Case Report

Association between pituitary adenomas and intracranial aneurysms: An illustrative case and review of the literature

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The co-existence of cerebral aneurysms and pituitary adenomas is rare. Here, we report a patient with a coexisting anterior communicating artery aneurysm and a pituitary adenoma and review the available literature concerning this phenomenon. There is a debate in the literature regarding any causal relationship between aneurysms and pituitary tumors, although there are many reports of aneurysms caused by trauma or radiation following treatment of pituitary tumors. These simultaneous lesions are best diagnosed with magnetic resonance imaging with magnetic resonance angiography. Craniotomy for simultaneous aneurysm clipping and resection of the pituitary tumor is the best treatment option.

Key words: Cerebral aneurysm, pituitary tumor, subarachnoid hemorrhage

The earliest case reports of the coexistence of anterior circulation aneurysms and pituitary adenomas date back to 1959.[1] Based on the various series reported in the literature, the incidence is approximately 3.6%. The coexistence of pituitary adenomas with anterior circulation intracranial aneurysms raises the question as to whether a causal relationship exists. When the coexistence is present, it is usually associated with growth hormone secreting tumors or nonsecreting tumors. Here we present a case of a 73-year-old man who presented with a ruptured anterior communicating artery aneurysm. His workup revealed the coexistence of a pituitary macroadenoma. Our management of these two lesions as well as a review of the literature is presented.

Case Report

A 73-year-old right-handed white male presented with the worst headache of his life, blurred vision and photophobia. Computed tomography (CT) of his head revealed findings suggestive of a suprasellar lesion. The CT angiography confirmed the presence of an anterior communicating artery aneurysm that measured approximately 9 mm. An approximately 1.8 cm lesion suggestive of a pituitary macroadenoma was also present [Figure 1]. The CSF analysis showed the fluid to be xanthochromic. Magnetic resonance imaging (MRI) and magnetic resonance angiography (MRA) revealed a 17 x 21 x 21 mm suprasellar mass and a 9 mm saccular aneurysm at the level of the anterior communicating artery [Figure 2].

Endocrine evaluation revealed no abnormalities. The patient was taken to the operating room where he underwent a cranial orbital osteotomy for clip ligation of the anterior communicating artery aneurysm and resection of the suprasellar mass, which was consistent

Figure 1: CT scans with contrast demonstrating anterior communicating artery aneurysm and suprasellar lesion

Figure 2: Sagittal and coronal MRI scan with contrast showing the suprasellar lesion

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with a pituitary macroadenoma. Intraoperative angiogram and postoperative CT showed no evidence of aneurysm or tumor [Figure 3]. The patient was monitored in the ICU where he continued his recovery and improved cognitively and physically. By the time of discharge, he had achieved independence in his activities of daily living. At his three-month follow-up appointment, he continues to do well.

**Discussion**

Etiology of aneurysms in the context of pituitary tumors.

Cases of infectious and traumatic aneurysms in the context of pituitary tumors have been reported. Onishi et al. reported an intracranial mycotic aneurysm following a transsphenoidal surgery for a pituitary adenoma. After treatment with four months of antibiotics, repeat angiography showed no aneurysm present.[2] Mielke et al. reported an intracranial fungal aneurysm that became fatal 10 months after transsphenoidal surgery for a growth hormone secreting adenoma.[3]

Wilson and Dempsey reported one of the first traumatic aneurysms during a transsphenoidal surgery in their series of 250 pituitary adenoma surgeries.[4] In 1990, Reddy et al.[5] treated a patient with acromegaly who had epistaxis postoperatively, but angiography didn’t show any abnormality. Five weeks later, another angiography revealed an aneurysm in the cavernous ICA that was treated by surgical trapping. Recently, Laidlaw et al.[6] reported a spontaneous rupture of an aneurysm which coexisted with pituitary apoplexy.

There have been many studies that have shown an association between intracranial aneurysms and radiation that was used to treat pituitary adenomas. This presumably occurs due to radiation-induced arterial damage, which leads to loss of arterial muscle with necrosis and fibrosis of the tunica intima and media, thus causing dilation of the arterial walls. Nishi et al.[7] were the first to report a case of multiple intracranial aneurysms associated with radiation therapy for the treatment of pituitary adenoma. Nine years after radiation treatment of 5000cGy, the patient reported visual disturbances and was found to have these multiple aneurysms.

Several studies have also attempted to link the coexistence of pituitary adenoma and intracranial aneurysms to mechanical factors. In their study of 116 cases, Pia et al.[8] reported that microanatomical changes in the cerebral circulation from compression or traction might lead to increase in blood flow and lead to aneurysmal formation. Hori et al.[9] reported a case of growth hormone secreting pituitary adenoma in direct contact with right ICA aneurysm. They suggested that the aneurysm arose as a result of a traction mechanism that the pituitary adenoma had when it reduced its size that led to the enlargement of the aneurysm.

Hormonal and microcirculatory influences have been suspected as a major etiological factor. There have been many studies with growth hormone pituitary adenomas and intracranial aneurysms. Acqui et al.[10] studied 62 cases of pituitary adenomas and intracranial aneurysms and stated that mechanical, microcirculatory and hormonal factors, especially growth hormone, play an important role in the formation of intracranial aneurysms. In their review of the literature, they reported that ~ 50% of the pituitary adenomas associated with intracranial aneurysms were growth hormone secreting.

Diagnosis of pituitary adenoma and intracranial aneurysm was a challenge before the advent of CT or MRI. Several authors have recommended the use of angiography in evaluating suprasellar masses, but Houdart et al.[11] did a comparison of MRI, CT and angiography and reported that MRI was superior to CT in differentiating parasellar masses and to differentiate pituitary tumors and aneurysms. In 1988, Hirsch et al.[12] did a diagnosis of pituitary adenoma and intracranial aneurysm in one study. Patients with known pituitary tumors and intracranial aneurysms who complain of severe headache present a diagnostic dilemma of pituitary apoplexy versus aneurysm rupture. A thorough workup including CT, MRI and cerebral angiography is warranted. Lumbar puncture for CSF analysis, as was performed in our case, may also be necessary.

Therapeutic approaches for pituitary adenoma and intracranial aneurysms have also made numerous advances. Gonzalez et al.[13] have reviewed three different approaches (frontotemporal, orbitozygomatic and maxillary extension of the orbitozygomatic) and found that the orbitozygomatic had much greater working area than the frontotemporal approach. Recently, Revulta et
al.\textsuperscript{13} have reported a minimally invasive neurosurgical technique using a supraorbital keyhole approach to treat a left carotid aneurysm and pituitary adenoma.

Intracranial aneurysms and pituitary adenomas have been reported by multiple authors in multiple studies, yet a clear association between them still does not exist. Magnetic resonance imaging and MRA are the best diagnostic approaches to these lesions. The transsphenoidal surgical approach should be avoided in patients with coexisting intracranial aneurysm and pituitary adenoma, as this can lead to the rupture of the aneurysm.

References


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