Spontaneous Micro Aneurysmal Subarachnoid Hemorrhage Secondary to Anterior Choroidal Artery Aneurysm: A Case Report with Review of Literature

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Abstract

Background: Spontaneous subarachnoid hemorrhage (SAH) secondary to a microaneurysm (≤ 2mm) is not well described in the literature. Moreover, based on the current literature, the likelihood of a small aneurysm to rupture is close to ≤ 1%. We describe a rare case that presented with spontaneous SAH and was found to have a microaneurysm of the anterior choroidal artery [AChoA] on a digital subtraction angiography (DSA). We also performed a brief literature review pertaining to the clinical characteristics and management aspects of intracranial microaneurysms.

Clinical Presentation: A 73-year-old female presented with the sudden onset of severe headaches. The patient was found to have a Fisher grade 4 SAH. Angiogram revealed a 1.9 mm x 1.3 mm x 1.2 mm microaneurysm of the AChoA. Due to the small nature of an aneurysm and the involvement of the AChoA, the aneurysm was best suited for a flow-diverting stent. We elected to wait one week before endovascular treatment primarily to be able to use antiplatelet agents for the procedure in the light of a recent SAH.

DSA one week later revealed a significant increase in the size of the microaneurysm to 3 mm x 2.9 mm with a 2.2 mm. The initial plan of flow diversion was aborted secondary to increased dimensions of an aneurysm and ability to place coils without sacrificing the AChoA. The patient tolerated the procedure well and remained neurologically stable.

Conclusion: Microaneurysms associated with intracerebral hematomas secondary to underlying hypertension are well established; however, there is scant literature on spontaneous SAH secondary to its rupture. Although the literature shows a small risk of rupture, there exists a risk and consequent poor clinical outcome. With our current understanding of the natural history of aneurysms, our case of SAH secondary to microaneurysmal rupture argues against its conservative management. Also, ‘one week wait and watch policy’ after the initial diagnosis may effectively favor coil embolization as its primary line of management.

Keywords: Subarachnoid; Hemorrhage; Microaneurysm; Spontaneous; Coiling

Introduction

Microaneurysms, also named as Charcot-Bouchard, miliary, sessile, or a baby aneurysm first described by Charcot and Bouchard in 1868, are associated with intracerebral hematoma and hypertensive arteriopathy [1–4]. They are described as being 2 mm or less in size, usually found at bifurcations of the vessels and rarely detected by angiography [3]. Formation of microaneurysms is contributed to long-standing hypertension, fibrinoid necrosis, or arteriosclerosis of the vessel wall [5]. Little information is known about the natural history or growth rate of microaneurysms.

Fisher described four types of microaneurysms: a saccular aneurysm, lipohyalinotic aneurysm, fusiform aneurysm, and bleeding globe (pseudoaneurysm) an aneurysm [2]. Saccular aneurysms, often arising at a bifurcation, does not contain muscle or elastic tissue. There are surrounding macrophages indicating recent and old hemorrhage. These aneurysms are found in areas common of hypertensive hemorrhage. Lipohyalinotic aneurysms are found in the cerebral cortex. Fusiform aneurysms are found in penetrating arteries of the cortex. Bleeding globe aneurysms have red blood cells and platelets with enveloping fibrin. These are typically found in large hemmorhages [4–6].

Based on the International Study of Unruptured Intracranial Aneurysms (ISAT), microaneurysms pose a low risk of rupture [7]. However, they are typically associated with intracerebral hematoma secondary to underlying hypertension [2]. Therefore, it is debatable that an incidental finding of a microaneurysm warrants treatment. Sometimes, they are found incidentally while clipping another aneurysm. Treatment of microaneurysms has traditionally included surgical clipping, bipolar cautery, wrapping or trapping and more recently, endovascular approaches such as coil or pipeline embolization [flow diverter placement] [3,8–21].

We made a thorough search and review of literature in PubMed and Cochrane database for articles reporting only on microaneurysms causing subarachnoid/intracerebral hemorrhage. Takebayashi and Kanelo studied the lenticulostriate arteries regarding the etiology of hypertensive intracerebral hemorrhages in 20 patients and found microaneurysms in 7 patients, of which two were ruptured [22]. Wakai, et al [23]. in 1992 studied 50 consecutive intracerebral hematomas that underwent hematoma evacuation, of which 42 patients had a pre-operative angiogram. Approximately, 22% of the patients were found to have microaneurysms as the cause of intracerebral haemotoma. Although there are multiple kinds of literature reporting microaneurysms causing intracerebral hemorrhage, the authors found one case report of a microaneurysm causing an subarachnoid hemorrhage (SAH) with a coinciding traumatic event [5,22,24,25]. To the best of our knowledge, we could not find any report of a subarachnoid hemorrhage [SAH] solely caused by a microaneurysm. We describe a case where a patient presented with SAH and was found to have a microaneurysm of the anterior choroidal artery [AChoA] which changed in size in seven days to accommodate the coils.

Case Presentation

A seventy-three-year-old African American female with a past
medical history of hypertension, type 2 diabetes mellitus, hyperlipidemia, coronary artery disease, and heart failure status-post pacemaker, presented with a sudden onset of a severe headache and neck pain. A computed tomography (CT) scan of her head showed a Fisher grade 4 SAH. The patient was slightly confused, awake, and following commands symmetrically in all extremities (Hunt Hess 3). A repeat CT head showed an interval increase in ventricular size. The patient developed somnolence and deteriorated to localizing. She was subsequently intubated and received an external ventricular drain. A CT angiogram was negative for any vascular abnormality. The following day, the patient underwent an angiogram, which showed a left AChoA a wide-necked aneurysm measuring 1.9 mm x 1.3 mm with a 1.2 mm neck. Due to the small size of an aneurysm unlikely to harbor coils without compromising the AChoA (Figure 1 A), it was determined that a flow-diverting stent would be used to treat an aneurysm. After discussing surgical and endovascular options, the patient’s family elected to pursue endovascular treatment. We elected to wait approximately one week before treatment. This would allow any cerebral edema to subside and decrease the risk of procedure-related hemorrhage due to the use of antiplatelet agents with the deployment of a stent.

A repeat angiogram one week later did not reveal any new vascular abnormalities; however, the left AChoA an aneurysm previously diagnosed had a significant increase in size, measuring 3 mm x 2.9 mm with a 2.2 mm neck (Figure 1 B). An aneurysm was large enough to be treated with coil embolization without a stent. Two Stryker helical ultrasoft coils (Target® 360 detachable coils) were deployed without any complication. Special attention was made to coil an aneurysm without occluding the artery originating from the neck of an aneurysm (Figure 1 C). Therefore, a small residual of the neck was left untreated intentionally to avoid occlusion of the AChoA.

The patient tolerated the procedure well and her post-operative neurological status remained the same. During her recovery, she developed ventilator-associated pneumonia and had difficulty weaning off the ventilator. She received a tracheostomy and a feeding tube. The patient was ultimately discharged to a nursing home in stable condition.

Discussion

In this particular case, two angiograms approximately one week apart showed an interval growth of an aneurysm. Based on the bleeding pattern and neurological examination, it was unclear if the AChoA an aneurysm was the source of the hemorrhage. The volume of an aneurysm on the first angiogram was unlikely to harbor coils; therefore, the plan of care was that an aneurysm would be treated with a flow-diverting stent. Due to the recent hemorrhage, recently placed an external ventricular drain, and need of antiplatelet agents for the stent, the authors decided to treat an aneurysm the following week. This would also allow time for any cerebral edema to subside and possibly convey another vascular abnormality on the subsequent angiogram. On the repeat angiogram, the aneurysm was large enough to harbor coils, thus avoiding the need for a stent. The rapid increase in the size of an aneurysm indicated a potentially aggressive and unstable aneurysm. Microaneurysms may be thin-walled and as significant growth spurt was seen in this particular case, the aneurysm was considered to be a high risk of intra-procedural rupture with coil deployment [8]. That influenced the authors to use soft coils for embolization to minimize manipulation and force within an aneurysm. Since the AChoA branched off the neck of an aneurysm, close attention was paid to not occlude an entire aneurysm and potentially occluded the AChoA. The small residual at the base of the neck will warrant close follow-up to monitor for recurrence.

Historically, microaneurysms have been treated surgically and more recently, endovascularly [3,8–21]. Because of its size, microaneurysms can be difficult to treat surgically. It can present with a thin wall, where surgical manipulation during clipping could lead to rupture. It can be too small to accept a clip or may risk tearing the parent artery. Because of its size and difficulty, microaneurysms have been treated with various techniques, such as bipolar cautery or wrapping with muscle, plastic, muslin, or cotton. The concept of wrapping an aneurysm was first described by Dott NM [26] in 1931 when he used muscle to wrap a middle cerebral artery aneurysm. Yasargil MG [27] described a bipolar cautery technique of irrigation on the bipolar forceps, compression of the microaneurysm, and several low-amperage deliveries. Guerreiro NR, et al. [28]
compared bipolar cautery to cotton wrapping in a rat model with microaneurysms at the abdominal aorta bifurcation. The authors found that bipolar cautery caused fewer adhesions to surrounding structures but did rupture afterward when pressures were increased. On the other hand, cotton wrapping was found to have firm adhesions to surrounding structures but did not rupture when pressures were increased. These alternatives to clipping continue to be a practical option in cases of microaneurysms where clipping is deemed too difficult.

Microaneurysms may be too small to harbor coils and could lead to intra procedural rupture if coils are forcefully deployed into an aneurysm. Other endovascular techniques have been described to deal with this kind of difficult lesions, i.e. extra sacular coiling assisted with a balloon, flow diversion etc [8]. With the recent advent for flow-diverting stents, the risk of coiling a microaneurysm has lessened; however, the use of antplatelet agents with stents carries its own set of risks. In addition to it, placement of the pipeline itself can lead to AChoA occlusion.

In our case, one argument to consider is that the actual dimensions of an aneurysm on the first angiogram were smaller due to local compression from cerebral edema, thus voiding its classification of a microaneurysm. Although this is a valid argument and supports why repeat angiograms are performed if initial findings are negative, the small dimensions of this particular aneurysm contradict what is accepted as the natural history of small aneurysms. Whether a microaneurysm is found to have caused a hemorrhage or found incidentally, there is a risk of rupture and treatment should be considered. Our study suggests ‘one week wait and watch’ policy after the diagnosis in getting the aneurysm bigger enough to accommodate the coils rather than the absolute conservative management.

Conclusion

Microaneurysms associated with intracerebral hematomas secondary to underlying hypertension are well established; however, there is scant literature on spontaneous SAH secondary to its rupture. Although the literature shows a small risk of rupture, there exists a risk and consequent poor clinical outcome. With our current understanding of the natural history of aneurysms, our case of SAH secondary to microaneurysmal rupture argues against its conservative management. Also, ‘one week wait and watch policy’ after the initial diagnosis may effectively favor coil embolization as its primary line of management.

Conflict of Interest and Funding Source

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