Predictors of Shaken Baby Syndrome and its Neurological Impact: Case Report
Predictores de Síndrome Bebe sacudido y su repercusión neurológica: Reporte de Caso
Preditores da Síndrome do Bebê Sacudido e suas repercussões neurológicas: Relato de Caso

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Abstract Shaken baby syndrome (SBS) is a serious and prevalent condition that has a profound impact on infants. Despite ongoing debates regarding the pathophysiology, diagnosis, and treatment of this syndrome, this article presents a clinical case involving a 7-month-old infant exhibiting clinical symptoms and imaging findings consistent with shaken baby syndrome. The report encompasses the severe consequences and predisposing factors associated with the condition. The objective is to contribute to the enhancement of early intervention strategies and public health initiatives for the well-being of children affected by shaken baby syndrome.

Resumen El síndrome del bebé sacudido (SIC) es una afección grave y prevalente que tiene un profundo impacto en los bebés. A pesar de los debates en curso sobre la fisiopatología, el diagnóstico y el tratamiento de este síndrome, este artículo presenta un caso clínico que involucra a un bebé de 7 meses que presenta síntomas clínicos y hallazgos de imagen compatibles con el síndrome del bebé sacudido. El informe abarca las graves consecuencias y los factores predisponentes asociados con la afección. El objetivo es contribuir a la mejora de las estrategias de intervención temprana y las iniciativas de salud pública para el bienestar de los niños afectados por el síndrome del bebé sacudido.

Resumo A síndrome do bebê sacudido (SBS) é uma condição grave e prevalente que tem um impacto profundo nos bebês. Apesar dos debates contínuos sobre a fisiopatologia, diagnóstico e tratamento desta síndrome, este artigo apresenta um caso clínico envolvendo uma criança de 7 meses de idade apresentando sintomas clínicos e achados de imagem consistentes com a síndrome do bebê sacudido. O relatório abrange as consequências graves e os fatores predisponentes associados à doença. O objetivo é contribuir para o aprimoramento de estratégias de intervenção precoce e iniciativas de saúde pública para o bem-estar das crianças afetadas pela síndrome do bebê sacudido.

Keywords: Shaken baby syndrome, PICU, retinal hemorrhage, subarachnoid hemorrhage, subdural hemorrhage, non-accidental trauma, pediatrics.

1. Introduction

An American radiologist named John Caffey coined the term ”whiplash shaken infant syndrome” in 1974. However, it was the British neurosurgeon Guthkelch who initially identified shaking as a cause of subdural hemorrhage in infants [Blumenthal (2002)].

Shaken Baby Syndrome (SBS) is a traumatic brain injury resulting from the violent shaking of an infant or young child. This force causes the delicate brain to bounce, jolt, and move back and forth inside the skull, leading to injuries such as contusions, swelling, and other severe complications. SBS can cause profound brain damage and is considered a form of child abuse, primarily affecting children under the age of 2, although it can occur in those as young as 5. Caregivers may deny or misrepresent the cause of the brain injury [of Pediatrics et al. (2001)].

Clinical indicators of SBS include subdural hemorrhages, subarachnoid and retinal hemorrhages, which are characteristic signs of shaking injury. Extensive retinal hemorrhages covering the peripheral pole, extending up to the ora serrata, along with retinoschisis and other ocular/periocular hemorrhages, strongly suggest abusive head trauma (AHT). This is particularly true when there is no other plausible explanation for the extensive accidental trauma.

2. Case report

The infant, under seven months old, eutrophic, and of mixed race, hails from Huaraz and belongs to a dysfunctional family. According to the mother, the child was brought to the emergency room due to a fall from a height of more than 1 meter and a subsequent blow to the facial area. The incident occurred 48 hours prior, and there is no known history of child abuse. This is the mother's first gestation, characterized by adequate prenatal care, institutional delivery, normal birth weight, and Apgar score, as well as normal psychomotor development. The mother noticed a sensory disorder in the child and observed hypoactivity, prompting her to seek medical attention. Upon admission, the infant exhibited vital signs, including a heart rate of 170 bpm, blood pressure of 98/50 mmHg, respiratory rate of 30 rpm, and a temperature of 36.5°C. Oxygen saturation in ambient air was 93%, and the Glasgow Coma Scale score was 6/15. Physical examination revealed contuso-equimotic lesions of approximately 3x3 cm on the face, bilateral ocular hemorrhages, isochoric arreactive pupils, and late seizures associated with continuous sucking and jaw movements. Hypertonia in the legs was also noted, leading to advanced airway management and connection to advanced mechanical ventilation. Diagnostic imaging, specifically tomographic images on admission, revealed a left frontoparietal subdural hematoma, which was evaluated by emergency neurosurgeons, recommending medical management **Figure 1**. Ocular orbital fundus examination showed diffuse retinal hemorrhages with opacities towards the optic nerve **Figures 3, 4**. The patient presented secondary lesions of encephalic trauma, including hypoglycemia, metabolic acidosis, and hypotension. Neurocritical neuroprotection was initiated with the intention of maintaining cerebral hemodynamics. After four weeks of hospitalization in the pediatric intensive care unit, the infant underwent surgery due to clinical deterioration, and a tomographic control revealed greater compromise in the extension of the subdural hematoma, necessitating evacuation **Figure 2**. Subsequently, audiovisual and motor disabilities were observed.

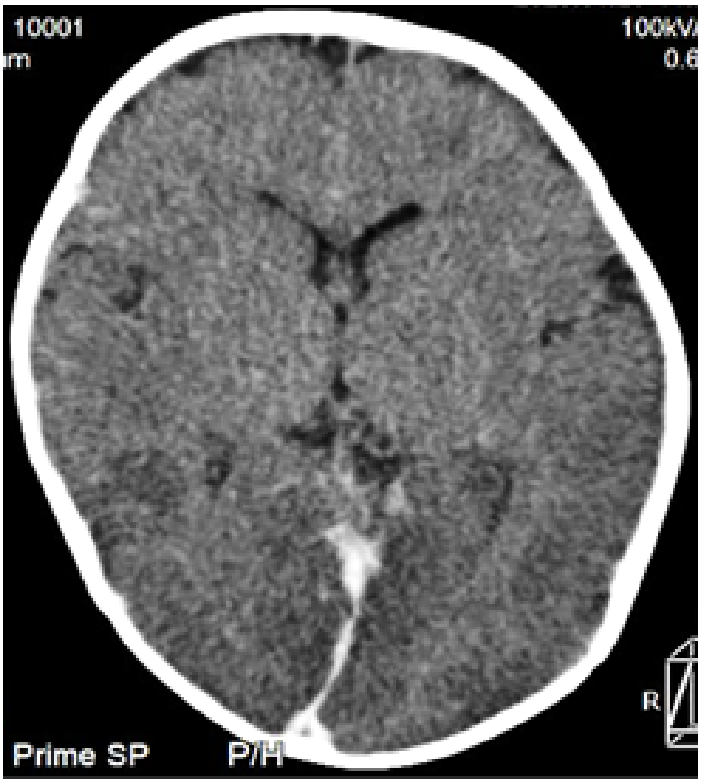

Figure 1: Diffuse cerebral edema, mild bilateral temporal acute bleeding and at the level of the interhemispheric fissure.

Figure 2: Increased volume of the ventricular system. Right frontoparietal subdural collection, structures of the posterior fossa of increased density in relation to severe brain damage.

Figure 3: RE: Optic nerve with depressed edges, hemorrhage in the posterior pole. Retinal paleness 2+.

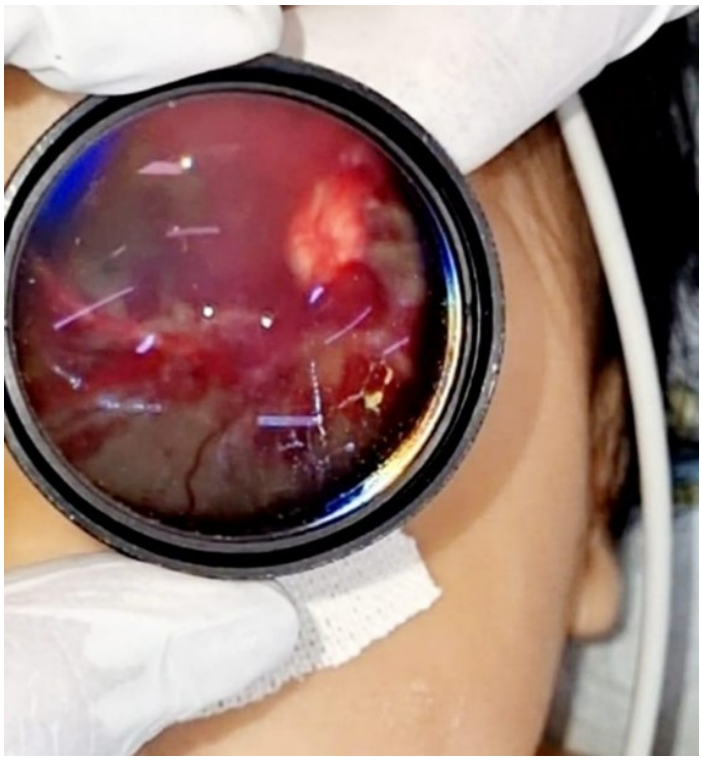

Figure 4: LE: optic nerve with defined edges, extensive hemorrhages in the posterior pole with involvement of the macula.

3. Discussion

In the case of our pediatric patient, despite the fact that her parents did not manifest physical abuse, shaken baby syndrome (SBS) can be observed by the presence of subdural hematoma, subarachnoid and diffuse cerebral edema, retinal hemorrhages, and, in general, the absence of other physical signs of traumatic injury. Moreover, this infant's age was within the range prior to his first year of life, most often between three and eight months of age.

Fundus imaging showed evidence of retinal hemorrhages that are especially characteristic of SBS caused by repetitive acceleration-deceleration injuries with or without blunt impact to the head (Christian et al., 2009) [Thau et al. (2021)], which could have been caused in our pediatric patient. There is a great deal of information on cases of child abuse, despite which early detection of clinicopathological features and self-imaging in children is not possible, in order to avoid later neurological disabilities. In two recent systematic reviews, including more than 30 clinical studies and thousands of children, the strong association of severe retinal hemorrhage with child abuse trauma was confirmed [Maguire et al. (2009)]. When the number of retinal hemorrhages is numerous, multilayered, bilateral, and extending to the ora serrata, they are very specific for child abuse trauma [Forbes et al. (2010)].

It should be mentioned that in the initial imaging of our patient, CT revealed Subdural Hemorrhage, which is the most common neuroradiological finding in CSH, and sometimes it is bilateral or multiple [6 (2014)]. According to a more complete systematic review of 21 previous studies, the neuroradiological features that distinguish child abuse trauma from other TBI are multiple subdural hemorrhages in convexity, interhemispheric hemorrhages, subdural hemorrhages in the posterior fossa, hypoxic ischemic injury (HII), and cerebral edema [Kemp et al. (2011)], which coincide with the evolution of our patient's evolving images.

The presence of a subarachnoid hemorrhage (SAH) is present in almost all fatal cases of child abuse trauma, but the overall incidence is the same in both AHT and non-AHT. Retrospective studies demonstrate that SAH is associated with a worse overall prognosis and worse outcome, with higher mortality, longer hospital stay, higher rates of infection, and more days on mechanical ventilation [Hochstadter et al. (2014)].

The prognosis of patients with abusive head injury correlates with the extent of injury identified on CT scan. It is important to recognize that the long-term symptoms that are going to present are blindness, attention deficit, developmental delays, intellectual deficits, sensory deficits, hearing impairment, motor dysfunction, growth retardation, feeding difficulties, seizures, behavioral, and educational difficulties that are disabilities that impact the quality of life of our pediatric patients.

4. Conclusion

Pediatricians should always be very attentive to any brain trauma in infants and be aware of the radiological and clinical findings that support the diagnosis of shaken baby syndrome, along with its prevention strategies.

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