Subconjunctival Hemorrhages in Infants and Children

A Sign of Nonaccidental Trauma

Catherine A. DeRidder, MD, Carol D. Berkowitz, MD,* Ralph A. Hicks, MD,†‡ and Antoinette L. Laskey, MD, MPH†‡§*

Abstract: Subconjunctival hemorrhages in infants and children can be a finding after nonaccidental trauma. We describe 14 children with subconjunctival hemorrhages on physical examination, who were subsequently diagnosed by a child protection team with physical abuse. Although infrequent, subconjunctival hemorrhage may be related to abuse. Nonaccidental trauma should be on the differential diagnosis of subconjunctival hemorrhage in children, and consultation with a child abuse pediatrics specialist should be considered.

Key Words: physical abuse, nonaccidental trauma, eye

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Ocular findings are present in 22% to 46% of children diagnosed with nonaccidental trauma[1,2] and are the presenting feature in 6% of suspected child abuse patients who present to an ophthalmologist.[1]

Increases in intrathoracic pressure can cause rupture of the small blood vessels of the subconjunctiva as can an impact to the eye from a direct blow.[3] Subconjunctival hemorrhage has been implicated in covert suffocation, one form of child maltreatment.[4] The differential diagnosis of subconjunctival hemorrhage is extensive and includes traumatic, infectious, oncologic, and hematological etiologies.

Subconjunctival hemorrhage in children can be attributed to constipation, coughing, or vomiting maneuvers owing to increased intrathoracic or intra-abdominal pressure. We describe 14 children with subconjunctival hemorrhages on physical examination, who were evaluated by a child abuse specialist and subsequently found to have additional evidence of nonaccidental trauma.

METHODS

We retrospectively reviewed the charts of children who were inpatients at a tertiary children's hospital in Indianapolis, IN, referred to the child protection team and who had subconjunctival hemorrhages on physical examination as noted in the medical history. These children were evaluated from January 2001 to December 2009. The child protection team had 1466 inpatient consults during this period. This study was approved by the Indiana University Institutional Review Board.

From the *Division of General and Emergency Pediatrics, Department of Pediatrics, Harbor-UCLA Medical Center, David Geffen School of Medicine at UCLA, Torrance, CA; and †Department of Pediatrics, Center for Safe and Healthy Families, Primary Children's Hospital, University of Utah, Salt Lake City, UT; ‡Child Protection Programs, and §Children's Health Services Research, Riley Hospital for Children, Indiana University School of Medicine, Indianapolis, IN.

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Reprints: Catherine A. DeRidder, MD, Division of General and Emergency Pediatrics, Department of Pediatrics, Harbor-UCLA Medical Center, 1000 W. Carson St, Box 437, Torrance, CA 90509 (e-mail: cderidder53@gmail.com).

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CASES

A summary of the cases is shown in Table 1. Eight (57%) were male patients. The median age was 6.5 months (range, 1–68 months), and the mean age was 16.5 months. There was a history of intimate partner violence in 6 (43%) and prematurity in 3 cases (21%). None of the children were in foster care, had a history of chest compressions, or had an ophthalmologic examination before the detection of the subconjunctival hemorrhages.

Ten caregivers (71%) initially sought medical attention because of eye and/or face findings in their child. In the other 4 cases, children were brought for a variety of concerns: a "pop" heard when the child was caught by the arm (case 1), fever (case 2), normal newborn checkup (case 3), and decreased level of consciousness (case 8). These 4 children ranged from 1 to 7 months, and the subconjunctival hemorrhages were noted on examination, although they were not part of the presenting complaint. Five children (36%) had bilateral hemorrhages at the time they were examined by the child protection team. Thirteen children (92%) had eye examinations documented by an ophthalmologist. None of the children in this case series had evidence of retinal hemorrhage or conjunctivitis.

None of the 14 children in our series had a history of cough, vomiting, or constipation.

Bruising was present in 11 children (79%). Affected body areas included the face, ears, scalp, neck, back, abdomen, and extremities. Eight children (73%) that had bruising were bruised in more than 1 body area; 5 (45%) of these children had bruising in 3 or more body areas. Eight children (57%) had bruising in the torso, neck, or ears. The 3 cases without bruising were all infants, ranging in age from 1 to 7 months.

Radiological and laboratory studies were performed at the discretion of the attending physician and consulting services. Two children (14%) had intracranial injury on head imaging, and 6 children (43%) were noted to have 1 or more fractures. Case 2 was found to have a transverse fracture of C3 to C4. In case 13, a maxilla fracture was found on facial computed tomography, and a grade I liver laceration was found on abdominal computed tomography.

On initial laboratory evaluation, 1 child (case 13) had a severe subgaleal hemorrhage and abnormal coagulation studies. The prothrombin time and international normalized ratio were prolonged at 16.5 seconds and 1.48, respectively. The activated partial thromboplastin time was also prolonged at 37.5 seconds. This child also had hemoglobin of 8.1 g/dL and hematocrit of 24%.

DISCUSSION

The prevalence of subconjunctival hemorrhages in nonaccidental trauma is unknown. A complete history and physical examination is necessary to delineate the etiology of a subconjunctival hemorrhage because the differential diagnosis is extensive (Table 2).

In a child who has subconjunctival hemorrhage on examination without known eye trauma, nonaccidental trauma should remain a significant consideration on the differential diagnosis.

TABLE 1. Summary of Cases

Case Number	Age	Sex	Ophthalmology Findings	Significant Physical Findings	Radiological Findings	Additional History
1	1 mo	F	Bilateral medial SCH	Bruising to face lateral to the right eye. Petechiae on upper lip around frenula.	Transverse fracture of right ulnar head.	Presented after father caught by the arm and heard a "pop." Father with history of abuse of other children.
2	1.5 mo	M	Medial SCH of right eye	Anterior fontanel full.	Fracture of C3-C4 with associated epidural hematoma.	Presented with concerns for meningitis. Mother noted "red spot" in his eye during hospitalization. Decompensated while admitted and transferred to PICU where fracture of C3-C4 with anterior displacement and compression of the cord found. Mother noted a fall 1 mo earlier from her lap into his car seat.
3	1.75 mo	M	Bilateral medial SCH	Bruising to face and extremities. Upper labial frenulum with punctate hemorrhage. Right lower leg swollen, bruised, and angulated with central defect in skin. Left forearm swollen and angulated.	Fractures of the left leg, right leg, left arm, fingers of the right and left hands, possible right fourth and fifth rib fractures.	At well child visit had discoloration and swelling of right lower leg. Noted by mother 1 wk before. SCH present for the past several days before admission.
4	2 mo	F	Medial SCH of bilateral eyes	Bruising to abdomen, back, face, scalp, ears, and extremities. Erythematous right upper eyelid and eyebrow. Torn lingual frenulum.	None	Presented with multiple bruises and abrasions on face and abdomen. Pale and gasped for breath during a feeding on the day before admission. Mother noted bruises 3 days before admission but did not know how they had occurred.
5	3 mo	F	Lateral SCH of left eye, ROP in left eye	Bruising to face under left eye.	Mildly displaced linear right parietal skull fracture, mild rickets, subarachnoid and subdural hemorrhages.	History of 25-wk gestation. IPV against mother by father. Presented after father noted lip and eye swelling while mother was at work. Mother noted bruise under left eye when she returned. Brought to medical attention the following day after bruising worsened.
6	5.5 mo	F	Small lateral SCH of left eye. No ophthalmology consult.	Bruising to back and extremities.	None	Mother presented to primary care physician after noting bruising to buttocks on previous day. Mother had also noted bruise to her jaw 6 days before admission and attributed it to rolling onto pacifier.
7	6 mo	F	Medial SCH of right eye, small right polar cataract	None	None	Presented when mother noted "red spot" in right eye and dried blood in nares after a longer than usual nap and decreased level of alertness. Presentation suggested possible suffocation event.

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TABLE 1. *(Continued)*

Case Number	Age	Sex	Ophthalmology Findings	Significant Physical Findings	Radiological Findings	Additional History
8	7 mo	M	Small SCH of right eye	None	Severe hypoxic ischemic encephalopathy.	History of 34-wk twin gestation. History of abuse of mother. Presented after mother could not arouse him in the afternoon after not waking from the night before. Resuscitated at outside hospital. SCH felt to be "consistent with recent increase in ICP" per medical record.
9	9 mo	M	Medial SCH of right eye	Bruising to abdomen.	Fractures of right and left leg, left arm, left rib.	Mother presented stating that her boyfriend hit her son while she was at work. Mother returned to find child unsupervised and boyfriend in a bar. Mother noted "blood in his right eye" and shoe mark on his abdomen. When mother questioned boyfriend, he threatened her with a knife so she did not bring the child to medical attention until 3 days after the event.
10	23 mo	M	SCH in left eye	Bruising to face (bilateral orbits), scalp, ears, back, and extremities. Bilateral periorbital edema. Scalp with alopecia at vertex.	None	History of eye swelling for 1 mo before admission. History of corneal abrasion at previous ED visit. Bruising and persistent eye swelling at presentation. Mother had concerns that he had more bruising after spending time with father. Father had previous arrest for IPV.
11	31 mo	M	SCH in medial and lateral aspects of right eye	Bruising to neck and face. Burn to right foot.	Scalp hematoma.	History of 32-wk gestation. Presented with 2 black eyes and lesion on foot. Two days before admission, hit posterior head on highchair. Family stated that he may have caused these injuries by hitting self in the head, face, and neck with a hose.
12	34 mo	M	Lateral SCH of right eye	Bruising to face (right periorbital and left lower eyelid), scalp, and neck.	Facial soft tissue swelling.	Presented after falling down 7 carpeted steps. Child stated mother's boyfriend pushed him down the stairs.
13	38 mo	M	Lateral SCH of right eye, confluent left SCH, elevated optic nerve	Bruising to face, neck, scalp, back, and extremities. Severe subgaleal hemorrhage.	Mildly displaced fracture of left maxilla, grade I liver laceration.	History of hydrocephalus with arachnoid cyst status post VP shunt. Biological father is incarcerated for IPV against mother. Mother's current husband also with IPV against mother. Presented with extensive facial, neck, trunk bruising. History of a fall on his head 10 days before. Abnormal coagulation laboratory findings.

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TABLE 1. *(Continued)*

Case Number	Age	Sex	Ophthalmology Findings	Significant Physical Findings	Radiological Findings	Additional History
14	68 mo	F	Medial SCH bilaterally	Bruising to face (periorbital and infraorbital), ears, and extremities.	None	School noted "bruising and blood in her eyes." Had missed school the previous day. Patient stated that her mother hit and bit her.

ED, emergency department; ICP indicates intracranial pressure; IPV, intimate partner violence; PICU, pediatric intensive care unit; ROP, retinopathy of prematurity; SCH, subconjunctival hemorrhage; SCH, subconjunctival hemorrhage; VP, ventriculoperitoneal.

Most children in this case series had bruising in addition to their subconjunctival hemorrhage. This suggests that subconjunctival hemorrhage, like any bruising in preambulatory children[30] or bruising of the torso, neck, and ears in ambulatory children,[31] is a finding that raises the suspicion for nonaccidental trauma. Key risk factors for nonaccidental trauma, prematurity[32] and history of intimate partner violence,[33] were also found in this case series.

Our case series reports an ocular finding, subconjunctival hemorrhage, which may indicate nonaccidental trauma. In our experience, caregivers had previously contacted a health care provider specifically for subconjunctival hemorrhages and been reassured that coughing, vomiting, or constipation could cause these findings, although these symptoms were not reported. In this case series, previous health care evaluations were not reviewed.

TABLE 2. Differential Diagnosis of Subconjunctival Hemorrhages

1. Traumatic
   a. Acute thoracic compression syndrome and traumatic asphyxia[4]
   b. Blunt and penetrating trauma
   c. Nonaccidental trauma[5,6]
   d. Birth trauma[7,8]
2. Infection
   a. Enterovirus, Coxsackievirus[9,10]
   b. Kawasaki disease[11]
   c. Herpes zoster[12]
   d. Herpes varicella[13]
   e. Adenovirus[10,14]
   f. Pertussis, coughing paroxysms[15,16]
   g. Human immunodeficiency virus[17]
   h. Hantavirus[18]
   i. Trichinellosis[19]
   j. Cerebral malaria[20]
   k. Leptospirosis[21]
   l. Ocular leech[22]
3. Valsalva/severe vomiting[23]
4. Oncologic
   a. Neuroblastoma[24]
   b. Leukemia[25]
   c. Rhabdomyosarcoma[26]
5. Hematologic
   a. Hemophilia[27]
   b. Thrombocytopenia[28]
   c. Hemophagocytic lymphohistiocytosis[29]

The absence of bruising, especially in premobile infants, does not preclude nonaccidental trauma as the mechanism for subconjunctival hemorrhages. It is postulated that infants are not able to generate as much intrathoracic and intra-abdominal pressure as older children with a Valsalva maneuver, although vascular permeability may be increased by infection with *Bordetella pertussis*.[34] There is 1 report on 2 of 100 infants with vomiting from pyloric stenosis who were noted to have subconjunctival hemorrhage.[23] We therefore recommend that infants with subconjunctival hemorrhages with or without bruising and no relevant history of trauma and no apparent infection should have nonaccidental trauma included in the differential diagnosis. The medical provider should also consider a referral to a specialist in child abuse pediatrics.

This review does have limitations. The cases were retrospectively identified from those who had been admitted at a tertiary children's hospital and a referral made to the child protection team. We cannot assess the prevalence of child abuse among children who present with subconjunctival hemorrhage. Future studies could prospectively assess the incidence of subconjunctival hemorrhage on presentation to a primary care provider and the subsequent diagnosis of nonaccidental trauma.

CONCLUSIONS

Subconjunctival hemorrhages can occur in isolation without other historical or overt clinical signs suggestive of physical abuse. In the absence of another etiology, nonaccidental trauma should be strongly considered in the differential diagnosis for subconjunctival hemorrhage in infants and children, and a consultation with a child abuse pediatrics specialist should also be considered.

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