

Review Article

Complete bilateral blindness associated with ruptured anterior communicating artery aneurysm: A literature review and illustrative case

Teeba A. Al-Ageely¹, Mustafa Ismail¹, Noor M. Akar², Rokaya H. Abdalridha³, Mohammed A. ALAli¹, Jaber H. Obaid², Muthanna N. Abdulqader⁴, Samer S. Hoz⁵, Norberto Andaluz⁵

¹Department of Neurosurgery, University of Baghdad, College of Medicine, ²Department of Neurosurgery, University of Al-Nahrain, College of Medicine, Baghdad, ³Department of Neurosurgery, University of Babylon, College of Medicine, Babil, ⁴Department of Neurosurgery, Neurosurgery Teaching Hospital, Baghdad, Iraq, ⁵Department of Neurosurgery, University of Cincinnati, Cincinnati, Ohio, United States.

E-mail: Teeba A. Al-Ageely - teebaalageely@gmail.com; Mustafa Ismail - mustafalorance2233@gmail.com; Noor M. Akar - noor.m.akar@gmail.com; Rokaya H. Abdalridha - rokayahassan101@gmail.com; Mohammed A. ALAli - mohammeda.mohsin22@gmail.com; Jaber H. Obaid - jaberhaitham913@gmail.com; Muthanna N. Abdulqader - muthana1987@gmail.com; *Samer S. Hoz - hozsamer2055@gmail.com; Norberto Andaluz - andalun@ucmail.uc.edu



***Corresponding author:**

Samer S. Hoz,
Department of Neurosurgery,
University of Cincinnati,
Cincinnati, Ohio, United States.
hozsamer2055@gmail.com

Received : 09 October 2022
Accepted : 08 November 2022
Published : 25 November 2022

DOI
[10.25259/SNI_930_2022](https://doi.org/10.25259/SNI_930_2022)

Quick Response Code:



ABSTRACT

Background: Anterior communicating artery (AcomA) aneurysms are considered one of the most common intracranial aneurysms, contributing to approximately 40% of the subarachnoid hemorrhages related to aneurysmal rupture. Aneurysms of the anterior circulation are commonly present with visual defects varying in their nature according to the aneurysmal site. However, complete bilateral vision loss associated with AcomA aneurysms is a significantly rare finding. We are reporting a case of complete bilateral blindness in a patient with a ruptured AcomA aneurysm with a literature review.

Methods: We conducted a PubMed Medline database search by the following combined formula of subjects' headings: ((Intracranial Aneurysm [MeSH Terms]) AND (AcomA Aneurysm [Title/Abstract])) AND [(Vision loss OR Blindness [Text Word])] AND (case reports [Filter]). Additional articles were searched through the reference lists of the included articles.

Results: Our review yielded a total of five cases. All the present cases revealed unilateral blindness only, and their outcomes after treatment vary from recovery of vision to unchanged complete vision loss – none of the cases found in the literature presented with bilateral blindness.

Conclusion: AcomA aneurysms can be associated with visual loss in some cases. However, usually, the defect is unilateral. Studies of the visual defects, including potential bilateral complete blindness associated with rupture inferiorly, directed AcomA aneurysm, should be highlighted.

Keywords: Anterior communicating artery aneurysms, Blindness, Intracranial aneurysms, Vision loss

INTRODUCTION

The anterior communicating artery (AcomA) is one of the most common sites of intracranial aneurysms, and it is considered the most common site for aneurysmal rupture, accounting for approximately 40% of aneurysmal subarachnoid hemorrhage (SAH).^[2] Aneurysms of the anterior circulation presenting with visual defects can be encountered with a fluctuating nature and

This is an open-access article distributed under the terms of the Creative Commons Attribution-Non Commercial-Share Alike 4.0 License, which allows others to remix, transform, and build upon the work non-commercially, as long as the author is credited and the new creations are licensed under the identical terms.

©2022 Published by Scientific Scholar on behalf of Surgical Neurology International

slowly progressive course.^[5] However, AcomA aneurysms are considered the most common form of intracranial aneurysms with a significantly lower rate of visual manifestations (<3%). This is attributed to the fact that most of the aneurysms of the AcomA rupture before becoming large enough to compress visual pathways, so they tend to present with SAH rather than visual symptoms.^[5,9] Furthermore, complete bilateral vision loss is a significantly scarce presentation of AcomA aneurysm rupture.

Here, we report a unique case of bilateral complete vision loss associated with an inferiorly directing AcomA aneurysm, along with a review of the literature on the related cases.

CASE REPORT

A completely healthy 40-year-old female presented with sudden severe headache, neck stiffness, fever, nausea, and complete bilateral blindness with no history of loss of consciousness and was vitally stable. The patient had completely intact vision and was neurologically intact before the presentation. An imaging assessment was performed initially, her computed tomography (CT) scan showed an interhemispheric SAH, and the CT angiography showed a medium-sized inferiorly directing (AcomA) aneurysm [Figure 1].

A decision for management with surgical clipping was made. During surgery, it was observed that the inferiorly directing aneurysm was adherent to the optic chiasm, and the optic nerve had normal vascularity [Figure 2]. Clipping of the aneurysm was done with no complications. The postsurgical outcome was uneventful; yet, the patient still had complete bilateral blindness. Three months after surgery, a diagnostic catheterization angiography revealed the complete aneurysm clipping without any residual neck; both ophthalmic arteries are visualized, and a bilateral retinal blush [Figure 3]. The patient was discharged and was kept on conservative treatment along with follow-up.

LITERATURE REVIEW

Methods

We conducted a PubMed Medline database search by the following combined formula of subjects headings: (((Intracranial Aneurysm [MeSH Terms]) AND (AcomA Aneurysm [Title/Abstract])) AND ((Vision loss OR Blindness [Text Word])) AND (case reports [Filter])). Additional articles were searched through the reference lists of the included articles. We followed the Natural Course of Unruptured Cerebral Aneurysms in a Japanese Cohort Study classification of aneurysms by size based on rupture rates: small (5–10 mm), medium (5–10 mm), large (10–25 mm), and gigantic (>25 mm).^[13]

RESULTS

A total of 18 cases were found in the relevant literature. Moreover, excluding cases unrelated to AcomA aneurysms and those with vision loss as a postoperative complication, we have selected only five cases in the literature reporting AcomA aneurysms presenting with vision loss. All the cases reported showed one-sided blindness, and no case in the literature reported bilateral vision loss. According to the reported cases [Table 1], the age of the patients ranged between 22 and 56 years old, and the male-to-female ratio was 1:4. Three of the existing cases showed right-sided blindness. In contrast, the other two cases showed left-sided blindness. Surgical clipping was done in 4 cases (80%), while the endovascular approach was applied in 1 case (20%).

DISCUSSION

Intracranial aneurysms arising in the anterior circulation are closely related to the anterior visual pathway, including the ophthalmic artery, the supraclinoid segment of the internal

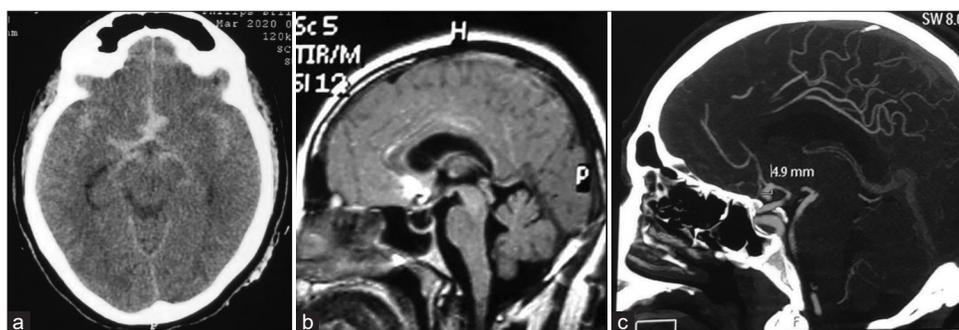


Figure 1: (a) Preoperative plain axial computed tomography scan showing subarachnoid hemorrhage in the interhemispheric fissure. (b) Preoperative sagittal magnetic resonance imaging shows the inferiorly directing aneurysm, the hyperintense lesion above it is a hematoma, while the hyperintense horizontal line below it is the optic chiasm. (c) Preoperative sagittal section cranial computed tomographic angiography showing the inferiorly directed anterior communicating artery aneurysm.

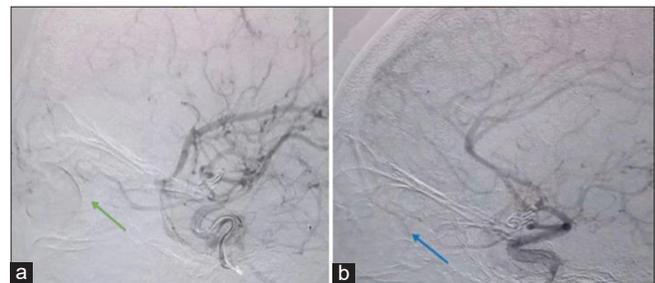
Table 1: Cases of Acoma aneurysm associated with vision loss along with their management and postoperative outcomes.

Article	Age/gender	Aneurysm direction	Aneurysm size	Rupture status	Vision loss	Management	Outcome
Sakakura <i>et al.</i> ^[11]	47/Male	-	-	Ruptured	Right	Endovascular coiling embolization	No Improvement
Bhat and Sampath. ^[1]	22/Female	Inferiorly	-	Ruptured	Left	Surgical clipping	Significant improvement 1 year postoperatively
Liu <i>et al.</i> ^[7]	55/Female	Inferiorly	7.1 × 8.3 mm	Unruptured	Left-sided visual loss and the temporal hemianopia of the right eye	Surgical clipping	Improvement of vision 3 weeks postoperatively.
Umredkar <i>et al.</i> ^[14]	45/Female	Anteroinferiorly	75 × 45 × 35 mm ³	Unruptured	Right	Surgical clipping	No Improvement
Ruben and Afshar ^[10]	56/Female	Anteroinferiorly	12 × 8 mm	Ruptured	Right	Surgical clipping	No Improvement
Al- Ageely <i>et al.</i> (current study),	40/Female	Inferiorly	6 × 4.9 mm	Ruptured	Bilateral	Surgical clipping	No improvement

Acoma: Anterior communicating artery

**Figure 2:** An intraoperative image showing the relationship between the right optic nerve (blue star) with the inferiorly directing anterior communicating artery aneurysm (black star) adhering to the optic chiasm.

carotid artery (ICA), and ICA bifurcation. In addition, the majority of these aneurysms are large to medium sized, resulting in significant compression of the visual pathway, leading to the observed visual defects.^[5] Acoma aneurysms usually are the least common aneurysms affecting vision, with only 3% of Acoma aneurysm cases suffering from visual field defects. This is attributable to their smaller sizes compared with other anterior circulation aneurysms and their high rates of rupture before enlarging enough to cause compression. On the other hand, aneurysms of the ophthalmic artery are the most commonly presenting with visual field defects, with an incidence of 32% due to its close relation to the optic nerve.^[3,5,8,9]

**Figure 3:** Diagnostic catheterization angiography 3 months after the operation showing the internal carotid arteries with intact ophthalmic arteries, visualized retinal blush (green and blue arrow) on both sides. (a) Right side. (b) Left side.

Despite the mechanism of the blindness still being unknown, ischemia caused by the presence of the aneurysm plays an essential role in the visual field defects as it was found that the capillary network of the optic chiasm receives its blood supply from the anterior cerebral artery and Acoma and any disruption in their blood flow might lead to ischemic effects in the optic chiasm.^[1,5] Moreover, spasms of perforators supplying optic nerves may be a potential explanation. However, this cannot be approved based on those observations. While penetration of the optic nerve by intracranial aneurysms is a severe complication affecting the visual pathway, it is considered quite an infrequent finding.^[4]

The most common visual defect associated with intracranial aneurysms is bilateral field deficits or bitemporal hemianopia caused by compression over the optic chiasm. In contrast, monocular visual loss is the rarest.^[1,5] The projection of the

aneurysm itself might play a role in the pattern of the visual defect.^[9] In our case, there was a bilateral visual loss, and the aneurysm was projecting inferiorly, as demonstrated in the figures.

Surgical clipping is the usual treatment of intracranial aneurysm that causes visual manifestations by clipping of the aneurysmal neck followed by hematoma or thrombus removal from the sac of the aneurysm, causing compression of the visual pathway. Surgical clipping was found to be a better option for recovery than endovascular coiling due to compression relief in surgical clipping, while the mass effect is not usually rapidly resolved by endovascular coiling.^[6,9,12] The predictability of recovery from visual defects due to aneurysms is relatively poor. It was found from a review of 165 cases that 70% of them improved, 21% remained the same, and 9% worsened after surgical clipping.^[12]

We reviewed the literature for the cases of AcomA aneurysms associated with blindness and their management and outcomes. The results were scarce, and all the cases presented unilateral vision loss. The AcomA aneurysm was directed anteroinferior in two cases, inferior and to the left in two cases, and unreported direction in the remaining case. The aneurysmal rupture was reported in three of the mentioned cases, while the other two cases did not involve aneurysm rupture complicating the pre- or intraoperative course. In the reported cases, the intraoperative view of the aneurysms showed a direct effect on the optic chiasm or the optic nerve.

The postoperative period of the reported cases went uneventful except for one in which the postoperative course was complicated and resulted in aphasia and right-sided hemiplegia. Regarding the outcome, vision loss persisted in three of the reported cases. Vision improvement was seen in two cases during the follow-up period despite eliminating the aneurysm and confirming the absence of aneurysmal recurrence.^[7,10,11,14]

AcomA aneurysms, although very common, are rarely associated with vision loss as the nature of these aneurysms causes them to rupture before leading to compression over visual pathways. In our case report, we present the only case of complete bilateral blindness associated with an AcomA aneurysm that persisted after the treatment with surgical clipping of the aneurysm.

The exact portion of AcomA aneurysms representing a cause for bilateral vision loss is not yet determined in the literature; awareness of this rare presentation of AcomA aneurysm is critical for the early detection and potential salvage of visual function.

CONCLUSION

Aneurysms of the anterior circulation can be associated with visual field defects that usually resolve after surgical

interventions. Visual loss is a rare phenomenon to be associated with ruptured AcomA aneurysms. We present a case demonstrating a possible complete bilateral blindness due to a ruptured AcomA aneurysm. Further studies are highly encouraged for a better understanding and prediction of the course of treatment and recovery.

Declaration of patient consent

Patients' consent not required as patients' identities were not disclosed or compromised.

Financial support and sponsorship

Nil.

Conflicts of interest

There are no conflicts of interest

REFERENCES

1. Bhat DI, Sampath S. Anterior communicating artery aneurysm presenting as monocular blindness. *Br J Neurosurg* 2011;25:644-6.
2. Dehdashti AR, Chiluwal AK, Regli L. The implication of anterior communicating complex rotation and 3-dimensional computerized tomography angiography findings in surgical approach to anterior communicating artery aneurysms. *World Neurosurg* 2016;91:34-42.
3. Ferguson GG, Drake CG. Carotid-ophthalmic aneurysms: Visual abnormalities in 32 patients and the results of treatment. *Surg Neurol* 1981;16:1-8.
4. Horiuchi T, Uchiyama T, Kusano Y, Okada M, Hongo K, Kobayashi S. Penetration of the optic nerve or chiasm by anterior communicating artery aneurysms: Three case reports. *Neuroophthalmology* 2011;35:128-32.
5. Kasner SE, Liu GT, Galetta SL. Neuro-ophthalmologic aspects of aneurysms. *Neuroimaging Clin N Am* 1997;7:679-92.
6. Kazekawa K, Tsutsumi M, Aikawa H, Iko M, Kodama T, Go Y, *et al.* Internal carotid aneurysms presenting with mass effect symptoms of cranial nerve dysfunction: Efficacy and imitations of endosaccular embolization with GDC. *Radiat Med* 2003;21:80-5.
7. Liu P, Lv X, Li Y, Lv M. High resolution MRI in treatment decision of anterior communicating artery aneurysm accompanied by visual symptoms: Endovascular treatment or surgical clipping? A report of two cases and literature review. *Interv Neuroradiol* 2016;22:270-7.
8. Lownie SP, Drake CG, Peerless SJ, Ferguson GG, Pelz DM. Clinical presentation and management of giant anterior communicating artery region aneurysms. *J Neurosurg* 2000;92:267-77.
9. Park JH, Park SK, Kim TH, Shin JJ, Shin HS, Hwang YS. Anterior communicating artery aneurysm related to visual symptoms. *J Korean Neurosurg Soc* 2009;46:232-8.
10. Ruben S, Afshar F. Visual failure following subarachnoid

- haemorrhage from rupture of an anterior communicating artery aneurysm. *J Neurol Neurosurg Psychiatr* 1991;54:1017.
11. Sakakura K, Ikeda G, Nakai Y, Watanabe N, Shiigai M, Uemura K, *et al.* A case of ruptured anterior communicating artery aneurysm with visual field defects and deteriorating to severe vision loss. *Brain and Nerve* 2017;69:1149-53.
 12. Schuss P, Güresir E, Berkefeld J, Seifert V, Vatter H. Influence of surgical or endovascular treatment on visual symptoms caused by intracranial aneurysms: Single-center series and systematic review. *J Neurosurg* 2011;115:694-9.
 13. UCAS Japan Investigators. The natural course of unruptured cerebral aneurysms in a Japanese cohort. *N Engl J Med* 2012;366:2474-82.
 14. Umredkar AA, Singla N, Gupta SK. Ruptured anterior communicating artery aneurysm presenting with monocular blindness. *Neurol India* 2009;57:826-8.

How to cite this article: Al-Ageely TA, Ismail M, Akar NM, Abdalridha RH, ALAli MA, Obaid JH, *et al.* Complete bilateral blindness associated with ruptured anterior communicating artery aneurysm: A literature review and illustrative case. *Surg Neurol Int* 2022;13:551.

Disclaimer

The views and opinions expressed in this article are those of the authors and do not necessarily reflect the official policy or position of the Journal or its management. The information contained in this article should not be considered to be medical advice; patients should consult their own physicians for advice as to their specific medical needs.