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Spiral CT of an Orbital Venous Malformation

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Summary: Spiral CT with a single breath-hold technique was useful in diagnosing an orbital venous malformation by demonstrating an increase in size of the lesion during a Valsalva maneuver.

Index terms: Veins, abnormalities and anomalies; Orbits, neoplasms; Computed tomography, technique

Although spiral computed tomography (CT) has certain advantages in other anatomic sites, particularly the thorax (1), abdomen (2, 3), and larynx (4), its advantages over conventional CT imaging in the orbit have been shown in only several clinical scenarios. Use of spiral CT in pediatric craniocervical imaging has been reported recently, with the advantages of shorter scanning time, less motion artifact, and the need for less sedation and intravenous contrast material (5). In addition, we have used spiral CT in cases of severe orbital trauma in which the patient was either unconscious or wearing a cervical collar, in order to minimize the time needed for a complete scan and obtain acceptable coronal reformatting from direct axial imaging. The patient we describe here presented with clinical characteristics for which spiral CT could be optimally used to maximize the radiographic appearance of an orbital venous malformation.

Case History

A 32-year-old man was transferred from an outlying hospital with progressive proptosis and visual loss on the right after being struck by a cardboard box. He denied any previous ophthalmic history. On examination, the patient's vision in the right eye was decreased to 20/200, with a markedly increased intraocular pressure and a relative afferent (Marcus Gunn) pupillary defect. Computed tomography (General Electric [Milwaukee, Wis] 9800 Advantage) revealed a homogenous mass occupying the in-

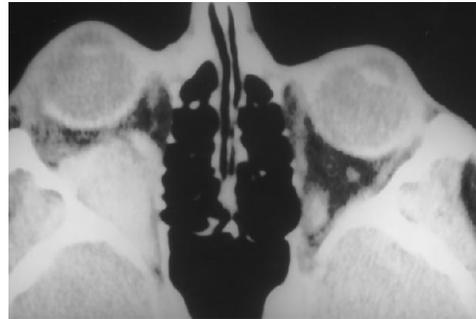


Fig 1. Axial CT with intravenous contrast at the level of the middle orbit. Right exophthalmos is seen. An intraconal lesion with poorly defined anterior borders is visible and was interpreted as a dense intraconal orbital hemorrhage. Anterior to the mass, a reticular pattern is seen in the orbital fat, consistent with orbital hemorrhage.

ferior and posterior right orbit, consistent with hematoma (Fig 1). Anterior to this density, a reticular pattern was seen in the anterior orbital fat, consistent with retrobulbar hemorrhage. Despite aggressive therapy with intravenous osmotic agents, the orbital compartment syndrome and optic neuropathy persisted, requiring a lateral canthotomy and inferior cantholysis. After this procedure, the patient's intraocular pressure returned to normal and vision improved to 20/40.

The patient did well after canthotomy and cantholysis, with final vision improving to 20/15 and complete resolution of his compressive optic neuropathy. He was asymptomatic and his exam remained stable during the ensuing 6 months. One year after the initial trauma, the patient noted intermittent symptoms of right retrobulbar "pressure sensation," fullness of the right upper eyelid, and diplopia, which occurred on awakening or when the patient bent over to tie his shoes. On examination, the patient's vision remained at 20/15, with no relative afferent (Marcus Gunn) pupillary defect. Extraocular motility was full, and the patient denied diplopia. Hertel exophthalmometry was symmetric. The patient was then asked to bend over and perform a Valsalva maneuver. This resulted in 2.5 mm of right proptosis and fullness in the right upper eyelid, with a blunting of the normal upper eyelid crease (Fig 2). There

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Fig 2. *Top*, Clinical appearance of the patient 1 year later, before the Valsalva maneuver. Note the symmetric appearance of the superior sulcus of the upper eyelids.

Bottom, The patient after the Valsalva maneuver. Note the fullness of the right upper eyelid, causing an ablation of the superior sulcus. Proptosis of the right eye also is seen.

was no conjunctival vascular congestion and no bruits on auscultation. Funduscopic examination revealed no papilledema, vascular congestion, or choroidal folds.

At this juncture, the clinical diagnosis was most consistent with a venous malformation, most likely an orbital varix. A spiral CT (Siemens [Erlanger, Germany], 120 kV, 3.0 mm section thickness, 24 seconds) with intravenous contrast (50 mL of diatrizoate meglumine) was performed, revealing an orbital apical mass with indistinct borders (Figs 3–5). The patient was then asked to bend his knees and perform a Valsalva maneuver in a single breath hold while a second axial spiral scan was performed. The mass was markedly enlarged, with radiologic evidence of proptosis. A presumptive diagnosis of orbital venous malformation was made.

The patient continues to remain stable, without change in his ophthalmic or orbital exam. Because of the location and presumed nature of his orbital lesion, conservative management without surgical intervention has been recommended.

Discussion

Because of the short scan time required (24 seconds), this patient was able to maintain a Valsalva maneuver continuously throughout the

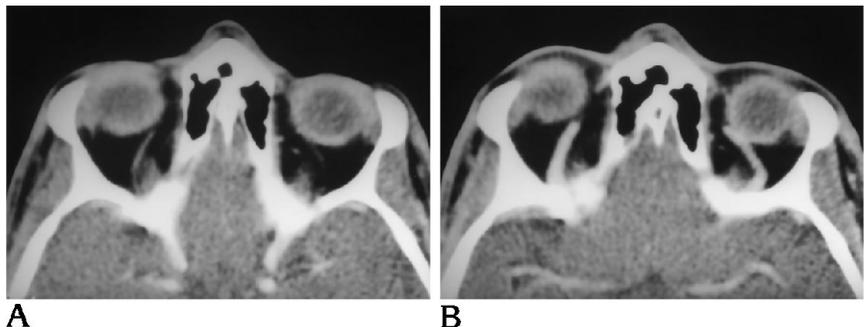
spiral CT scan, thus minimizing any motion artifact from repeat Valsalva. Although an orbital venous malformation is sufficiently slow flowing that a conventional CT would in all probability reflect the effect of Valsalva on the lesion, the spiral CT allowed for more definitive imaging through a single breath-hold.

In this case, the broad terms *orbital venous malformation* and *vascular anomaly* are applicable. The more specific terms *orbital varix* and *lymphangioma* are avoided, because histopathologic diagnosis is not available. In addition, some authorities question whether a distinction between the variety of orbital venous masses is appropriate, postulating instead that perhaps all of these lesions have a common cause (6, 7). Because orbital varices are usually in direct communication with the native venous system, the increase in venous pressure caused by a Valsalva maneuver will result in expansion of the malformation. This was clearly demonstrated in this case.

The superior position in the orbit is the most common location for these masses, which tend to parallel the normal orbital vasculature. Consequently, the majority of venous malformations typically occupy the superior or superomedial orbit, in the area of the superior ophthalmic vein. However, inferior orbital venous malformations are a well-described entity and may reflect the course of the inferior ophthalmic vein. Spontaneous or posttraumatic hemorrhage has been reported with orbital venous malformations resulting in an orbital compartment syndrome. In one series of 155 patients with orbital vascular anomalies, phleboliths were noted radiographically in 45% of the cases (Wright JE, "Orbital Vascular Anomalies," presented at the European Society of Ophthalmic Plastic and Reconstructive Surgery meeting, Antibes, France, September 17, 1993); this finding was not apparent in our patient.

Fig 3. *A*, Axial spiral CT (120 kV, 3.0-mm section thickness, 24 seconds) of the superior orbits before the Valsalva maneuver, demonstrating the normal appearance of the superior ophthalmic veins.

B, During the Valsalva maneuver, the superior ophthalmic veins dilate symmetrically and were interpreted as normal.



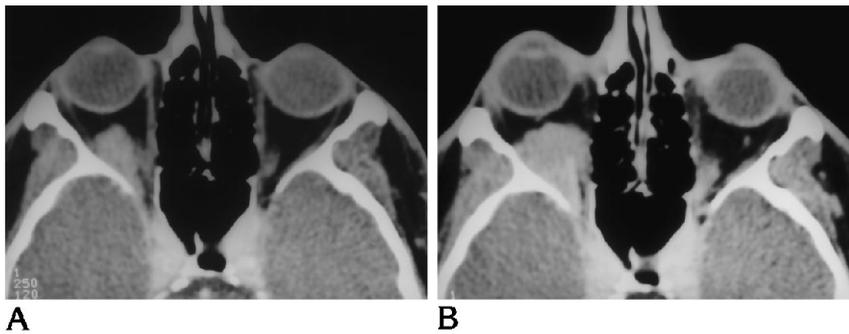


Fig 4. Axial spiral CT (120 kV, 3.0-mm section thickness, 24 seconds) of the orbit at the level of the superior orbital fissure.

A, Before the Valsalva maneuver, a posterior orbital mass is noted in the right orbit.

B, During the Valsalva maneuver, the mass is noted to expand significantly, consistent with a venous malformation.

In the case reported, the lesion was presumably present long before the patient's injury. Its vascular nature no doubt resulted in a dramatic orbital hemorrhage from relatively mild trauma. Although both older (orbital venography) and newer (color Doppler imaging) techniques also may be useful in diagnosing orbital venous mal-

formations (8, 9), spiral CT allowed for rapid imaging of the lesion during a single breath-hold Valsalva maneuver. Spiral CT should be considered in patients with suspected orbital venous malformations.

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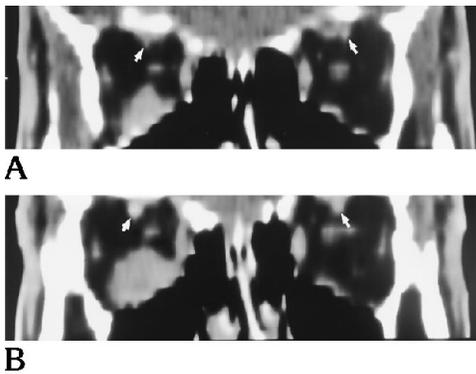


Fig 5. Coronal reformats just anterior to the sphenozygomatic suture.

A, Before the Valsalva maneuver, demonstrating the inferior location of the right orbital lesion. Arrows indicate the superior ophthalmic veins in their normal location just inferior to the superior rectus muscles.

B, During the Valsalva maneuver, note the expansion of the mass and the superior ophthalmic veins (arrows).