

Subdural Haemorrhage in Infant with Macrocephaly

Fareena Zahari, Ismail Mohd Saiboon

Department of Emergency Medicine, Faculty of Medicine, University Kebangsaan Malaysia /University Kebangsaan Malaysia Medical Centre (UKMMC), Kuala Lumpur

Keyword:

Subdural haemorrhage,
Traumatic events,
CT Scan,
macrocephaly,
infant

Abstract

Subdural haemorrhage (SDH) are often seen after a traumatic event. We present a case of subdural haemorrhage in a 6-year-old infant with macrocephaly without any preceding history of trauma, fall, or physical abuse. The child presented to our department with history of fever, multiple episodes of vomiting and sleepiness. He was initially diagnosed with meningitis and was admitted. In the ward he developed seizures and neurological deficit which led to CT scan of the brain. The scan revealed bilateral SDH of varying ages with mass effect. We would like to highlight in this case, a child with macrocephaly or a rapidly enlarging head circumference ($> 95^{\text{th}}$ percentile for age) are commonly associated with benign enlargement of subarachnoid spaces (BESS). This leads to stretching of the bridging subdural veins due to enlargement of the cerebrospinal fluid (CSF) spaces that can predispose to development of SDH. SDH in children with BESS may occur spontaneously or as a result of minor trauma.

Corresponding Author: *fareenazahari@yahoo.com* (Fareena Zahari)

INTRODUCTION

Traumatic brain injury (TBI) of infancy can be accidental or nonaccidental and is characterized by three (3) primary findings: retinal haemorrhage (RH), subdural hematoma (SDH), and neurological dysfunction (ND) such as vomiting, decreased level of consciousness, lethargy, seizure and focal neurological findings. These three features are referred to as the 'triad'. The triad can also have a nontraumatic etiology and can be seen in infants with cortical vein thrombosis/ sagittal sinus thrombosis, ruptured vascular malformations, meningitis/ encephalitis and glutaric aciduria type 1.¹ Several different clinical setting can be associated with the triad which include severe accidental trauma,² severe birth trauma or even short falls.³

When an infant presented to the medical centre with triad and there is no history of trauma for explanation and none of the aforementioned conditions that might explained it, suspicion of nonaccidental injury (NAI) trauma from shaken baby syndrome (SBS) as most likely diagnosis will be made. However, there is evidence from several case reports published, in some cases of the triad, there is impressive macrocephaly that may indicate a medical cause of the triad and not child abuse.⁴ We are reporting a case of a macrocephalic baby who presented to us with signs of the atraumatic neurological dysfunction.

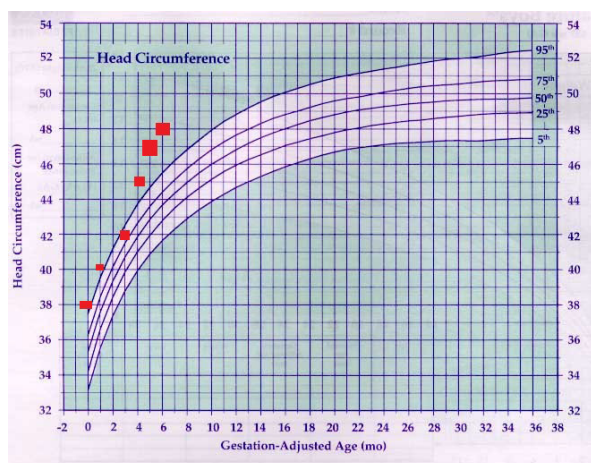


Figure 1. Head circumference chart

CASE PRESENTATION

Six-month-old baby, he presented to our emergency department (ED) with the history of fever, recurrent vomiting and increase sleepiness. No history of traumatic event was obtained. No seizure.

The baby boy had no known medical history and was delivered vaginally with the birth weight of 3400g at 37-week-gestational-age of pregnancy. Birth length was 54cm, and birth head circumference was 38.0cm (97th percentile). His parents were informed regarding the large head circumference and was put on monitoring. There was no neurodevelopmental delay. No imaging nor referral to any specialty made.

On physical examination, he was looking lethargic, pallor and mildly dehydrated. Vital signs were as follows; temperature 40.1°C, pulse rate of 170 beats per minute, respiratory rate of 30 breath per minute and saturation of 99% under room air. There was macrocephaly with bulging of the anterior fontanelle and marked head lag. However, there was no neck stiffness and no neurological deficits with normal tone, normal reflexes and down-going Babinski bilaterally. The lungs were clear, abdomen was soft, ears were normal, throat was is not injected and tonsils are normal.

Blood investigation, full blood counts showed white cells (WC) of 5.8 (neutrophils 10%, lymphocytes 71.8%), haemoglobin (Hb) 7.2, haematocrit (HCT) of 22.9% and platelet of 518.



Figure 2. Image of the patient

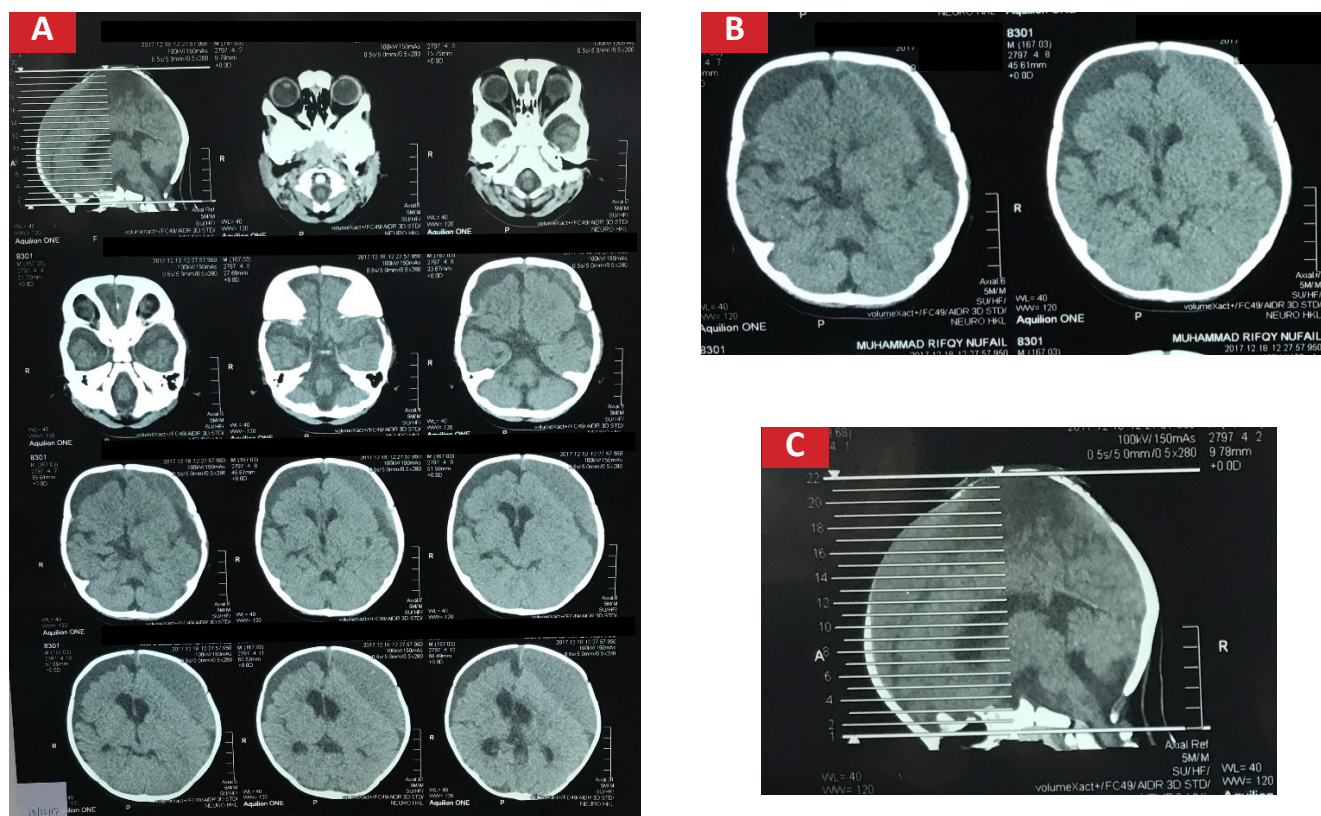


Figure 3. (A) Bilateral frontoparietotemporal SDH effusion. (B) Left subdural effusion isodense to brain parenchyma with layering. Suggestive of subacute - chronic bleed. Right subdural effusion, suggestive of chronic effusion. No hydrocephalus. (C) Bulging of anterior fontanelle.

Renal profile : urea 3.1, sodium 135, potassium 3.7, creatinine 101. Patient was admitted to paediatric ward with the impression of acute meningitis and antibiotic ceftriaxone was prescribed to patient.

On day 3 of ward admission, the patient developed seizure. Jerking movement of right upper and lower limbs, up-rolling of eyeballs for the duration of 3 minutes. The seizures aborted with IV midazolam 0.1mg/kg. Urgent computer tomography (CT) brain showed bilateral subdural bleed of varying ages with mass effect. (Figure 3)

Right burrhole with left mini craniotomy was performed after consultation with neurosurgical team. Investigation was done towards the parents to look for any possibility of child abused, which were ruled out as there was no evidence of child maltreatment. Patient was discharged home well after 18 days of being warded.

DISCUSSION

Many studies in the past has shown that the vast majority of cases with SDH in children under 2 years of age are due to child abuse.⁵ Those infants with clinical presentation were nonspecific, the prognosis was poor with high percentage of long-term neurologic sequel and deaths.⁶

In a study of 84 infants with head injury under 1 year of age, Billmire found child abuse was found as the cause in 18 (95%) out of 19 children with intracranial haemorrhage.⁷ A population-based study of children under the age of 2 years who presented with SDH by Jayawant et al found 27 (82%) out of 33 cases were highly suggestive of abuse.

The findings of SDH resulting from a nontraumatic cause is a rare event, especially in infants with no underlying coagulopathy. A case series⁸ presented

three healthy infants, ages 4,5 and 7 months that, during an evaluation of macrocephaly, were found to have frontal SDH in association of BESS. There were no history of trauma or risk factors for child abuse. All infants were neurologically intact and achieved normal developmental milestone in one-year follow up.

In our patient, the SDH was found incidentally, during an evaluation of seizure that developed in the ward. There was no history of an underlying coagulopathy and no findings by history, physical examination, or x-rays to suggest child abuse. The CT findings of bilateral prominent subarachnoid CSF spaces suggested the diagnosis of BESS.

BESS is regarded as a benign condition, consisting of bilateral decreased densities over the frontal convexities, prominent cerebral sulci and normal brain size. The infants are usually asymptomatic and are being studied with MRI or CT as part of an evaluation of the large head. The syndrome is benign and the radiologic findings usually resolve spontaneously by the age of 2 years.⁹

The interrelationship between CSF volume, intracranial pressure (ICP) and cortical vessels is complex.¹⁰ Infants with BESS have a greater risk of developing a spontaneous SDH or a SDH with minimal trauma and the pathogenesis of the SDH is likely a multifactorial in origin. First, these infants have a greater head mass, so any traumatic impact, however small, will result in slightly greater force than if the infant had a normal head mass.¹ Second, the theoretical model of BESS developed by Papasian 2000 shows that the cortical veins in infants with BESS will incur venous stretch injury at lower forces than those in infants with normal extra-axial fluid spaces.¹¹ In enlarged subarachnoid spaces, the stretching of the bridging veins makes these infants vulnerable to bleed either spontaneously or with only a minimal, trivial trauma.¹²

CONCLUSION

BESS is a condition that does not require treatment, however it is very common to be present

in infants with macrocephaly. The association of increasing degrees of BESS with increasing prevalence of subdural collection support the concept of an anatomical predisposition to SDH among infants with macrocephaly. Child abuse should always be kept in mind, and should be ruled out in infants with SDH, but in the specific context of infants with macrocephaly, SDH may be spontaneous in nature with probably good prognosis.

REFERENCES

1. Miller, R. & Miller, M. Overrepresentation of Males in Traumatic Brain Injury of Infancy and in Infants with Macrocephaly Further Evidence That Questions the Existence of Shaken Baby Syndrome. 2010; 31(2): 165–173.
2. Natelson, S. E. & Sayers, M. P. The fate of children sustaining severe head trauma during birth. *Pediatrics*. 1973;51(2): 169–174.
3. Plunkett, J. Fatal pediatric head injuries caused by short-distance falls. *The American journal of forensic medicine and pathology*. 2001;22(1): 1–12.
4. Tucker, J., Choudhary, A. K. & Piatt, J. Macrocephaly in infancy: benign enlargement of the subarachnoid spaces and subdural collections. *Journal of neurosurgery. Pediatrics*. 2016;18(1): 16–20.
5. Tzioumi, D. & Oates, R. K. Subdural hematomas in children under 2 years. Accidental or inflicted? A 10-year experience. *Child abuse & neglect*. 1998;22(11): 1105–1112.
6. Ludwig, S. & Warman, M. Shaken baby syndrome: a review of 20 cases. *Annals of emergency medicine*. 1984;13(2): 104–107.
7. Billmire, M. E. & Myers, P. A. Serious head injury in infants: accident or abuse? *Pediatrics*. 1985;75(2):340–342.
8. Ravid, S. & Maytal, J. External hydrocephalus: a probable cause for subdural hematoma in infancy. *Pediatric neurology*. 2003;28(2): 139–141.
9. Alvarez, L. A., Maytal, J. & Shinnar, S. Idiopathic

external hydrocephalus: natural history and relationship to benign familial macrocephaly. *Pediatrics*. 1986; 77(6): 901–907.

10. Leestma J. Forensic aspects of intracranial equilibria. In *Forensic Neuropathology*. 3rd edition. Edited by Leestma J, Boca Raton, FL: CRC Press. 2014;364–414
11. Papasian, N. C. & Frim, D. M. A Theoretical Model of Benign External Hydrocephalus That Predicts a

Predisposition towards Extra-Axial Hemorrhage after Minor Head Trauma. *Pediatric Neurosurgery*. 2000;33(4): 188–193.

12. Jayawant, S., Rawlinson, A., Gibbon, F., Price, J., Schulte, J., Sharples, P., Sibert, J. R., et al. 1998. Subdural haemorrhages in infants: population based study. *BMJ (Clinical research ed.)*. 1998;317(7172): 1558–1561.