

# Retinal hemorrhages caused by accidental household trauma

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Traumatic retinal hemorrhages in young children are considered pathognomonic of child abuse. We identified 3 children with unilateral retinal hemorrhages caused by accidental household trauma. The hemorrhages were ipsilateral to intracranial hemorrhage and isolated to the posterior retinal pole. (J Pediatr 1999;135:125-7)

Traumatic retinal hemorrhages in infants and young children are considered by some to be pathognomonic of child abuse.<sup>1,2</sup> Retinal hemorrhages have been reported with severe accidental injury but have not generally been associated with minor or moderate head trauma.<sup>1-3</sup> The recognition that retinal hemorrhage can rarely result from accidental household injuries may influence decisions regarding suspected child abuse. We present 3 cases of unintentional household trauma (one of which has been previously reported)<sup>4</sup> that resulted in head injury and retinal hemorrhages.

## CASE REPORTS

### Case 1

A 13-month-old boy fell down 13 concrete basement stairs in a walker; the fall resulted in loss of consciousness and irregular respiration. On arrival to the emergency department, he

was awake and intermittently irritable, with a Glasgow Coma Scale score of 15. Initial blood pressure was elevated (145/114 mm Hg) but normalized within minutes. His head circumference was at the 90th percentile for age. Physical examination showed a small frontal scalp contusion, nasal abrasions, and a right thigh bruise; a neurologic examination revealed no focal findings. Head computed tomography scan revealed an acute subdural hemorrhage in an enlarged extra-axial space in the right parieto-temporal region, with minor mass effect (Fig 1). A skeletal survey revealed no acute or healing bony injuries, and no coagulopathy was present. A social work evaluation by a hospital trauma specialist revealed no risk factors for or concerns about child abuse. Clinically, the child remained well except for intermittent irritability and occasional vomiting. A second head CT scan 48 hours later showed resolution of

the brain hemorrhage and a normal-appearing brain. He was discharged home after 4 days.

Initial ophthalmic evaluation revealed unilateral, pre-retinal, and intraretinal hemorrhage and localized retinal edema in the posterior pole of the right eye. There were no other ophthalmic abnormalities. The child had normal findings on subsequent ophthalmic examinations 3, 11, and 24 months after discharge.

CT Computed tomography  
GCS Glasgow Coma Scale

### Case 2

A 9-month-old boy was being supported on the forearms of his father and swung in play, when his father lost his grip. The child fell 1 to 2 feet, hitting the back of his head on the floor. The event was witnessed and described by friends visiting with the family at the time. Immediately after the fall, the child cried, then became transiently unresponsive with abnormal arm and leg movements. At the local emergency department he was noted to have extension of the arms and a right lateral gaze. Initial blood pressure was 118/97 mm Hg, which normalized quickly. His initial GCS score was 4, and an endotracheal tube was placed. CT scan showed acute subdural and/or subarachnoid hemorrhage over the left parieto-occipital region with a minimal midline shift. He was transported to The Children's Hospital of Philadelphia for further care.

On admission to our hospital, the infant had spontaneous eye opening and extremity movement, and he grimaced

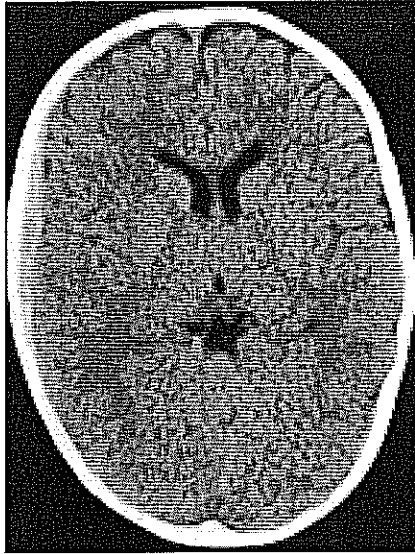
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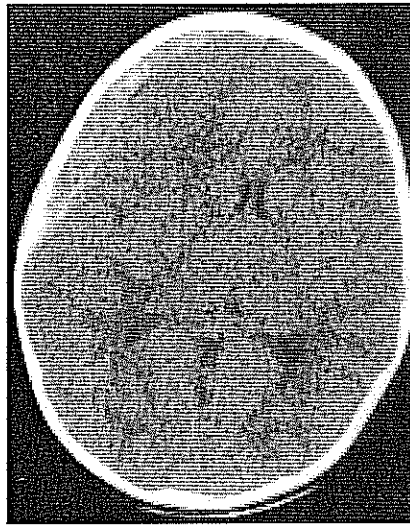
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**Fig 1.** Case 1. Non-contrast CT scan shows an acute subdural hemorrhage in right parieto-temporal region, with minimal mass effect. Note also enlarged extra-axial cerebrospinal fluid space.

in response to noxious stimuli. No bruises or soft tissue swellings were noted. The endotracheal tube was removed, and administration of anticonvulsants was begun. The initial movements and extensor tone were thought to most likely represent seizure activity. Over the next 3 hospital days, the child experienced no further seizure activity, had no focal neurologic deficits, and had resolution of mild irritability and hypoactivity. A skeletal survey revealed no bony injuries, and follow-up head CT scan done the day after admission showed resolution of the hemorrhage and a normal-appearing brain.<sup>4</sup> No coagulopathy was found. A hospital social work evaluation and a child abuse team evaluation did not find risk factors for child abuse. In addition, a neighbor who witnessed the injury was called and verified the mechanism that was described.

Initial ophthalmic examination revealed multiple intraretinal flame-shaped hemorrhages and round intraretinal hemorrhages in the posterior pole of the left eye. The left macula showed foveal edema without exudates. In addition, there were 2 small, posteriorly located vitreous hemorrhages arising from the superficial reti-



**Fig 2.** Case 3. Non-contrast CT scan demonstrates a large acute right fronto-parietal subdural hematoma associated with midline shift.

nal vasculature along the posterior pole arcade. Findings on examination of the right eye were normal. The infant was discharged home after 3 days and was found to be developmentally and neurologically normal at 3- and 6-month follow-up visits.

### Case 3

A 7-month-old girl fell through a stair rail onto a concrete basement floor, landing on her head. There was no loss of consciousness. The child was brought directly to the local emergency department, where she was somnolent but arousable with a GCS score of 7. Initial blood pressure was 123/76 mm Hg, which normalized quickly. Her fontanelle was bulging and her right pupil was sluggish in response to light. An endotracheal tube was placed, and she was transferred to Children's Hospital for further care. Head CT scan showed a large, right parieto-frontal subdural hemorrhage with a midline shift (Fig 2).

On arrival, the baby was taken to the operating room for evacuation of the hematoma by means of a right frontoparietal craniotomy. A diastatic fracture of the coronal suture, a linear frac-

ture of the temporal bone, and a right cerebral contusion were noted at surgery. The patient did well postoperatively, regaining normal neurologic function by the second hospital day. Findings on a skeletal survey were normal except for evidence of the previous craniotomy. Evaluation by the hospital trauma social worker did not reveal concerns about non-accidental injury. Initial prothrombin time (14.3 seconds) and partial thromboplastin time (39.7 seconds) were mildly elevated but were corrected without therapy.

By the third hospital day, the baby had right periorbital edema, mild eyelid erythema, and mild eye discharge. Ophthalmic examination at that time revealed unilateral abnormalities alone, consisting of orbital inflammation (edema, cellulitis) and sub-retinal and pre-retinal hemorrhages in the posterior pole of the right eye. The baby received antibiotics to treat possible preseptal cellulitis. The patient was discharged home on the fourth hospital day and had normal findings on neurologic examinations 1 week and 1 month after discharge and normal findings on ophthalmic examinations 3 weeks and 6 months after discharge.

In follow-up averaging 4 years, no reports of physical abuse have been made to child and youth agencies in the counties in which these children reside.

## DISCUSSION

Retinal hemorrhages in young children have almost become diagnostic of child abuse. Although most traumatic hemorrhages after birth are related to abuse, the differential diagnosis of retinal hemorrhages is extensive, and qualitative and quantitative differences in hemorrhages from different causes exist.

Retinal hemorrhages seen in cases of child battering are often intraretinal, frequently involving all layers of the retina. The hemorrhages are often bilateral but can be unilateral.<sup>5</sup> Although they can be isolated to the posterior

pole, diffuse hemorrhages to the periphery of the retina are characteristic. In the most severe cases, vitreous hemorrhage, traumatic retinoschisis, perimacular retinal folds, and retinal detachment occur.<sup>6-8</sup> A correlation has been demonstrated between the severity of retinal and cerebral injuries in non-accidental trauma.<sup>9,10</sup>

Retinal hemorrhages after accidental trauma have been reported only occasionally.<sup>2,3,11</sup> These hemorrhages likely result from injury mechanisms similar to those described for intentional injury. Differentiating hemorrhages caused by accidental injury from those caused by abuse may be difficult, because either cause can result in unilateral or bilateral hemorrhages and can involve all layers of the retina.

Our patients had accidental injuries that resulted in subdural and/or subarachnoid hemorrhage and unilateral retinal hemorrhage. In each case the hemorrhages were ipsilateral to the intracranial hemorrhage and were isolated to the posterior retinal pole. Retinal involvement was relatively mild, without peripheral retinal involvement, retinal folds, or detachment. We recognize that differentiating abusive from accidental trauma can be difficult; however, several factors suggest that these cases were accidental. In each case the initial history provided was of significant trauma and did not change over time. Individuals not related to the child witnessed one injury. The neurologic symptoms and rapid recoveries were concordant with the forces described, there was no delay in seeking medical treatment, there was no prior reported history of abuse, and the remaining results of physical examination

and skeletal survey were negative. To our knowledge, none of the children have been subsequent victims of physical abuse. Our conclusion of accidental trauma in case 1 is supported by previous reports of vitreous and retinal hemorrhages associated with walker injuries.<sup>11</sup> It is possible but unlikely that mild, transient hypertension and coagulopathy contributed to the retinal hemorrhage. Further research regarding the biomechanical pathophysiology of retinal hemorrhages is needed.

We report these cases to highlight the fact that rare cases of household accidental trauma can result in retinal bleeding. The incidence of retinal hemorrhages caused by household trauma is unknown; ophthalmic examinations in which mydriatics are used are not routine in children with head injury. However, during the 4 years in which these 3 cases were identified, 1617 children with head injury were admitted to our hospital. Although we acknowledge the strong association of traumatic retinal hemorrhages and child abuse, we caution against presuming that all children with traumatic retinal hemorrhages have been abused. Finally, because retinal hemorrhages can affect future vision, we recommend that all infants and children with significant head trauma, especially those with subdural and/or subarachnoid hemorrhage, have an ophthalmic examination.

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who deal with victims of child abuse must fully understand and be ready to explain how these patients differ from victims of child abuse. They must also be ready to counter defense arguments that retinal hemorrhages were the result of trivial trauma, as is often proposed by child abuse perpetrators.

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### To the Editor:

It is not clear to me that the article on retinal hemorrhage by Christian et al<sup>1</sup> has added any new information. Retinal hemorrhages are a very reliable, though imperfect, indicator of head trauma, but no one would argue that the presence of retinal hemorrhages automatically indicates non-accidental injury. Determining the intent of the caretaker or circumstances of injury depends on history and investigative confirmation.

Regarding that investigation, I am not reassured in cases 1 and 3 by statements that social work evaluations revealed "no risk factors or concerns" about possible abuse. Even in case 2, a neighbor's telephone agreement seems to be weak evidence.

I am immediately reminded of my colleagues' babysitter-injured child with brain damage and the murdered child in whose case I testified this week. Both were cleared to return to their pre-morbid environments after their first injuries.

If one accepts cases reported by Christian et al as accidental trauma, the unsurprising conclusion seems to be that head trauma may cause retinal hemorrhages and that the cause of trauma should be carefully investigat-

ed. It is that second part that still leaves me uneasy.

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## Reply

### To the Editor:

We appreciate the responses to our article. We used the term *household trauma* to describe injuries that occurred in the home by accidental mechanisms. The type and neurologic severity of a given injury relates to the specific magnitude and types of forces experienced by the brain and its coverings. In the cases reported here, the neurologic outcomes of the children were good, reflecting the fact that the primary injuries to the brain itself were not severe, but that sufficient surface impact and/or angular deceleration was present to lacerate or rupture cortical vessels. Such occurrences are uncommon, and we by no means suggest that low-height falls, the most common type of household trauma, typically cause retinal hemorrhages. Rather, we noted that retinal hemorrhages caused by accidental trauma were uncommon in our population, occurring in less than 1 of 500 children admitted to our hospital with head injury. Nonetheless, we believe it is useful to point out that in some unusual cases of accidental trauma with the requisite biomechanics, hemorrhage into the subarachnoid, subdural, and retinal compartments may occur.

Dr Lynch correctly points out that the systems in place for evaluating and protecting abused children are flawed, and permanent or fatal injuries can occur when children are returned to abusive environments. The findings in

the cases profiled in the article, however, underscore the need to remain objective in evaluating pediatric injuries. In contrast to the experience of Dr Lynch and Dr Coats, in our experience, traumatic retinal hemorrhages oftentimes are assumed to be evidence of non-accidental injury by practitioners who know of the strong association between this finding and non-accidental mechanisms but are unfamiliar with the exceptions to that association. The severity of retinal bleeding, although relatively mild in our examples, cannot be used to judge the mechanism of trauma, because some children with severe abusive brain injury have little or no retinal hemorrhages.

Until the mechanisms to protect children and help families are improved or more foolproof methods for differentiating causes of injury are discovered, physicians have a responsibility to recognize that both abusive and accidental trauma may vary in their manifestations. Missing child abuse when it exists can have a tragic outcome, but the consequences of a false accusation, and even conviction of abuse, to a family are not inconsiderable. It is for this reason that all available data should be brought to bear when an opinion on the cause of a specific injury is formed.

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## Fixed drug eruptions in children

### To the Editor:

We enjoyed reading the report of Morelli et al on fixed drug eruptions in children published in March 1999. Trimethoprim-sulfamethoxazole is the most common causative agent in our experience, also. However, we were surprised to see acetaminophen and paracetamol listed as two different drugs. These two names are synonyms for the same medicine in the medical literature. We wonder whether there were any differences in the additives or other substances used during the man-