellar artery aneurysms: Endovascular treatment and clinical outcome. AJNR Am J Neuroradiol 2011, 32: 159-64
9. Ooigawa H, Morikawa E, Ishihara S, Ogura T, Takeda R, Kurita H. Partially thrombosed giant Aneurysm arising from a distal anterior inferior cerebellar artery posterior inferior cerebellar artery variant: a case report. InterdiscipNeurosurg: Adv Tech Case Manage 2016; 2: 123-25
10. Akhtar S, Azeem A, Jiwani A, Javed G. Aneurysm in the anterior inferior cerebellar artery-posterior inferior cerebellar artery variant: case report and review of literature. Int Surg Case Rep 2016; 22: 23-27
11. Ansari KA, Menon G, Nair S, Abraham of anterior inferior cerebellar artery-posterior inferior cerebellar artery variant. Asian J Neurosurg 2018 Jan-Mar 13 (1): 53-55
12. Lee BS, Witek AM, Moore NZ < Bian MD. Treatment of an anterior inferior cerebellar artery aneurysm with microsurgical trapping and in ditu posterior inferior cerebellar artery to anterior inferior cerebellar artery bypass: case report. OperNeurosurg (Hagerstown) 2018 Oct 1 15 (4): 418-24
13. Bambakidis NC, Manjila S, Dashti S, Tarr R, Megerian CA. Mangement of anterior inferior cerebellar artery aneurysms : an illustrative case and review of literature. Neurosurg Focus 2009 May 26(5)
14. Drake CG, Peerless SG, Hernesniemi JA: Surgery of vertebra basilar aneurysms : London , Ontario experience opf 1767 patients. New York, Spinger 1996
15. Gonzalez LF, Alexander MJ, Mc Dougall, CG Spetzler RF. Anteroinferior cerebellar artery aneurysm : surgical approaches and outcomes : a review of 34 cases. Neurosurg 2004: 55: 1025-35
16. Dashti SR, Miller JP, Tarr RW, Selman WR. Vascular Lesion of the cerebellopontine angle, in Bambakidis NC, MegerianC, Spetzler RF (eds). Surgery of the cerebellopontine angle. Hamilton Ontario : BC Decker publishers, 2009
17. Gonzalez LF, Amin-hanjani S, Bamkakidis NC, Spetzler RF. Skull base approaches to the basiler artery. Neursurg Focus 19: E3, 2005
18. Kawase T, Toys S, Shiobara R, Mine T. Transpetrossal approach for aneurysms of the lower basilar artery. J Neurosurg 1985; 63: 857-61
19. Seifert V, Stolke D. posterior transpetrossal, approach to aneurysm of the basilar trunk and vertebrobasiler junction. J Neurosurg 1996: 85; 373-79
20. Steward DL, Pensak-ML. Transpetrosal surgery techniques. Otolaryngolcin North Am 2002; 35 :367-91
21. Tummala RP, Coscarella E, Morcos JJ. Transpetrosal approaches to the posterior fossa. Neurosurg Focus 2005; 19(2): E6
22. Crockard HA, Koksel T, Watkin N. Transoraltransclival clipping of anterior inferior cerebellar artery aneurysm using new rotating applier. Technical Note. J Neurosurg 1991; 75; 483-85
23. Ogilvy CS, Barker FG, Joseph MP, Cheney ML, Swearingen B, Crowell RM. Transfacialtransclival, Approach for midline posterior circulation aneurysms, Neurosurg 1996: 39; 736-41