Published in final edited form as:

JAMA Ophthalmol. 2013 November ; 131(11): 1468–1470. doi:10.1001/jamaophthalmol.2013.5073.

Shaken Adult Syndrome:

Report of 2 Cases

Amir A. Azari, MD, Mozghan R. Kanavi, MD, Noah B. Saipe, MD, Heather D. Potter, MD, Daniel M. Albert, MD, and Michael A. Stier, MD

Department of Ophthalmology and Visual Sciences, University of Wisconsin, Madison (Azari, Kanavi, Saipe, Potter, Albert); Ophthalmic Research Center, Shahid Beheshti University of Medical Sciences, Tehran, Iran (Kanavi); Department of Pathology and Laboratory Medicine, University of Wisconsin, Madison (Stier); McPherson Eye Research Institute, University of Wisconsin, Madison (Albert)

Abstract

IMPORTANCE—To establish that the intracranial and ophthalmologic findings present in victims of abusive head trauma can also be seen in shaken adults.

OBSERVATIONS—We report 2 cases of shaken adults with intracranial and ophthalmologic findings that resulted from repetitive acceleration-deceleration injury. These findings included intracranial hemorrhages, hemorrhages involving the optic nerve sheath, intraretinal and subretinal hemorrhages, and macular folds.

CONCLUSIONS AND RELEVANCE—The intracranial and ophthalmologic findings that are characteristic of abusive head trauma—subdural hemorrhages, optic nerve sheath hemorrhages, and retinal hemorrhages—are generally thought to be limited to young children and infants. Adults may also be victims of shaking abuse, and an ophthalmic examination may be beneficial when shaking is suspected.

Intracranial and ophthalmologic findings characteristic of abusive head trauma (AHT), formerly known as shaken baby syndrome, are not limited to pediatric patients. Two suspect cases of shaken adult syndrome have been reported previously.^{1,2} Although these cases implicate shaking as a traumatic mechanism, one had evidence of direct-impact trauma² and the second failed to report ocular pathology.¹ Herein, we report 2 new cases of lethal shaken

Copyright 2013 American Medical Association. All rights reserved.

Corresponding Author: Amir A. Azari, MD, Department of Ophthalmology and Visual Sciences, University of Wisconsin–Madison, Room F4/349, 600 Highland Ave, Madison, WI 53792 (amirazarimd@gmail.com).

Author Contributions: Drs Azari and Stier had full access to all of the data in the study and take responsibility for the integrity of the data and the accuracy of the data analysis.

Study concept and design: Azari, Kanavi, Potter, Albert.

Acquisition of data: Azari, Kanavi, Saipe, Stier. **Analysis and interpretation of data:** Azari, Kanavi, Stier.

Drafting of the manuscript: Azari, Kanavi, Stier. **Critical revision of the manuscript for important intellectual content:** Azari, Saipe, Potter, Albert, Stier. **Administrative, technical, or material support:** Stier. **Study supervision:** Azari, Potter, Albert, Stier.

Additional Contributions: We thank Vicky Rogness for her assistance with this project.

Conflict of Interest Disclosures: None reported.

Disclaimer: Dr Albert, who was editor of *JAMA Ophthalmology* at the time this manuscript was accepted, was not involved in the review or editorial decision to accept this manuscript for publication.

adult syndrome with a clear history of shaking and absence of significant impact head trauma. The intracranial and ocular findings in these cases mirror those seen in AHT.

Report of Cases

Case 1

A man in his 50s with short stature and a medical history of hypertension was found dead several hours following an assault. The witness reported she was home sleeping with the victim when an intruder entered. She observed the ensuing assault that is described and quoted in the police interview as follows, “He was grabbed by his shoulders and shaken hard, back and forth, 3-4 times.” The victim spent the rest of the night lying left side of face down and prone on the floor, snoring heavily. The assailant was described as larger in stature and years younger than the victim.

Forensic examination disclosed nonimpact pressure abrasions to the left side of the face, consistent with lying face down for hours. Associated discoloration was noted about the left upper and lower lips, without definitive contusion. No additional external physical findings were present on the face, head, or inner aspect of the scalp. Unilateral subdural hemorrhage was present over the right dorsal cerebrum. Minor features of gross brain swelling without herniation were evident. No additional features of trauma were observed intracranially or extracranially. Toxicology testing disclosed the presence of alcohol in postmortem venous blood. There were no hemato-logic studies and no autopsy findings suggestive of a systemic coagulopathy.

Histological analysis of brain tissue showed minor foci of acute subarachnoid hemorrhage in association with the gross subdural bleeding. Alternate causes for the hemorrhagic process were not identified (ie, inflammation, neoplasia, and coagulopathy). Amyloid precursor protein immunohistochemistry results were positive in a bilateral distribution in white matter of centrum semi ovale and dorsal midbrain.

Histological studies on both eyes revealed extensive subdural and subarachnoid hemorrhages within the optic nerve sheath. Blood was also present within the vitreous, subretinal space, inner nuclear layer, outer plexiform layer, and outer nuclear layer, with involvement of the ora serrata in both eyes. Additional bilateral findings included swelling of the optic nerve heads, macular folds, and extraocular muscle hemorrhage.

Case 2

A man in his 60s with a history of alcohol abuse was found unconscious in his home surrounded by bloody vomitus. His 2 friends attempted to resuscitate him through “vigorous shaking” by the shoulders. There was no mention of any other attempt at resuscitation. Without response to shaking, medical services were summoned. He was transferred to a tertiary health facility and determined to be clinically brain dead. Support was withdrawn and a comprehensive forensic autopsy conducted.

External autopsy findings disclosed variably appearing mixed-age blunt traumas to the torso and upper limbs, consistent with self-sustained injuries. The face and scalp were without

trauma; however, a minor amount of sanguinous fluid emerged from the right ear. Internal findings included a 2.0-cm area of erythema over the superior margin of the right temporalis muscle. Autopsy description of the lesion was “area of minor subtle scalp discoloration.” No scalp laceration or skull fracture was evident. There was bilateral subdural hemorrhage. Prominent cerebral edema with right transtentorial herniation and secondary Duret midbrain hemorrhage were present. Neurohistology showed tissue necrosis and focal subarachnoid hemorrhage in association with the gross subdural hemorrhage. Immunohistochemical staining for amyloid precursor protein showed nonspecific positivity. Inflammation, neoplasia, or malformative lesions were not present. Extracranial findings included Mallory-Weiss tears of the gastroesophageal junction, with blood in the stomach. The liver had moderate steatosis and early cirrhosis. Toxicology testing results of admission specimens showed alcohol, and no coagulopathy studies were performed.

Ophthalmic studies revealed bilateral subdural and subarachnoid hemorrhages within optic nerve sheaths (**Figure**). Blood was also present within the vitreous, inner and outer retinal layers, and subretinal space in both eyes. The retinal hemorrhages extended to the ora serrata bilaterally. Prominent macular folds were observed in both eyes, as well as extraocular muscle and episcleral hemorrhage. Papilledema was not present.

Discussion

Classic ophthalmic findings in AHT include retinal hemorrhages, vitreous hemorrhage, and macular folds. Retinal hemorrhages are usually symmetric, bilateral, preretinal, intraretinal, and subretinal.³ These hemorrhages show predilection for the ora serrata, perivascular areas, and posterior pole—all of which are areas of maximal vitreoretinal attachment.³ The historical definition of Terson syndrome is vitreous and intracranial subarachnoid hemorrhage.⁴ However, current clinical application of this diagnosis may include any case in which intraocular and intracranial hemorrhage coexist.⁴ While findings in AHT and Terson syndrome can be similar, certain features allow their distinction. This includes hemorrhage of extraocular muscles, sclera/ episclera, and retina at the ora serrata in addition to macular folds.^{3,5} These findings are either absent in Terson syndrome or rarely reported. Less useful for distinguishing AHT and Terson syndrome are patterns of intracranial hemorrhage and other ocular findings that overlap in these entities.

We believe the reported cases represent a constellation of lethal traumatic injuries, with shaking as the primary physical mechanism. This is substantiated by the witnessed reports, pattern of intracranial and ophthalmic pathology, and lack of alternative explanation for the findings. Risk factors for these deaths may include alcohol ingestion and a physical differential between victim and offender(s). Both decedents' postmortem toxicologic testing results showed the presence of ethanol. In the first case, the assailant was greater in physical stature, almost 2 decades younger, and emotionally invigorated. In the second case, the decedent was shaken by 2 adults while unconscious; however, other events, such as vomiting, may have also contributed to the extent of the hemorrhages and affected the pathology. Although intracranial and ophthalmic injury secondary to shaking happen principally in pediatric individuals, it may also occur in adults. In this setting, an ophthalmic examination would be beneficial.

Acknowledgments

Funding/Support: This work was supported by the National Institutes of Health grant P30-EY016665 (Core Grant for Vision Research) and an unrestricted department award from the Research to Prevent Blindness.

Role of the Sponsor: The sponsors had no role in the design and conduct of the study; collection, management, analysis, and interpretation of the data; and preparation, review, or approval of the manuscript; and decision to submit the manuscript for publication.

REFERENCES

1. Pounder DJ. Shaken adult syndrome. *Am J Forensic Med Pathol*. 1997; 18(4):321–324. [PubMed: 9430280]
2. Carrigan TD, Walker E, Barnes S. Domestic violence: the shaken adult syndrome. *J Accid Emerg Med*. 2000; 17(2):138–139. [PubMed: 10718242]
3. Levin AV. Retinal hemorrhage in abusive head trauma. *Pediatrics*. 2010; 126(5):961–970. [PubMed: 20921069]
4. Mills MD. Terson syndrome. *Ophthalmology*. 1998; 105(12):2161–2163. [PubMed: 9855137]
5. Gilliland MG, Levin AV, Enzenauer RW, et al. The Brody School of Medicine at East Carolina University. Guidelines for postmortem protocol for ocular investigation of sudden unexplained infant death and suspected physical child abuse. *Am J Forensic Med Pathol*. 2007; 28(4):323–329. [PubMed: 18043020]

Figure. Histological Examination With Hematoxylin and Eosin Stain From Case 2

Histological studies reveal extensive optic nerve sheath hemorrhage. Intraretinal hemorrhages (A), subretinal space hemorrhage (B), and hemorrhage at the ora serrata and vitreous hemorrhage (C) were also present. D, Macular folds are shown. E, Identical findings of variable degrees are observed in case 1. Scale bar = 200 μm in panel A, 800 μm in B, 400 μm in C, 200 μm in D, and 600 μm in E.