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Subconjunctival Hemorrhage and Respiratory Syncytial Virus Infection in an Infant Evaluated for Non-accidental Trauma: A Case Report of a Possible Association

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Abstract

A six-week-old previously healthy infant was found to have a subconjunctival hemorrhage (SCH) and concomitant respiratory syncytial virus (RSV) infection. Because SCH in an infant may represent a sentinel finding of non-accidental trauma (NAT), an extensive multidisciplinary evaluation was performed, which identified no traumatic injuries or evidence of abuse. The SCH resolved within one week, and the patient recovered with supportive care without complications. To our knowledge, SCH in association with RSV has not previously been reported, despite RSV being common in infants. As with SCH reported in association with other respiratory infections, inflammatory and pressure-related processes are possible mechanisms, although this observational case cannot establish causation. Reporting this possible association may broaden the differential diagnosis of SCH to include other medical causes in infants with RSV, while reinforcing the need for completing a thorough screening for abuse. Identifying medical causes for childhood injuries is as important as accurately diagnosing inflicted injury, as misdiagnosing child abuse can have serious medicolegal consequences for children and their families.

Categories: Ophthalmology, Pediatrics
Keywords: case report, child abuse evaluation, infant, non-accidental trauma, respiratory syncytial virus, subconjunctival hemorrhage

Introduction

Subconjunctival hemorrhage (SCH) is a sentinel finding of pediatric non-accidental trauma (NAT), and SCH remains an important and well-documented extraocular manifestation of NAT [1]. However, pediatric SCH has multiple reported age-dependent etiologies such as trauma, Valsalva associated with coughing/vomiting, coagulopathy, and infection, which may overlap with NAT as an etiology. Often, isolated SCH is not fully screened for NAT, and occult injuries are found if there is suspicion for abuse and screening is performed [2]. Ophthalmologists are consulted when there is suspicion of NAT, and full indirect ophthalmoscopic examination through a dilated pupil is recommended for the workup of pediatric/infantile SCH in the setting of suspected NAT [3].

When the NAT workup is normal after identifying only a single sentinel injury, it is prudent to analyze the inciting case findings. This idea is even more important when analyzing a finding like SCH, which has multiple etiologies. To our knowledge, there have been no previous reports of SCH associated with respiratory syncytial virus (RSV) identified in searches of PubMed and Google Scholar, although pediatric SCH has rarely been associated with other respiratory infections. This observation is noteworthy, given that RSV is the leading cause of lower respiratory tract infections in children [4]. Herein, we present the case of an infant with SCH in the setting of RSV infection whose comprehensive multidisciplinary NAT evaluation identified no evidence of abuse. The aim is to describe a possible illness-associated explanation of the SCH, as this observational case cannot establish causation or rule out abuse.

Case Presentation

A six-week-old previously healthy female was admitted to the hospital for increased work of breathing and dehydration. She was evaluated in the emergency department (ED) approximately one week earlier for respiratory symptoms, at which time the initial viral panel was negative, and SCH was not specifically evaluated or documented. Supportive care was provided, and she was discharged with return precautions. On subsequent admission approximately one week later, she tested positive for RSV via polymerase chain reaction testing and was found to have SCH of the right eye (Figure *1*). The mother, who accompanied the infant through her evaluations, first noticed the SCH during this hospitalization; she did not report a previous history of ocular or facial trauma. No relevant family history was reported. SCH had not been documented at well-child checks or in birth records. As SCH has been recognized as a sentinel injury in young infants and raises concern for possible abuse, a physical exam and multidisciplinary evaluation were

initiated. Initial screening measures included computed tomography (CT) of the head, skeletal survey, and dilated funduscopic examination. Laboratory studies were obtained to evaluate for occult injuries or underlying conditions that would predispose to developing SCH (Table *1*). Physical examination revealed no other bruises, abrasions, oral injuries, or deformities. Hemoglobin was 9.5 g/dL, a value which the treating pediatric team considered compatible with the physiologic decline in hemoglobin during early infancy. The red blood cell count of 2.67 x10(6)/mcL and hematocrit of 27.4% were similarly considered age-appropriate. The absolute neutrophil count of 1.01 thou/mcL was also considered within age-appropriate limits. An isolated low anion gap of 1 was obtained from a specimen reported to be mildly hemolyzed, with otherwise reassuring electrolyte findings, and was not considered clinically significant. Platelet count and coagulation studies were within the reported reference ranges.



FIGURE 1: A subconjunctival hemorrhage observed on the superior nasal portion of the infant's right eye.

Laboratory Test	Value	Reference Range
CMP - Sodium	134 mmol/L	134-142 mmol/L
CMP - Potassium	5.4 mmol/L	4.0-6.2 mmol/L
CMP - Chloride	106 mmol/L	96-110 mmol/L
CMP - Carbon Dioxide (CO2)	27 mmol/L	17-29 mmol/L
CMP - Blood Urea Nitrogen (BUN)	9.0 mmol/L	2.0-14.0 mmol/L
CMP - Glucose	86 mg/dL	60-115 mg/dL

CMP - Creatinine	0.24 mg/dL	0.20-0.40 mg/dL
CMP - Calcium	9.5 mg/dL	9.0-10.9 mg/dL
CMP - Albumin	3.4 g/dL	2.6-4.4 g/dL
CMP - Alkaline Phosphatase	302 unit/L	80-425 unit/L
CMP - Total Protein	5.4 g/dL	4.6-7.4 g/dL
CMP - Total Bilirubin	0.8 mg/dL	0.2-1.0 mg/dL
CMP - Aspartate Aminotransferase (AST)	42 unit/L	20-64 unit/L
CMP - Alanine Aminotransferase (ALT)	20 unit/L	14-45 unit/L
CMP - Anion Gap	1	5-20
Amylase Level	34 unit/L	30-110 unit/L
Lipase Level	122 unit/L	23-208 unit/L
C-Reactive Protein (CRP)	<5.0 mg/dL	<= 9.0 mg/dL
CBC - White Blood Cell (WBC)	5.43 thou/mcL	5.00-20.00 thou/mcL
CBC - Red Blood Cell (RBC)	2.67 x10(6)/mcL	3.60-5.00 x10(6)/mcL
CBC - Hemoglobin	9.5 g/dL	11.0-17.0 g/dL
CBC - Hematocrit	27.4 %	37.0-54.0 %
CBC - Mean Corpuscular Volume (MCV)	102.6 fL	89.0-109.0 fL
CBC - Mean Corpuscular Hemoglobin (MCH)	35.6 pg	26.0-38.0 pg
CBC - Mean Corpuscular Hemoglobin Concentration (MCHC)	34.7 g/dL	32.0-36.0 g/dL
CBC - Red Cell Distribution Width (RDW)	13.1 %	12.4-16.6 %
CBC - Platelets	251 thou/mcL	200-400 thou/mcL
CBC - Mean Platelet Volume (MPV)	10.3 fL	5.0-11.0 fL
CBC differential - % Neutrophils	18.6 %	-
CBC differential - % Lymphocytes	64.6 %	-
CBC differential - % Monocytes	14.2 %	-
CBC differential - % Eosinophils	2.0 %	-
CBC differential - % Basophils	0.2 %	-
CBC differential - % Immature Granulocytes	0.4 %	-
CBC differential - NRBC %	0.0	-
CBC differential - Absolute Neutrophils	1.01 thou/mcL	1.80-7.10 thou/mcL
CBC differential - Absolute Lymphocytes	3.51 thou/mcL	2.05-14.20 thou/mcL
CBC differential - Absolute Monocytes	0.77 thou/mcL	0.10-2.80 thou/mcL
CBC differential - Absolute Eosinophils	0.11 thou/mcL	0.00-1.02 thou/mcL
CBC differential - Absolute Basophils	0.01 thou/mcL	0.00-0.34 thou/mcL
CBC differential - Absolute Immature Granulocytes	0.02 thou/mcL	0.00-0.09 thou/mcL
CBC differential - Absolute NRBC	0.00 x10(3)/mcL	0.00-1.00 x10(3)/mcL
Coagulation - Prothrombin Time (PT)	13.6 seconds	12.1-15.1 seconds
Coagulation - International Normalized Ratio (INR)	1.0	0.9-1.0
Coagulation - Partial Thromboplastin Time (PTT)	29.6 seconds	22.8-34.4 seconds

TABLE 1: Laboratory studies obtained during evaluation of subconjunctival hemorrhage.

Comprehensive metabolic panel, amylase level, lipase level, complete blood count with differential, and coagulation study results with units and reference ranges are included. CMP: comprehensive metabolic panel; CO2: carbon dioxide; BUN: blood urea nitrogen; AST: aspartate aminotransferase; ALT: alanine aminotransferase; CRP: C-reactive protein; CBC: complete blood count; WBC: white blood cell; RBC: red blood cell; MCV: mean corpuscular volume; MCH: mean corpuscular hemoglobin; MCHC: mean corpuscular hemoglobin concentration; RDW: red cell distribution width; MPV: mean platelet volume; NRBC: nucleated red blood cell; PT: prothrombin time; INR: international normalized ratio; PTT: partial thromboplastin time. Reference ranges shown are those reported by the institutional clinical laboratory at the time of testing.

The dilated funduscopic examination was grossly normal, with no retinal hemorrhages noted (Table *2*). The head CT demonstrated no acute abnormality (Figure *2A*). On the initial skeletal survey, the attending pediatric radiologist noted unilaminar periosteal reaction along the femoral and tibial shafts consistent with normal appositional bone growth for age. However, the radiologist considered the medial left proximal tibial metaphyseal spurring "worthy of further evaluation," stating that "a transmetaphyseal fracture cannot be excluded on this image and further imaging is warranted" (Figure *2C*). The concerning finding was seen on the anteroposterior but not the lateral view and was not a confirmed fracture. Child abuse pediatrics was consulted, and magnetic resonance imaging (MRI) of the brain, spine, and left knee/tibia was obtained. The MRI of the brain (Figure *2B*) and spine was reported as normal, and MRI of the left knee/tibia showed no fracture or associated soft tissue injury (Figure *2D*). The skeletal studies were interpreted by attending pediatric radiologists, and MRI studies by attending pediatric neuroradiologists. The Department of Children's Services (DCS) was contacted and evaluated the home and caregivers involved in the infant's care. The DCS investigation resulted in no concerns. Respiratory treatment was supportive, no intubation was required, and the infant stabilized on room air. The SCH resolved within one week of admission, and no complications or unexpected adverse events were reported. Following the completed medical and psychosocial evaluation, the infant was discharged to the mother with a planned DCS follow-up home visit and repeat skeletal survey after two weeks. At follow-up, no further injuries were identified, and the proximal tibial finding showed no interval change, favoring physiologic periostitis/metaphyseal spurring rather than fracture (Figure *2E*).

Exam	Right Eye	Left Eye
Disc	Normal	Normal
Cup-to-disc Ratio	0.3	0.3
Macula	Normal	Normal
Vessels	Normal	Normal
Periphery	Normal, no retinal hemorrhages noted	Normal, no retinal hemorrhages noted

TABLE 2: Dilated funduscopic exam findings.

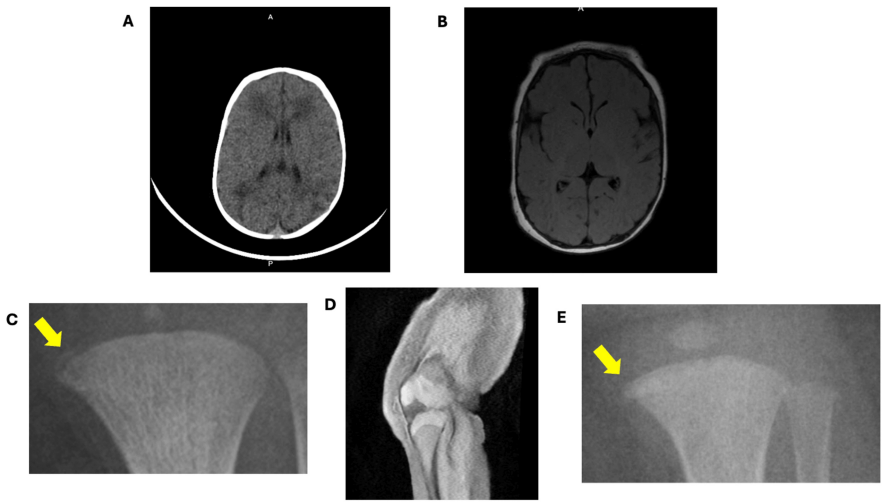


FIGURE 2: Radiographic and magnetic resonance imaging findings.

(A) Axial view of head CT demonstrating no abnormalities. (B) Axial view of T2 FLAIR MRI of head demonstrating no abnormalities. (C) Anteroposterior radiograph of the proximal left tibia demonstrating medial metaphyseal spurring that prompted concern for a possible transmetaphyseal fracture (arrow). (D) Sagittal T1-weighted MRI of the left knee demonstrating no signs of fracture or soft tissue damage. (E) Anteroposterior radiograph of the left tibia at two-week follow-up demonstrating no interval change, favoring physiologic periostitis/metaphyseal spurring rather than fracture (arrow). CT: computed tomography; FLAIR: fluid-attenuated inversion recovery; MRI: magnetic resonance imaging.

Discussion

Trauma is the most common cause of SCH in young children, but SCH has many other non-traumatic causes, including infectious, inflammatory, hematologic, and vascular conditions [1]. In older children, SCH can occur because of indirect vascular trauma secondary to illnesses that increase forceful Valsalva and intrathoracic pressure, including severe coughing, vomiting, constipation, and sneezing. However, these causative mechanisms are not commonly reported in young infants. Koti et al. found SCH to be extremely rare in children under three years old presenting with cough, vomiting, or constipation [5]. Thus, identifying SCH in a young infant should prompt further investigation for physical abuse, particularly because occult injuries may be identified when appropriate screening is performed [2].

Though RSV is one of the leading viral causes of lower respiratory tract illness in infants [4], there is a paucity of information regarding its ocular sequelae. Previous literature has described SCH in association with other infectious illnesses, including herpes zoster [6], varicella [7,8], pertussis [9], Mycoplasma pneumoniae infection [10], and adenovirus-associated respiratory illness [11]. SCH has also been reported in association with COVID-19 and influenza, although these reports are limited and include neonatal and adult patients [12,13]. Despite these reported associations between SCH and other infectious or respiratory illnesses, we identified no previous report specifically describing SCH in association with RSV infection in searches of PubMed and Google Scholar.

It is unlikely that the infant reported in this case had a remaining SCH from delivery, as most birth-associated SCH resolve within the first weeks of life [14]. There were also no concerns for constipation, specific coughing events, or other entities that may have caused forceful Valsalva, despite this being an unlikely cause of SCH in this young age group [5]. Furthermore, spontaneous SCH rarely occurs in children, and its presence should prompt an appropriate workup for other medical causes or traumatic injuries [1].

In this patient, the temporal association between SCH and RSV infection, in the absence of another identified medical or traumatic cause after multidisciplinary evaluation, raises the possibility of an illness-related mechanism. One study reported ocular surface inflammation from conditions such as allergic, viral, neonatal, Kawasaki disease, and Herpes Zoster-related conjunctivitis associated with SCH in 13% of children [1]. We hypothesize that the RSV infectious process may contribute to SCH through mechanisms similar to those proposed for other upper respiratory infections such as COVID and influenza: viral remnants in ocular tissues may cause an inflammatory effect that weakens the blood vessels, allowing for an increased propensity for rupture through the increased intrathoracic pressure that accompanies typical sneezing or coughing in many viral upper respiratory infections [12]. Conjunctivitis has been reported in 11% of children hospitalized with RSV [15]. Whether an ocular inflammatory process contributed to the SCH in this infant cannot be established, and no specific coughing or Valsalva event was documented at its onset. Accordingly, these inflammatory and pressure-related pathways remain biologically plausible hypotheses, rather than established mechanisms, in this patient.

SCH in the setting of RSV infection may represent a rare illness-associated finding, and recognizing this possibility could be clinically important given the potentially serious medicolegal consequences of both missed abuse and incorrectly attributed abuse. It is also important to state that child abuse cannot be completely excluded simply because imaging, laboratory studies, and physical examination demonstrated no other injuries; however, physicians should consider other non-traumatic causes, though rare, of SCH in infants in the context of a single sentinel injury with a known medical illness that may contribute to a propensity to develop SCH. The importance of maintaining a broad differential diagnosis is supported by a 2026 retrospective cohort study in which Tayama et al. found abuse in only 12 (0.9%) of 1,281 infants and young children with SCH [16]. The Tayama et al. cohort included children aged one to <48 months (mean age 22.5 months); isolated SCH was defined as SCH without another injury identified within seven days before or after the SCH, and abuse ascertainment incorporated diagnosis codes with review of clinical notes and radiology reports. These population-level findings do not remove the need for an age-appropriate abuse evaluation in an individual six-week-old infant.

Strengths of this case report include the multidisciplinary evaluation with ophthalmic examination, neuroimaging, skeletal surveys, child abuse pediatrics evaluation, and follow-up imaging. These investigations informed the clinical assessment but cannot definitively exclude abuse or establish RSV causation.

Limitations of this case report include the inability to establish the exact timing of SCH onset, although SCH was not documented approximately one week prior to admission during the previous ED visit or at well-child checks or in birth records, the lack of previously reported SCH associated with RSV infections, and the impossibility of entirely ruling out abusive trauma as a cause of SCH, despite multidisciplinary evaluation. Additionally, a single case cannot establish a causal relationship between RSV infection and SCH. Nevertheless, the temporal association between RSV infection and the SCH, analogous reports of SCH in association with other respiratory and infectious illnesses, and the absence of another identified explanation for SCH after multidisciplinary evaluation support consideration of RSV-associated illness as a possible explanation. Further study would be necessary to determine whether SCH represents a reproducible, though rare, ocular finding associated with RSV infection.

Conclusions

SCH in infants is a sentinel finding of non-accidental trauma, raising the concern for child abuse in specific contexts, and should prompt screening for further injuries. While it is virtually impossible to completely exclude inflicted injury in this case, a multidisciplinary team identified no evidence of abuse or additional traumatic injuries. The temporal association of the SCH with RSV infection indicates the possibility of the RSV infectious process contributing to SCH via inflammatory or pressure-related processes associated with respiratory illness, as has been proposed for other infections. This case documents a possible association, not proof of causation. Nonetheless, considering other medical causes for SCH in infants with RSV, after completing a thorough screening for abuse, is as important as accurately diagnosing inflicted injury given potentially serious medicolegal consequences.

Additional Information

Author Contributions

All authors have reviewed the final version to be published and agreed to be accountable for all aspects of the work.

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