Unilateral Acute Closed-Angle Glaucoma After Elective Lumbar Surgery Reveals Multiple Intracranial Aneurysms. A Case Report and Discussion on Workup of Differential Diagnoses

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Key words
- Acute closed-angle glaucoma
- Cerebral aneurysm
- Durotomy
- Lumbar
- Postoperative complication
- Spine surgery

Abbreviations and Acronyms
AACG: Acute angle-closure glaucoma
CSF: Cerebrospinal fluid
IOP: Intraocular pressure

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The purpose of our paper is to present a case of a rare complication of posterior lumbar surgery. Our patient presented for elective lumbar decompression, which was complicated by durotomy. She then developed sudden headache and right eye pain once upright on postoperative day 2. Then on postoperative day 3, she developed a dilated nonreactive pupil with extraocular movements intact. A computed tomography scan of the head was negative for subarachnoid hemorrhage. Magnetic resonance angiography showed a possible right posterior communicating artery aneurysm. She was transferred to a tertiary center with a severe headache and a nonreactive pupil, raising concern for evolving third nerve palsy due to aneurysm. A cerebral angiogram was performed and showed multiple aneurysms. Aneurysm location did not explain the patient's symptoms, and ophthalmology was consulted. Elevated intraocular pressure was noted, and the patient was diagnosed with acute angle-closure glaucoma (AACG). Our patient was medically treated and subsequently underwent laser peripheral iridotomy. She has had improved vision and pupillary function at 1 month follow-up. The diagnosis is complicated by a durotomy, which led to cascade in the differential diagnosis to rule out intracranial pathology. Her age and home medications, which had sympathomimetic effects, placed her at increased risk, but lying prone in the dark under the drapes was likely the lead causative factor. In conclusion, a postoperative posterior spine patient with eye pain and changes in vision and pupils should be evaluated with AACG in mind due to the devastating consequences if left untreated or treatment is delayed.

INTRODUCTION

Acute angle-closure glaucoma presents with dramatic-onset severe ocular pain, headaches, eye injection, mid-dilated nonreactive pupil, and blurred vision often with rainbow-colored halos around lights. Acute primary angle-closure glaucoma occurs due to relatively sudden blockage of the trabecular meshwork by the iris, preventing drainage of aqueous humor from the eye, and resulting in dramatically increased intraocular pressure (IOP). This increase in IOP causes a pressure gradient to build in the posterior chamber of the eye, resulting in anterior bowing of the iris and crowding, or narrowing, of the angle with partial or complete blockage of the trabecular meshwork (1, 33, 37). By providing an alternative route of communication between the anterior and posterior chambers of the eye via a peripheral laser iridotomy, this posterior pressure gradient is relieved and the iris can move posteriorly to its normal orientation. Its workup is critical as aneurysm rupture or sentinel bleed can mimic ocular findings. Posterior communicating artery aneurysms are notorious for presentation of a dilated and nonreactive pupil with incomplete or partial third nerve palsy in up to 36% cases (20). A small number (6.3%) of patients can present with face or eye pain as an early warning sign of impending aneurysmal bleed (27).

One percent of patients who present with headache will have a ruptured saccular aneurysm. Twenty-five percent of patients who complain of acute onset of the worst headache of their life will have saccular aneurysm rupture (6). Through previous study, those most prone to angle-closure glaucoma are older and Asian, which predispose them to increased lens thickness and narrow anterior chamber (24). Early and prudent diagnosis is critical for both disease processes.

Here we review a patient presenting with midpositioned and fixed pupil due to unilateral acute closed-angle glaucoma. The patient had multiple undiagnosed aneurysms. Acute glaucoma can be found within the workup for subarachnoid hemorrhage at presentation. Its early diagnosis and treatment are essential for good recovery due to this disease representing an ophthalmic emergency.

CASE REPORT

History

The patient is a 72-year-old white female with a history of lumbar radiculopathy with history of surgery with fusion 8 months before presentation at an outside hospital. The patient had worsening radicular symptoms with stenosis on

magnetic resonance imaging and underwent posterior lumbar decompression complicated by durotomy. The patient was kept flat postoperatively to prevent spinal headaches and to aid in healing of the durotomy. She ambulated well on postoperative day 1. After rising on postoperative day 2, our patient developed a severe headache and was kept flat. On postoperative day 3 she noted blurry vision in her right eye with right eye pain and mydriasis. An anesthesiologist examined the patient and could not discern any anesthesia-related complication. A computed tomography scan (CT) of the head was obtained, but no subarachnoid hemorrhage was noted. Magnetic resonance angiography was performed, showing possible right posterior communicating aneurysm. She was transferred to our facility with reported partial third nerve palsy and possible aneurysm.

EXAMINATION

On arrival, our patient was noted to be alert and cognitively intact. Her right eye was noted to be anisocoric to 6 mm and nonreactive. Extraocular movements were intact without evidence of afferent pupillary defect. She was also noted to have decreased visual acuity in the right eye. No other neurologic deficits were noted.

Workup

The patient underwent CT angiography of the head, which revealed a left C6 segment aneurysm. Because these findings did correlate with symptoms or magnetic resonance angiography, she had cerebral angiography performed (**Figure 1**). Four aneurysms were noted on the study: right ophthalmic segment aneurysm, right cavernous segment internal carotid artery aneurysm, left ophthalmic segment aneurysm, and left superior hypophyseal aneurysm. Her symptoms did not correlate with the findings; ophthalmology was consulted.

Consult

On initial bedside ophthalmology evaluation, our patient denied eye pain. She had mildly elevated IOP of 24 and 22 mm Hg for right and left eyes, respectively, along with mild injection and chemosis and slit lamp examination in the eye clinic was recommended. On the third hospital day, she was sent to the ophthalmology clinic for formal evaluation. IOP at that time was noted to be 45 mm Hg in the right eye with shallow anterior chamber, pupillary block, and corneal edema consistent with acute angle-closure glaucoma (AACG). Her left eye was also found to be anatomically narrow and at risk for AACG. She underwent a laser peripheral iridotomy of the right eye to relieve pupillary block. She was medically treated with dorzolamide/timolol, latanoprost, prednisolone, and acetazolamide. Amitriptyline was stopped due to sympathomimetic effects. Her IOP improved and returned to normal after laser peripheral iridotomy and IOP-lowering medications. She was taken for a laser peripheral iridotomy of the left eye the following day. No change was noted in her pupil reactivity, and her IOP returned to normal along with improved vision in the right eye.

Follow-up

The patient improved and was discharged home with a plan to return for treatment of her aneurysms on an elective basis. At 4 months' follow-up, she was noted to be doing well with improved vision and trace pupil reactivity. She was brought back at 3 and 4 months after diagnosis for pipeline stenting of the right and left internal carotid artery aneurysm, respectively, without complication.

DISCUSSION

Our patient presented an interesting scenario, where she developed AACG in the postoperative setting with many confounding issues arising. Due to the symptoms of AACG, it is commonly mistaken for subarachnoid hemorrhage due to severe headache and worked up accordingly as in our patient (18). She was actually found to have multiple aneurysms that were unruptured and unlikely to cause symptoms. Our team noted the discordance between examination and imaging, and ophthalmology was consulted with improvement in examination after appropriate treatment.

The delay in diagnosis could have led to permanent vision loss. Our case is interesting because there were several overlapping differential diagnoses. First, our patient's spinal headache is unknown to be truly caused by cerebrospinal fluid (CSF) egress or if it was an early sign of AACG. This should be able to be differentiated on the basis of the postural nature of the headache, but it led to an incorrect cascade in the differential diagnosis. Once the patient developed pupillary changes in the background of a CSF leak, the patient was worked up for intracranial hemorrhage, which was negative. The patient was incorrectly diagnosed with a third nerve palsy in the background of severe headache, which led to the workup for aneurysms, which were found. When no posterior communication artery aneurysm was found, then ophthalmology was consulted and the diagnosis was made.

It is important as neurosurgeons to remember the symptoms and examination for AACG because many patients are worked up for cerebral aneurysms and can be exacerbated by prone positioning as in lumbar spine surgery. On reviewing the chart, our patient was found to have multiple risk factors for development of AACG that are likely not contemplated during the preoperative assessment. AACG is most commonly found in elderly women (3, 7). Cataracts, an age-related phenomenon, can cause lens thickening resulting in shallow anterior chamber and narrow angle. Patients who are hyperopic also have shorter axial lengths resulting in more crowded anterior chamber angles (21). Sympathomimetic medications cause dilation of the pupil, which further crowds and narrows an already narrow angle (3, 4). Her home medications included amitriptyline and ropinirole, which have sympathomimetic effects. The stresses of anesthesia and surgery have also been shown to lead to AACG (2, 4, 5, 9-11, 21, 23, 25, 30, 36). With this in mind our elderly lumbar patient population was assessed to reduce risk factors and stop medications that could reduce the risk of potentially significant complication.

Reviewing anesthesia records revealed no use of sympathomimetic drugs were used during the case. The patient was placed prone for the case with eyes taped shut under drapes. This was likely the largest risk factor for her developing AACG (14). The dark room prone test has been used with up to 90% specificity to diagnose narrow-angle glaucoma with reduction only to 50% in a lit room (12). Prone positioning can increase IOP up to 34 mm Hg in patients with narrow-angle