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CASUISTIC PAPER

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Mirror aneurysm of ICA terminus associated with adult polycystic kidney disease

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ABSTRACT

Introduction. Bilatereal saccular cerebral aneurysms (SCAs) that developed symmetrically on the same named vessels are defined as mirror aneurysms and account for a small subset of multiple cerebral aneurysms. The internal carotid artery (ICA) bifurcation is a rare location for mirror aneurysms.

Aim. We aimed to present the importance of risk status assessment for SCAs and screening in all ADPKD patients for timely detection and managementof SCAs before catastrophic complications occur

Description of the case. We present mirror aneurysms of bilateral ICA bifurcation that appear like a couple of dancing men on coronal computed tomography angiography (CTA) images, which were successfully treated with single stage coil embolization in a 45 year old female patient with medical history of autosomal dominant policystic kidney disease (ADPKD).

Conclusion. SCAs are more frequent in patients with ADPKD than in general population and also these aneurysms are more likely to rupture at earlier ages**.** Mirror aneurysms of ICA terminus can be treated effectively and safely by single stage coil embolization.

Keywords. autosomal dominant polycystic kidney disease, ICA terminus aneurysm, mirror aneurysm

Introduction

Saccular cerebral aneurysms (SCAs) also called Berry aneurysms account for the majority of intracranial aneurysms with a reported wide range of prevelance of 0.2-8.9% in asymptomatic population. Most of them occur typically at the branching points of larger vessels, with 90% occuring in the anterior circulation.[1] Bilateral SCAs that developed symmetrically on the same named vessels in the form of mirror image of each other are defined as 'mirror aneurysms' and account for a small subset of multiple cerebral aneurysms. In the study conducted to evaluate predictors of future hemorrhage in patients who had unruptured mirror aneurysms performed by the International Study of Unruptured Intracranial Aneurysms (ISUIA) investigators, the prevelance of mirror aneurysms was 12% (376 of 3120 patients). They were more prevelant in women and usually tend to be larger. While they were found to be common in patients with family history of subarachnoid hemorrhage (SAH), they were not found to be an independent precursor of SAH in the future.[2,3]

Aim

We present an unruptured mirror aneurysms of internal carotid artery (ICA) terminus established on computed tomography angiograhy (CTA) in a 45 year old

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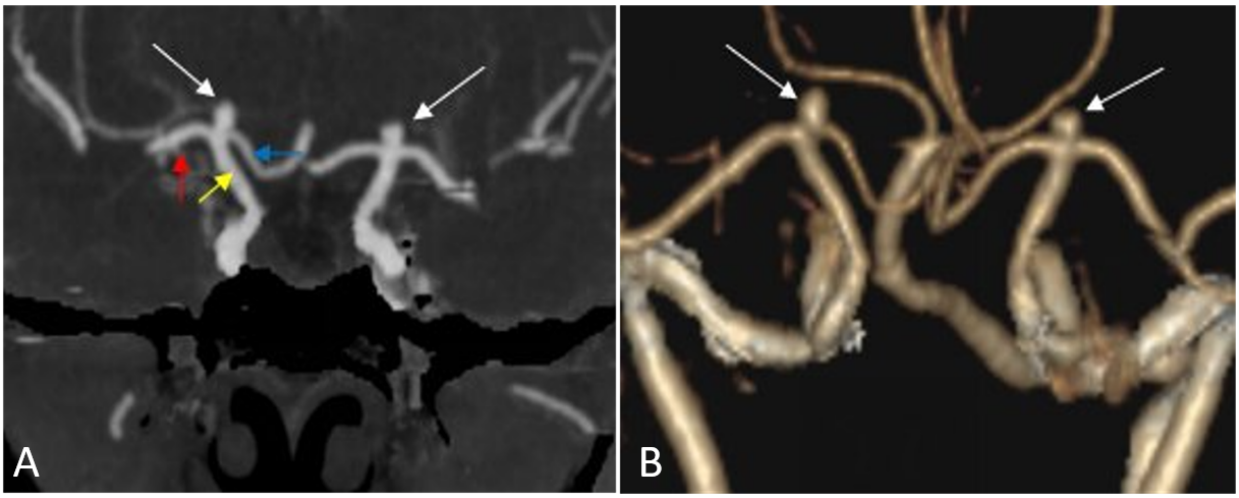

Fig. 1. CTA of the brain; maximum intensity projection image (A) and three-dimensional reformatted image (B) show mirror saccular aneurysms projecting antero-superiorly from the bifurcation point of bilateral ICA terminus, appearing like 'dancing men (white arrows), (yellow arrow: ICA, red arrow: MCA-M1 segment, blue arrow: ACA-A1 segment)

female patient with medical history of autosomal dominant polycystic kidney disease (ADPKD).

Description of the case

A 45 year old female patient presented with the complaint of longlasting intermittant headache. Her medical history was remarkable with the presence of ADPKD and a family history of subarachnoid hemorrhage in her brother years before. Due to the family history and the presence of PCKD both of which are associated with increased incidence of cerebral aneurysm, CTA of brain was performed. A paired symmetrical unruptured aneurysms in bilateral ICA bifurcation that mirror each other and appear like 'dancing men' on coronal images were revealed. In addition to being located symetrically on the same named vessels, they were also both projecting anterosuperiorly and had the same size of 4x3.5 mm. Both of them showed uniform, bright enhancement without thrombosis or calcification (Fig. 1). There were no branches taking off from or in the vicinity of the aneurysms. The right posterior communicating artery (PCoA) was hypoplasic with a diameter of less than 0.5 mm, but the rest of the circle of Willis was unremarkable (Fig. 2). The mirror aneurysms were succesfully treated with single-stage bilateral coil embolization (Fig.3).

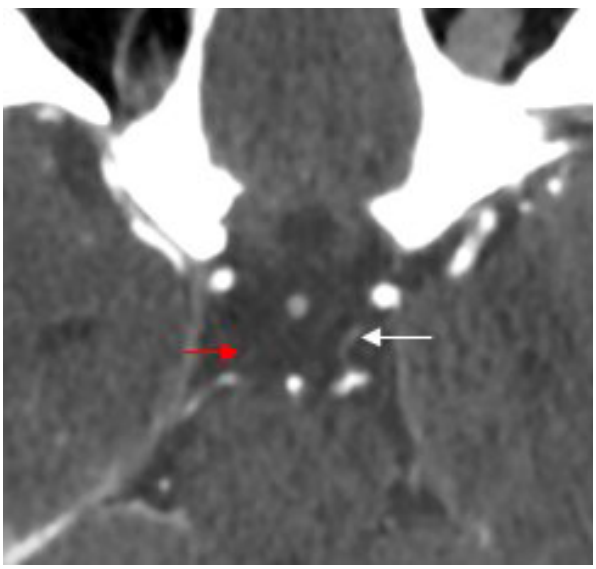

Fig. 2. Axial image of the CTA of the brain showing right hypoplasic PCoA (red arrow). The left PCoA was normal in caliber (white arrow) and the remaining of the circle of Willis was unremarkable

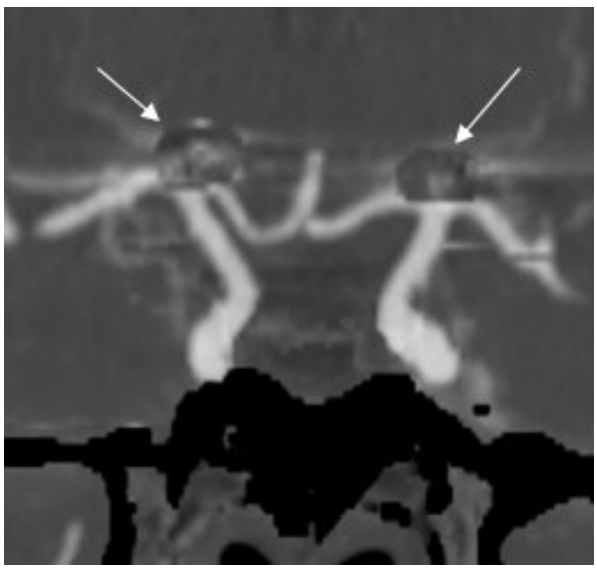

Fig. 3. Maximum intensity projection image of CTA of the brain showing the artefacts associated with the coil embolization of the mirror aneurysm (white arrows)

Discussion

SCAs have a well recognized association with ADPKD.[2] As in general population familial predisposition for the formation of SCAs is apperant among the patients with ADPKD in whom the SCAs are found in up to 16% of patients with a family history of aneurysms [1,4] . In addition, the risk of rupture of these cerebral aneurysms at an earlier age is higher in familial patients than those having nonfamilial, sporadic ones.[4,5] SCAs are multiple in approximately 15% to 45% of the cases of cerebral aneurysms.[6] However, occuring in the form of mirror aneurysms symmetrically at the same named vessels are not frequent. In addition, the ICA bifurcation is a rare location for these mirror aneurysms. In the ISUIA study the most common location of mirror aneurysms was the middle cerebral artery (MCA) which was involved in 126 patients (34%).[2] In the retrospective review of 172 cases treated for 344 mirror aneurysms performed by Choi et al., the ICA bifurcation was reported only in 4 patients (2.3%). In this study, the MCA bifurcation was seen in 83 patients (48.2%) and was reported as the most common site of involvement.[7] In a review of ADPKD patients with ruptured cerebral aneurysm it was revealed that most of ADPKD patients with ruptured cerebral aneurysms were young, female patients having small aneurysms located in the anterior circulation.[8] In a single center cohort of 495 consecutive patients with ADPKD submitted to targeted cerebral aneurysm screening, it was concluded that the intracranial aneurysm rupture rate is high in ADPKD despite targeted screening, and involves mostly patients without familial risk factors for cerebral aneurysm.[9] Current American Heart Association/American Stroke Association (AHA/ASA) guidelines recommend noninvasive screening to all patients with ADPKD.[10] On the other hand, the Kidney Health Australia – Caring for Australasians with Renal Impairment (KHA-CARI) 2015 guideline suggest screening for intracranial aneurysms in high-risk individuals with ADPKD that is those with a positive family history of subarachnoid hemorrhage, intracerebral hemorrhage, and/or unruptured intracranial aneurysm in at least one affected first-degree relative.[11] Similarly, Kidney Disease Improving Global Outcomes (KDIGO) experts recommended only targeted- selective screening based on the presence of other risk factors like family history of intracranial aneurysm or subarachnoid hemorrhage, previous intracranial aneurysm rupture, high-risk professions such as airline pilots and patient anxiety despite adequate information.[12] In the management of detected, unruptured mirror aneurysms, as in all aneurysms, some nonspecific measures are recommended to all patients like blood pressure control, smoking cessation. The treatment decision must be carefully made in an individualized manner. Endovascular or neurosurgical treatment should be considered in patients with high rupture risk aneurysms or growing aneurysms.[13] Single stage treatment is preferred, if applicable, in order to prevent further delay that can be associated with the rupture of one of the aneurysms and to avoid second general anesthesia. In their retrospective review, Choi et al. suggested that when applicable, single-stage coil embolization should be considered as a reasonable treatment option for mirror aneurysms.[7] Our patient has also be successfully treated with single stage coil embolization. The aneurysms considered at low rupture risk can be followed by serial imaging to avoid possible treatment related complications. Repeat screening every 5 years with MR angiography after a negative initial study and annual surveillance MR angiography in patients with detected, incidental intracranial aneurysm have been showed as cost effective.[13]

Conclusion

Since SCAs are more frequent in patients with ADPKD than in general population and also these aneurysms are more likely to rupture at earlier ages. Risk status for intracranial aneurysms should be carefully assessed in all ADPKD patients and screening should be conserned in these patients for timely detection and management before catastrophic complications occur. Management should be performed in an individualized manner and the aneurysms with high rupture risk should be appropriately managed before catastrophic complications occur. Mirror aneurysms of ICA terminus can be treated effectively and safely by single stage coil embolization.

Declarations

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Author contributions

Conceptualization, B.E. and N.N.W.; Methodology, B.E. and O.C.; Formal Analysis, B.E. and M.O.C.; Investigation, B.E., O.C. and N.N.W.; Data Curation, B.E. and N.N.W.; Writing – Original Draft Preparation, B.E. and O.C.; Writing – Review & Editing, B.E., O.C. and M.O.C.; Supervision, B.E. and N.N.W.

Conflicts of interest

The authors declare no conflict of interest.

Data availability

All data generated or analyzed during this study are included in this article [and/or] its supplementary material files. Further enquiries can be directed to the corresponding author.

Ethics approval

Informed consent was taken from the patients.

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