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Case Report

Traumatic Transient Herniation Concomitant with Tonsillar Hemorrhagic Contusion in a Child

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Keywords: tonsillar contusion; Chiari type 1; tonsillar herniation; cerebellar tonsillar haemorrhage; benign tonsillar ectopia.

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Abstract

Downward displacement of cerebellar tonsils more than 5 mm below the foramen magnum is named as Chiari type I malformation and named benign tonsillar ectopia if herniation is less than 3 mm. It does not just depend on congenital causes. There are also some reasons for acquired Chiari Type 1 and benign tonsillar ectopia/herniation. Trauma is one of them. Trauma may increase tonsillar ectopia or may be the cause of new-onset Chiari type 1. The relationship between the tonsil contusion and its position is unclear. We present a case of pediatric age group with tonsillar herniation with a hemorrhagic contusion. Only 1 case has been presented so far in the literature. A case with unilateral tonsil contusion has not been presented to date. We will discuss the possible reasons for taking the place of the tonsils to the above level of the foramen magnum in the follow-up period, by looking at the literature.

Introduction

Downward displacement of cerebellar tonsils more than 5 mm below the foramen magnum is named as Chiari type I malformation [1]. Downward displacement less than 3 mm is also called benign tonsillar ectopia. At the time of the invention of Chiari malformation, it was thought to be congenital in origin. However, it has been shown that 'acquired Chiari type I malformation' could be seen after intracranial mass lesions, spinal cerebrospinal fluid (CSF) losses or without any obvious organic pathology [2-4]. And also benign tonsillar ectopia can be seen after some conditions such as trauma. Isolated tonsillar contusion concomitant with tonsillar herniation after trauma is a very rare occurrence. This is the second case with the tonsillar contusion and herniation, and the first case with unilateral(left) tonsillar contusion with herniation.

In this case report, we present a 15-year-old girl with pathology above and discuss pathophysiology and treatment of acquired Chiari malformation and tonsillar ectopia/herniation in such a scenario with a literature review.

Case Report

A 15-year-old, unconscious girl was admitted to our clinic after a car accident. Her Glasgow Coma Scale (GCS) score was 7/15 with a concussion. She had no other systemic problems. Immediately after endotracheal intubation, a non-enhanced head computed tomography (CT) was obtained. The CT revealed left tonsillar contusion concomitant with herniation (Figure 1A, B). The cerebellar tonsils and brainstem were under compression at the level of the foramen magnum. She was internalized into intensive

care unit. She was sedated and given anti-oedema treatment. She extubated herself at the 14th hour of her admission. Her control cranial CT depicted the tonsillar contusion and cerebellar ectopia were persistent and were as same as before. Her anti-oedema treatment was tapered slowly, and she was taken into the ward. Her general status got better and was discharged to home as GCS: 15/15 at the 4th day of her admission. A non-enhanced brain MRI was obtained at 3rd.month after trauma. There was no hemorrhagic contusion in the cerebellum, and surprisingly the cerebellar ectopia has completely regressed (Figure 1C).

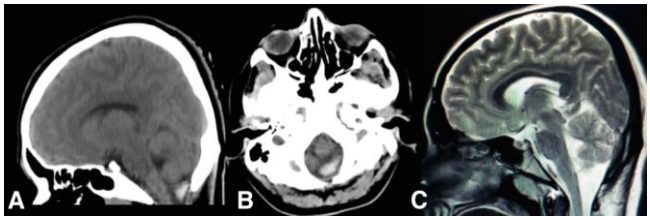

Figure 1: Cranial CT depicts tonsillar hemorrhagic contusion and tonsillar ectopia/herniation on sagittal image A) and on the axial image at the level of foramen magnum B). Sagittal T2-weighted cranial MRI shows that all intracranial structures are in place with no residual pathology C)

Discussion

Chiari type I malformations have been proposed as congenital entities associated with hydrocephalus. However, it has been understood that this is not the sole mechanism explaining every Chiari type I malformation since hydrocephalus has not always been concomitant with it [5]. Instead, small and shallow posterior fossa theory gained popularity. However, there was some conflicting information in the literature. Even though some patients had Chiari type I associated with small posterior fossa; many had normal sized posterior fossa comparable to healthy controls [6]. One other point to consider is that Chiari type I malformation mostly becomes symptomatic in the middle ages even though its proposed nature of early formation.

With the invention and convenient use of MRI, both physiology of CSF production, circulation, absorption and pathophysiology of Chiari malformations have been better understood. It was depicted that Chiari type I malformations were not only congenital but also ‘acquired’ after intracranial masses or CSF losses from spinal dura [2-4]. Trauma can cause acquired Chiari type 1 malformation. Besides this, most Chiari type I malformation cases may be asymptomatic. In these asymptomatic patients, symptoms relevant Chiari type I malformation may be initiated after trauma. Or this can cause new onset complaints in symptomatic patients. Trauma can be a trigger factor at this point [7].

In the presented case, we observed a trauma patient with tonsillar hemorrhagic contusion concomitant with herniation. Serlin presented a case with both benign tonsillar ectopia and contusion after trauma [8].

We present the second case with the tonsillar contusion and herniation, and the first case with unilateral tonsillar contusion with herniation.

The patient had no prior brain imaging. We do not know whether there is tonsillar herniation before the trauma. Maybe there was tonsillar ectopia underlying before. It may have increased with trauma and more herniated after trauma.

Her general status improved with conservative treatment and her control brain MRI depicted both the hemorrhagic contusion and herniation regressed completely. To better appreciate the pathophysiology of Chiari type I malformations and benign tonsillar herniation, we first understand the CSF absorption pathways, which may have played a great role in the patient above.

Cerebrospinal fluid is produced mainly by choroid plexus and distributed through the whole ventricular system and subarachnoid space. It is absorbed by arachnoid villi, and trans passes to the venous system [9]. There are three pathways for absorption of CSF: cranial arachnoid granulations, spinal arachnoid granulations and lymphatic system. The later two ones were demonstrated in both animal models and human cadavers [10-13]. Edsbagge et al. found spinal CSF absorption rate as 0.11-0.23 ml/min depending on activity level of the person. With increasing activity, the absorption rate is increasing [14]. The alternative CSF pathways especially lymphatic system is more pronounced in early life since the arachnoid granulations become mature and functional [9]. When we turn back to our patient, trauma-related oedema and metabolic changes would have decreased functional capacity of cranial arachnoid granulations. Remaining CSF outflow pathways namely spinal arachnoid granulations and lymphatic pathways would have become more functional and led to a negative pressure in the cranium and transient cerebellar ectopia. This theory explains why the cerebellar ectopia regressed after the ongoing pathological processes ceased in follow-up. Another theory is the regression of the tonsillar herniation due to the atrophy of the tonsils in the follow-up period, as Serlin pointed out [8].

We think that the first theory in our case was realised because there was a one-sided tonsillar contusion in our present case, if atrophy occurred, we would expect it to be one-sided, but both tonsils were above the foramen magnum level after three months.

For giving an example to new onset of Chiari

malformation; Olivero and Dinh presented a similar case of a traumatic patient (car accident), the age of 28 years, with Chiari type I malformation and cervical syrinx. She had an admission GCS score of 12. They treated the patient conservatively. Despite some residual findings in her neurological examination, the syrinx had regressed completely, and caudal displacement of cerebellar tonsils had lessened in the control imaging [15]. We have diagnosed our patient as benign tonsillar ectopia due to patient's complaints not suggesting Chiari syndrome complaints before and after the trauma and because of radiologically and clinically full recovery of tonsillar herniation. In this study, we treated the patient conservatively, and she completely became conscious and well despite her admission GCS score of 7.

Isolated tonsillar hemorrhagic contusion concomitant with transient herniation is a unique presentation. Transient nature of such pathological entity with the total restoration of clinical status necessitates conservative approach if no additional pathology is evident. However, to make a more comprehensible statement, new animal and clinical studies are in need.

References

1. Markunas CA, Tubbs RS, Moftakhar R, et al. Clinical, radiological, and genetic similarities between patients with Chiari Type I and Type 0 malformations. J Neurosurg Pediatr. 2012;9(4):372-78. https://doi.org/10.3171/2011.12.PEDS11113 PMid:22462700 PMCid:PMC3678957

2. Huang PP, Constantini S. Acquired Chiari I malformation. Case report. J Neurosurg. 1994;80(6):1099-102. https://doi.org/10.3171/jns.1994.80.6.1099 PMid:8189267

3. Kojima A, Mayanagi K, Okui S. Progression of pre-existing Chiari type I malformation secondary to cerebellar hemorrhage: case report. Neurol Med Chir (Tokyo). 2009;49 (2):90-92. https://doi.org/10.2176/nmc.49.90

4. Sathi S, Stieg PE. Acquired Chiari I malformation after multiple lumbar punctures: case report. Neurosurgery. 1993;32 (2):306-09. https://doi.org/10.1227/00006123-199302000-00023 PMid:8437671

5. Carmel PW. The Chiari malformations and syringomyelia. In: Hoffman HJ, Epstein F (eds) Disorders of the Developing Nervous System: Diagnosis and Treatment. Boston: Blackwell Scientific Publications, 1986:133-51.

6. Stovner LJ, Bergan U, Nilsen G, Sjaastad O : Posterior cranial fossa dimensions in the Chiari I malformation: relation to pathogenesis and clinical presentation. Neuroradiology. 1993;35(2):113-18. https://doi.org/10.1007/BF00593966

7. Wan M J, Hiroshi N, Charles HT. Conversion to symptomatic Chiari I malformation after minor head or neck trauma. Neurosurgery. 2008;63(4):748-53. https://doi.org/10.1227/01.NEU.0000325498.04975.C0 PMid:18981886

8. Serlin Y, Benifla M, Shelef I. Tonsillar contusion associated with benign tonsillar ectopia following minor head trauma. Child's Nervous System. 2016;32(5):881-5. https://doi.org/10.1007/s00381-015-2924-y PMid:26438549

9. Chen L, Elias G, Yostos MP, et al. Pathways of cerebrospinal fluid outflow: a deeper understanding of resorption. Neuroradiology. 2015;57(2):139-47. https://doi.org/10.1007/s00234-014-1461-9 PMid:25398655

10. Johnston M, Zakharov A, Papaiconomou C, Salmasi G, Armstrong D. Evidence of connections between cerebrospinal fluid and nasal lymphatic vessels in humans, non-human primates and other mammalian species. Cerebrospinal Fluid Res. 2004;1(1):1-1. https://doi.org/10.1186/1743-8454-1-2 PMid:15679948 PMCid:PMC546409

11. Mathieu E, Gupta N, Macdonald RL, Ai J, Yucel YH. In vivo imaging of lymphatic drainage of cerebrospinal fluid in mouse. Fluids Barriers CNS. 2013;10 (1):35. https://doi.org/10.1186/2045-8118-10-35 PMid:24360130 PMCid:PMC3879644

12. Miura M, Kato S, Von Ludinghausen M. Lymphatic drainage of the cerebrospinal fluid from monkey spinal meninges with special reference to the distribution of the epidural lymphatics. Arch Histol Cytol. 1998;61(3):277-86. https://doi.org/10.1679/aohc.61.277 PMid:9756104

13. Silver I, Kim C, Mollanji R, Johnston M. Cerebrospinal fluid outflow resistance in sheep: impact of blocking cerebrospinal fluid transport through the cribriform plate. Neuropathol Appl Neurobiol. 2002;28 (1):67-74. https://doi.org/10.1046/j.1365-2990.2002.00373.x PMid:11849565

14. Edsbagge M, Tisell M, Jacobsson L, Wikkelso C. Spinal CSF absorption in healthy individuals. Am J Physiol Regul Integr Comp Physiol. 2004;287(6):1450-55. https://doi.org/10.1152/ajpregu.00215.2004 PMid:15308484

15. Olivero WC, Dinh DH. Chiari I malformation with traumatic syringomyelia and spontaneous resolution: case report and literature review. Neurosurgery. 1992;30(5):758-60. https://doi.org/10.1227/00006123-199205000-00018