



Short Communication

DOI: 10.36959/595/407

“Infantile” Acute Subdural Hematoma: A Clinical Entity Different from Abusive Head Trauma

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Introduction

More than thirty years have passed since the publication of the article entitled, “Infantile” acute subdural hematoma. Clinical analysis of 26 cases by Aoki and Masuzawa in the Journal of Neurosurgery [1].

Because of the biophysiological characteristics of infants, the authors limited their definition of the term, “infantile” acute subdural hematoma (i-ASDH) to acute subdural hematomas due to apparently minor head trauma without loss of consciousness and not associated with primary brain injury [1]. At the time, the article was critically reviewed by Dr. ReKate as follows [2]: While, not totally pathognomonic of shaking, the constellation of SDH and retinal hemorrhage in the context of a historically trivial injury should be regarded as whiplash shaken baby syndrome unless another etiology can be determined.

We have published a response to Dr. ReKate’s letter stating that the most common mode of child abuse in Japan is direct violence, resulting in visible signs of trauma and associated with a poor neurological prognosis [3]. This differs from i-ASDH, and is true of the current situation in Japan as well [4,5].

Partly due to this criticism, i-ASDH as proposed by us has not been fully accepted as a clinical entity at least in the English-speaking world. I therefore wish to ask two questions to Dr. ReKate and other neurosurgeons in the United States.

First, I would like to know if the automatic diagnosis of SDH + RH (retinal hemorrhage) = SBS (shaken baby syndrome) or AHT (abusive head trauma) as cited by Dr. ReKate still has currency. Second, I would like to know if the assumption that a minor fall in infants cannot cause SDH is supported by unequivocal scientific evidence.

The aim of this presentation is to propose i-ASDH again as a definite patho-etiological entity, based on the comparison between i-ASDH and AHT and including data on recent cases in Japan. In addition, in order to establish an internationally valid definition of ASDH in infants, we wish to propose a new classification consisting of three groups, namely, the non-accidental, accidental and “infantile” types.

Currently in Japan, thanks to the routine practice of ex-

aming head injuries including minor trauma in infants with CT, an increasing number of cases with mild type of i-ASDH [1] showing thin SDHs and an asymptomatic clinical course after generalized convulsions is being encountered. Most of these babies present retinal hemorrhage at the time of their arrival at the emergency department.

This entity is characterized by an extremely stereotypical clinical profile illustrated by the following hypothetical case: A Japanese male infant aged 5 ~12 months falls and hits his occipital region against a soft surface as he tries to stand up by putting his hands on the corner of the living room table. Immediately after the fall, the baby begins to cry, and the mother holds him in her arms and notes generalized convulsions. The baby is taken to the emergency room by ambulance, where a CT reveals an acute subdural hematoma. Retinal hemorrhage is also noted. Shortly thereafter he regains full activity and no neurological sequelae are noted.

It is worth mentioning that the history presented by mothers is always the same for both the recent cases and those from more than thirty years ago, even though the mothers could not have known about i-ASDH, at least until they arrived at the emergency room. This is also true in the most recent case report [6].

There are three distinct differences between i-ASDH and AHT. First, i-ASDH generally has a good outcome, with GR in approximately 80% of the patients. (Table 1 and Table 2) Second, i-ASDH is strictly age-specific, occurring mostly in infant from 5 ~12 months old, shows a statistical difference from AHT (Table 3 and Table 4) as noticed by Gardner [7], and

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Accepted: April 18, 2020

Published online: April 20, 2020

Citation: Aoki N (2020) “Infantile” Acute Subdural Hematoma: A Clinical Entity Different from Abusive Head Trauma. J Pediatr Neurol Neurosci 4(1):51-53

Table 1: Comparison of outcome between i-ASDH and AHT.

	i-ASDH		AHT	
	Aoki & Masuzawa [1], 1984 (n = 26)	Nishimoto & Kurihara [8], 2006 (n = 25)	Golden & Maliawan [9], 2004 (n = 39)	Kivlin, et al. [10], 2000 (n = 92)
Good	22 (85%)	18 (72%)	9 (23%)	22 (24%)
Moderate disability	2 (8%)	7 (28%)	8 (20%)	8 (9%)
Severe disability	0	0	10 (26%)	26 (28%)
Dead	2 (8%)	0	12 (31%)	36 (40%)

i-ASDH: infantile acute subdural hematoma; AHT: Abusive head trauma.

Table 2: Statistical analysis of comparison of outcome between i-ASDH and AHT, with chi-square test.

	Chi-square value	Fisher direct probability	Probability
Aoki & Masuzawa [1], 1984 vs. Kivlin, et al. [10], 2000		0	P < 0.001
Aoki & Masuzawa [1], 1984 vs. Nishimoto & Kurihara [8], 2006		0.324	N.S
Aoki & Masuzawa [1], 1984 vs. Golden & Maliawan [9], 2004		0	P < 0.001
Nishimoto & Kurihara [8], 2006 vs. Kivlin, et al. [10], 2000	661.611		P < 0.001
Kivlin, et al. [10], 2000 vs. Golden & Maliawan [9], 2004	0.397		N.S.
Nishimoto & Kurihara [8], 2006 vs. Golden & Maliawan [9], 2004	372.53		P < 0.001

i-ASDH: Infantile acute subdural hematoma; AHT: Abusive head trauma.

Table 3: Comparison of age distributions between i-ASDH and AHT.

Age (months)	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
i-ASDH No. of case																	
Aoki & Masuzawa [1], 1984 (n = 26)	0	0	1	1	1	1	6	6	2	5	2	0	1	0	0	0	0
Nishimoto & Kurihara [8], 2006 (n = 25)	0	0	0	0	0	3	8	5	3	4	1	0	0	0	0	0	1
AHT No. of case																	
Kivlin, et al. [10], 2000 (n = 92)	9	13	18	15	6	10	7	4	1	6	3	3	3	1	2	1	0
Golden & Maliawan [9], 2004 (n = 39)	19	16	1	1	2	0	0	0	0	0	0	0	0	0	0	0	0

i-ASDH: Infantile acute subdural hematoma; AHT: Abusive head trauma.

Table 4: Statistical analysis of comparison of age distributions between i-ASDH and AHT, with Wilcoxon rank-sum test.

	Z value	probability
Aoki & Masuzawa [1], 1984 vs. Kivlin, et al. [10], 2000	4.042	< 0.001
Aoki & Masuzawa [1], 1984 vs. Nishimoto & Kurihara [8], 2006	0.211	N.S.
Aoki & Masuzawa [1], 1984 vs. Golden & Maliawan [9], 2004	12.075	< 0.001
Nishimoto & Kurihara [8], 2006 vs. Kivlin, et al. [10], 2000	4.286	< 0.001
Kivlin, et al. [10], 2000 vs. Golden & Maliawan [9], 2004	6.876	< 0.001
Nishimoto & Kurihara [8], 2006 vs. Golden & Maliawan [9], 2004	13.670	< 0.001

i-ASDH: Infantile acute subdural hematoma; AHT: Abusive head trauma.

occurs predominantly in males, with the male:female ratio being 9:1 [1,8].

Third, the absence of a primary brain injury is evident on CT, MRI and surgery, and is compatible with the benign clinical course after surgical removal of the hematoma or conservative management. Although the majority of neurosurgeons in

the United States might assume that a minor fall cannot cause SDH, the potentially tragic consequences of either a false-positive or false-negative diagnosis make the need to establish a differential diagnosis between i-ASDH and AHT particularly urgent. The matter is of major legal importance as well, and the diagnosis should be based on strict medical evidence.

The mechanism causing accidental SDH, most commonly encountered in car accidents and falls from high places, is almost identical to that of AHT, resulting from a high-grade impact associated with various degrees of primary brain injury seen at all ages. On the other hand, the mechanism of i-ASDH differs from accidental SDH and AHT, and consists of an isolated disruption of the bridging veins or other cortical veins without an associated primary parenchymal brain injury.

Additionally, as described above, the clinical profile of i-ASDH is quite different from that of other ASDHs with respect to age specificity, male predominance, low-grade impact, and the benign clinical course.

Thus, in order to recognize i-ASDH as a definite patho-etiological entity, a new classification of ASDH in infants, consisting of the non-accidental, accidental and "infantile" types, should be proposed.

Acknowledgement

The author is indebted to Dr. Atsushi Orimo, Department of Clinical Research, Tokyo Metropolitan Tama Medical Center for his statistical analysis.

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DOI: 10.36959/595/407