Visual Dysfunction Caused by Gauze Wrapping of an Intracranial Aneurysm

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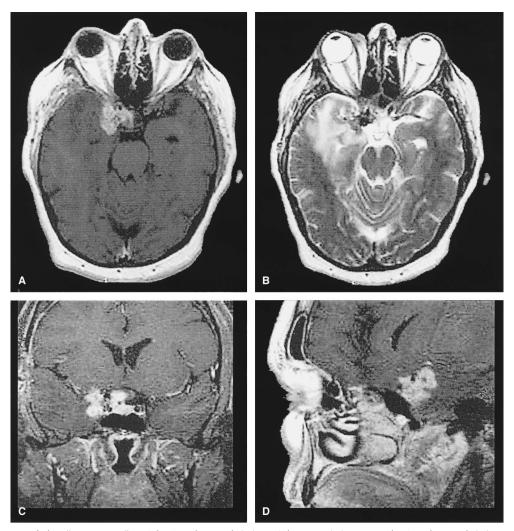


FIGURE 1. MRIs of the "gauzoma." Axial T1 enhanced **(A)**, axial FLAIR **(B)**, coronal T1 enhanced **(C)**, and sagittal T1 enhanced **(D)** images show a $2.5 \text{cm} \times 1 \text{cm}$ mass adjacent to the anteriomedial right temporal lobe and involving the right optic nerve and tract and the cavernous sinus.

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Abstract: A 43-year-old woman developed right frontal headache and decreased vision in her OD 14 months after treatment of an intracranial aneurysm by wrapping with cotton gauze. A junctional visual field defect was present, and an MRI revealed a contrast-enhancing mass involving the right optic nerve, lateral chiasm, optic tract, and cavernous sinus. Biopsy demonstrated a marked inflammatory reaction mixed with strands of birefringent cotton gauze. Despite treatment with high-dose corticosteroids, visual loss progressed to bilateral blindness. This is the 30th reported case of an intracranial inflammatory tumor developing from a gauze-wrapped aneurysm ("gauzoma" or "muslinoma") and the worst reported visual outcome. Most cases have occurred in women and involved the optic nerves or chiasm. Visual improvement has sometimes occurred after treatment with abscess drainage, debulking, and/or corticosteroids. A rare complication of aneurysm wrapping, gauzomas causing visual loss have been reported up to 54 months after surgery.

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A 43-year-old woman presented to the emergency department in March 2000 with the acute onset of headache and subarachnoid hemorrhage. No focal neurologic deficits were noted. Ophthalmologic examination was not performed. A cerebral angiogram revealed an aneurysm at the junction of the right internal carotid and posterior communicating arteries. It was treated endovascularly with Guglielmi Detachable Coils (GDC).

Six months later, a follow-up angiogram demonstrated persistence of a small residual neck. Further endovascular treatment failed to obliterate the neck. At surgery, the aneurysm was deemed unclippable, so the thick-walled residual neck was wrapped with shreds of Ray-Tec (Johnson and Johnson Medical, Arlington, TX) sponge from which the x-ray detectable monofilaments had been removed. Surgicel (Ethicon, Somerville, NJ) and Gelfoam (Phamacia and Upjohn, North Peapack, NJ) also were used to provide additional support. The patient's postoperative course was complicated by an epidural empyema, which required surgical debridement.

Fourteen months following the wrapping procedure, the patient experienced a new right frontal headache, followed by pain in her OD with dimming of vision in that eye. MRI revealed a 2.5 cm x 1 cm contrast-enhancing mass in the anterior medial right temporal lobe, which involved the right optic nerve, lateral chiasm, optic tract, and cavernous sinus with enlargement of the optic nerve and tract (Fig. 1). Visual acuity was 20/200 OD, 20/20 OS, and a large relative afferent pupillary defect OD was present. Humphrey 30-2 visual field testing revealed a junctional visual field

defect (Fig. 2). On ophthalmoscopic examination, the right optic disc was pale.

The patient was taken to surgery for exploration and decompression of the optic nerve. A pale, fibrous tumor that encapsulated the entire intracranial right internal carotid artery was found adjacent to the optic nerve. The tumor's greatest diameter was in the area of aneurysm. The mass did not displace the optic nerve, which appeared grossly normal. It extended slightly into the temporal lobe, which was abnormally soft. Strands of cotton gauze were visible within the mass, which could not be excised. A biopsy and cultures were obtained.

Microscopic analysis of the sample revealed an acute and chronic mixed inflammatory cell infiltrate (Fig. 3A) as well as dense collagen surrounded by obliquely cut strands of foreign matter (gauze) showing birefringence with polarized light (Fig. 3B). Normal brain tissue also was identified in the slides. The cultures did not grow any microorganisms.

Five days after surgery, there was no significant change in visual function. At follow-up 1 month later, the patient's visual acuity had fallen to light perception OD and 20/30 OS, with a worsening in the visual field OS (Fig. 4). The patient was treated with methylprednisolone 250 mg intravenously q6h for 5 days, followed by prednisone 60 mg/d orally, tapered slowly over several months, but vision did not improve substantially. On examination 1 year later, the patient's vision had deteriorated to no light perception OD and hand motion OS. At that time, the patient was readmitted for another course of intravenous corticosteroids but showed no improvement in vision. No other deficits have been noted.

Inflammatory tumors occurring after aneurysms are wrapped with cotton gauze, called "gauzomas" or "muslinomas," are relatively rare, despite the widespread use of gauze in the reinforcement of aneurysms (1). Only 29 cases have been reported (1). This number may be artificially low because many cases may have gone undetected before the

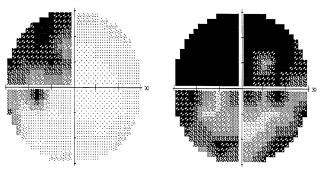


FIGURE 2. Humphrey visual fields at initial presentation show right optic nerve-chiasmal junction defect.

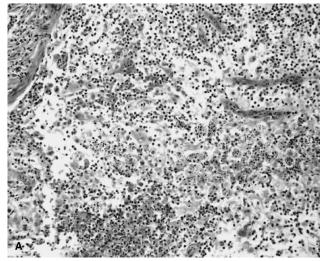






FIGURE 3. Biopsy of the intracranial mass. **A.** Mixed inflammatory cell infiltrate. **B.** Dense collagen capsule surrounding gauze fibers (top), which are bifringent to polarized light (bottom) (hematoxylin & eosin).

use of high-resolution CT or MRI (2). Two retrospective chart reviews support this idea (3–5).

Of the 29 reported cases, 26 have been women, and 24 have presented with optic neuropathy. Visual acuity at presentation has ranged from light perception to 20/30 in the most affected eye (1). Other manifestations have included fever, malaise, confusion, neuroendocrine abnormalities (diabetes insipidus, oligomenorrhea), headache, oculomotor nerve palsy, visual hallucinations, and seizures. No asymptomatic gauzomas have been reported (3).

Gauzoma should be considered in any patient with a history of visual loss following wrapping of an aneurysm, especially if there is evidence of a ring-enhancing mass on CT scan accompanied by a negative arteriogram (2). Histopathologic examination typically reveals a granulomatous foreign-body reaction with the presence of birefringent gauze fibers (3).

Several theories regarding the pathophysiology of gauzomas have been suggested. Muslin is thought to initiate a foreign-body type inflammatory reaction (3, 4), which may result in compression by space-occupying effect (5). Inflammation also may cause occlusion of small blood vessels with resultant ischemia (1). One reported case (6) showed a response to cyclophosphamide, suggesting a vasculitic process. Local infection or abscess formation around the gauze may play a role in initiating the granulomatous reaction, although abscess formation around the wrapped aneurysm is rare (3, 4). Proximity of the optic nerves and chiasm to the wrapped aneurysm appears to be the key factor in the development of optic neuropathy. While most cases are accompanied by malaise or headache, the increased area of inflammation seen in more advanced cases can lead to focal seizure activity or involvement of adjacent cranial nerves.

Treatment has included surgical debulking and intravenous corticosteroids, or a combination of both (1). Six patients have been treated with corticosteroids alone; three showed some recovery of visual function, one stabilized, and two worsened. Five patients have been treated with surgical intervention alone (debulking, subtotal excision, abscess drainage); two patients showed some improvement in vision, two worsened, and one had an unreported visual outcome. Seven patients have received a combined treatment of surgery and corticosteroids; two showed some visual improvement, two stabilized, two worsened, and one had an unreported visual outcome. One patient resolved a bitemporal hemianopia with cyclophosphamide treatment after failing multiple treatment trials of corticosteroids and surgery (6). Two patients who presented with headache, fever,

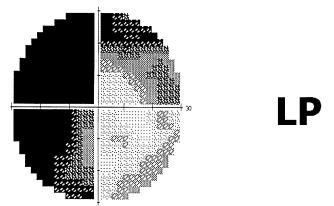


FIGURE 4. Visual fields performed 1 month after intracranial biopsy show marked deterioration.

seizures, mild blurred vision, and no focal neurologic deficits were treated with broad-spectrum antibiotics (combination of cloxacillin and cefotaxime in one patient and ceftazidime, vancomycin, tobramycin, and metronidazole in the other) and became asymptomatic, despite a residual mass (3). Another patient underwent abscess drainage and a 4-week course of flucloxacillin with no change in visual acuity at a 6-month follow-up examination (4). Seven patients have received no treatment; five had mild visual improvement and two stabilized (1).

Many unclippable aneurysms may be treated with an endovascular approach, which is often attempted before surgery, as in this case. Remodeling of the neck of the aneurysm with the assistance of a balloon allows many widenecked aneurysms to be coiled (7, 8). Liquid polymers and other similar agents currently under development may provide more options in the future (9). However, wrapping is often the only viable alternative. We agree with previous authors who warn against the use of cotton wrapping near the optic chiasm. However, when wrapping is the only option, close ophthalmologic follow-up is recommended (10). Of the 29 cases reviewed, onset of visual symptoms occurred anywhere from 1 to 54 months after surgery (mean = 13 months) (1). Formal visual field testing and ophthalmologic evaluation should be arranged immediately after surgery and at regular intervals for the first 2 years, and at the first sign of visual dysfunction.

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