



## Pathology & Biology Section – 2004

### G73 Meningitis Mimicking Inflicted Abusive Head Trauma

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After attending this presentation, attendees will be reminded to consider other etiologies for markers of inflicted abusive head trauma which may prevent misdiagnoses of shaken baby syndrome.

The main goal impact of this presentation is to prevent misdiagnoses of inflicted abusive head trauma and the resulting consequences.

The current consensus regarding the triad of retinal hemorrhages, cerebral edema, and subarachnoid or subdural hemorrhage in non-ambulating infants is that it is virtually pathognomonic for inflicted abusive head trauma (i.e., shaken baby/shaken-impact syndrome - SBS). This case illustrates that while these findings are highly sensitive for SBS they are not 100% specific.

The local forensic pathologists were contacted by the pediatric intensivist to evaluate an eight-week-old male infant under treatment in the hospital's intensive care unit. The child had been admitted to the unit two days prior. The history given by the mother was that the child had a rectal temperature of 104° F at home, for which she gave him an ice bath. She then took him to the local health clinic. He was noted at the clinic desk to be "acutely ill." The mother was instructed to immediately take the baby to the hospital emergency room. She complied. Upon admission to the hospital the infant had a rectal temperature of 100.2° F and a heart rate of 240 beats per minute. Very little additional information is documented regarding the initial physical exam. The HEENT exam record consists of, "flat anterior fontanelle and a clear nose." Medical treatment focused on evaluating and treating the baby's rapid heart rate, and the child was "pan-cultured." Approximately 12 hours after admission the child's anterior fontanelle was noted to be bulging. A neurosurgical consult and a CT scan of the head were ordered. These revealed, "diffuse bilateral retinal hemorrhage, cerebral edema, and possible subarachnoid hemorrhage." The diagnosis of SBS was made. Local law enforcement and child protective services personnel were notified. Based upon the clinical diagnosis, the infant's older sibling (15 months) was removed from the custody of his parents.

The consulting forensic pathologists requested the results of all microbiology cultures, with particular attention to the spinal fluid cultures. They were advised that no lumbar puncture or spinal fluid culture had been performed upon admission, or at any time during the hospitalization. The tracheal aspirate culture was positive for *Streptococcus pneumoniae*. Throughout the child's hospitalization the mother maintained her position that she had not harmed her child. Regarding events leading up to her child's hospitalization, the mother specifically described the baby as having fever, jumping-like movements, "eyes rolling up into the head," and the presence of a hard red lump on the infant's head. The story did not change upon repeated interviews. The infant was pronounced brain dead on the fourth hospital day, and life support was withdrawn. The body was transported to the morgue. A complete autopsy was performed approximately 18 hours after death.

The autopsy revealed no external evidence of injury. All markings were a result of therapeutic intervention. The internal examination of the torso and neck was also negative for injuries. Examination of the head revealed a markedly swollen brain with herniation, very scant subdural and subarachnoid hemorrhage, and very extensive bilateral retinal hemorrhages. The meninges were remarkable for multifocal dull gray-green discoloration. The dura and overlying scalp around the anterior fontanelle grossly exhibited thickening and discoloration, suggestive of granulation tissue/inflammation. The middle ears were opened revealing a cloudy green exudate on the left. Based on these findings, the case appeared to represent undiagnosed bacterial meningitis. A more definitive diagnosis required microscopic examination of the brain, meninges, and retinas. The "red lump" reported by the mother was a calcifying cephalohematoma of parietal skull. This was attributed to birth-related trauma. Upon these initial findings, the police and child protective services were notified, and the older sibling was returned to parental custody.

Thorough microscopic examination revealed severe acute meningitis with necrosis of the small to medium sized meningeal blood vessels. The inflammatory process completely encased the optic nerves. Microthrombi were noted in the blood vessels of the optic nerves and retinas. Sections of the eyes showed bilateral diffuse intraretinal hemorrhage. No optic nerve sheath hemorrhages were noted. Swabs of the middle ear fluid were remarkable for acute inflammation and cocciform bacterial organisms consistent with *Streptococcus pneumoniae*. The cause of death was ultimately attributed to acute bacterial meningitis.

Review of the literature reveals numerous papers on retinal hemorrhages, all of which state that the most common cause of retinal hemorrhages in infants is inflicted head trauma, particularly shaken baby syndrome. However, most papers also state that other rare causes, such as infection and bleeding disorders, must be ruled out. Only one case report was found documenting retinal hemorrhages in the setting of bacterial meningitis and without suspected abuse. The hemorrhage in this report was focal, and the patient recovered.<sup>1</sup> The meningitis did not result in massive cerebral edema and death, as was seen in this case.

This case should serve to remind the forensic pathologist and the clinician of the importance of investigating other potential causes of the "markers" of shaken baby syndrome, regardless of how unlikely they may be. The presenter will discuss possible explanations for misdiagnosis and recommendations for



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evaluating similar cases.

<sup>1</sup> Fraser SG, Horgan SE. Retinal hemorrhage in meningitis. *Eye* 1995;9:659-60.

### **Retinal Hemorrhage, Shaken Baby Syndrome, Meningitis**