CASE REPORT

A Rare Case of an Infant with Left Hemiparesis: A Case Report of Bilateral Open-lip Schizencephaly

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Siti BC, Zulkifli MM, Mohd Yusoff SS, et al. A Rare Case of an Infant with Left Hemiparesis: A Case Report of Bilateral Open-lip Schizencephaly. *Malays Fam Physician.* 2020;15(3);90–94.

Keywords:
Brain malformation, developmental delay, hemiparesis, schizencephaly

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Abstract

Schizencephaly is a very rare congenital birth defect. It is characterized by a cortical brain malformation that manifests as a grey-matter-lined cleft extending from the ependyma to the pia mater. It is a rare condition, and few cases have been reported in the literature. The exact cause is unknown. Herein, we report a case of an infant presenting with left side hemiparesis. The CT scan of her brain revealed right fronto-temporal and left parieto-temporal open-lip schizencephaly; thus, urgent referral to a pediatric neurologist was made for early intervention.

Introduction

Schizencephaly is a rare congenital brain malformation in which abnormal slits or clefts form in the cerebral hemispheres of the brain. There are two types, introduced by Yakovlev and Wadsworth in 1941:[1] the sides of the cleft may be in contact (closed-or fused-lip), also known as Type I, or widely separated (open-lip), also known as Type II. Yakovlev and Wadsworth proposed that both open and closed types were caused by a primary developmental failure of growth of the cerebral mantle before the end of the second month of fetal life.[1] The prevalence of this condition in the United Kingdom's population is about 1.48 in 100 000 births.[2] About 47% of schizencephaly cases are diagnosed during an antenatal ultrasound.[2] The majority of cases are detected after 22 weeks of gestation, and most of the cases occur in younger mothers.[2]

Symptoms of schizencephaly vary depending on the severity of the lesion and whether the lesion involves one or both hemispheres. A lesion that is small and unilateral presents with unilateral paralysis and mild or no intellectual disabilities; in contrast, larger bilateral hemisphere lesions usually present with quadriplegia and severe intellectual disabilities.[3] Other signs and symptoms that can be observed are global developmental delay, seizure, microcephaly, hydrocephalus, spasticity, and hypotonia.[3]

This case report reviews a rare case for doctors at a primary care clinic attending an infant with left-side hemiparesis. It encourages awareness of schizencephaly as a differential diagnosis, and points out that non-accidental injury needs to be ruled out first.

Case report

A 10-months old Malay baby girl presented to our outpatient clinic with three weeks' history of left-limb weakness noted by her foster mother. Her foster mother noticed that the baby had reached for an object with her right hand and not passed the object to her left hand. She moved only her right leg while lying supine, and she was still unable to crawl. She had no other symptoms. Further history-taking revealed that she had no history of trauma, seizure, or fever. She was born at 36 weeks of gestation via spontaneous vertex delivery with a birth weight of 3.0 kilograms. Her current weight is 7.1 kilograms. Her antenatal, intrapartum and postpartum states were uneventful. She had no previous medical illness and no history of hospitalization. She started weaning at six months and, at time of presentation, tolerated porridge with blended fish. The baby had completed her immunizations up to age standards, and had regular checkups at the nearest health clinic.

There was no family history of syndromic children, epilepsy, or learning disabilities. Her biological father is 37 years old, works as a laborer and is an active substance abuser. Her biological mother is 35 years old and works as a clerk. She is the youngest child of five siblings. All other siblings are healthy. There was no history of any abuse or neglect in the family. She was adopted by her own uncle and aunt at seven months old, as the couple had no children after ten years of marriage.

During examination, the child was active and playful, displaying no features of a syndromic child. Her developmental milestones

corresponded to those of children six to seven months old. She was able to roll from prone to supine, but unable to sit without support. She was mouthing but had no pincer grip yet. She was babbling and smiled responsively, and she had no stranger anxiety. Her head circumference was below the 3rd percentile and her weight and height were in the 5th and 25th centiles respectively. Vital signs were normal. Central nervous system examination showed an upper motor neuron lesion of the left limbs with left upper and lower-limb hypertonia, hyperreflexia and an upgoing Babinski sign. The right limbs were normal. There was no limb clonus or eye nystagmus. Several differential diagnoses were made at the time. Among the possibilities were stroke, congenital brain anomaly, brain tumor, cerebral palsy or non-accidental injury (NAI) with underlying global developmental delay. NAI needed to be rule out first. Her biological parents had been contacted to obtain a history of the baby's development and social background. Neither parents ever hit or abused the baby. They were aware of developmental delay in their child, but assumed she would catch up soon. Physical examination of the skin revealed no bruises, no hand or bite marks, no injuries and no retinal hemorrhage. Skull, chest, upper-limb and lower-limb radiographs all showed normal findings.

Basic blood investigations such as pack cell volume and electrolytes were all normal. Infective screening for Toxoplasma-IgM was negative. Toxoplasma-IgG was indeterminate. Cytomegalovirus (CMV)-IgM was not detected; however, CMV-IgG was reactive. The CMV-IgG (IU/mL) titer was 26.58 (normal range <0.6). HSV-1 and 2 IgG were non-reactive. An urgent computed tomography (CT) scan of the brain was performed. It showed cerebrospinal fluid cleft formation from the cortex to the lateral wall of the right lateral ventricle in the right fronto-temporal region, and similar cleft formation in the left parieto-temporal region, that was suggestive of right fronto-temporal and left parieto-temporal open schizencephaly.

She was referred to the pediatric neurology team and was admitted to the ward for further investigation and management. The findings of a magnetic resonance imaging (MRI) scan of her brain were as shown below:

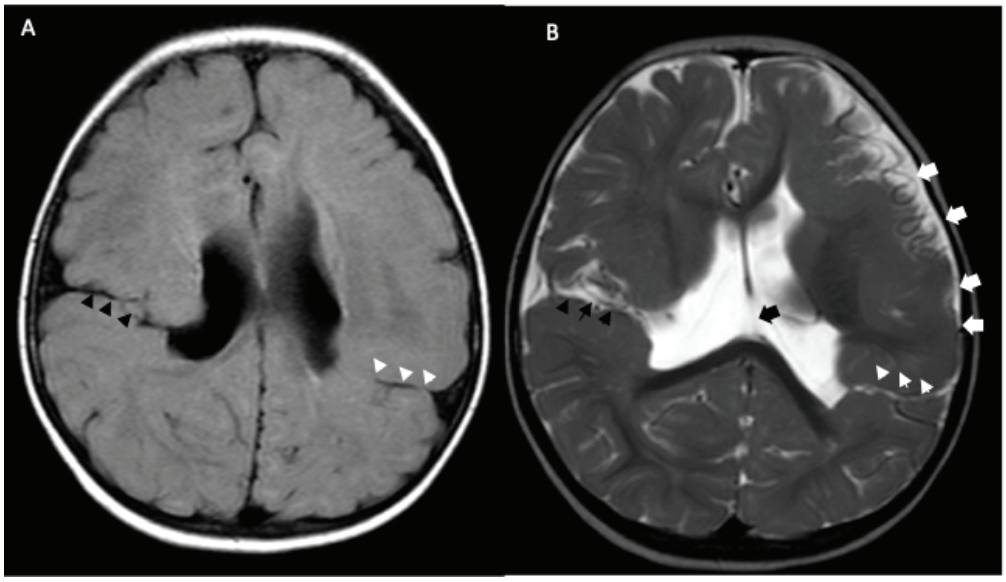

Figure 1(A): Axial view MRI of the brain on FLAIR**. Figure 1(B):** Axial view MRI of the brain on T2. Several CSF cleft seen at the lined by grey white matter which extended to the lateral ventricle at the right fronto-temporal-lobe (black head arrow) and left parieto-temporal lobe (white head arrow). Smooth gyri at the left frontal lobe (white bold arrow). Partially partial agenesis of the septum pellucidum (bold black arrow).

The Magnetic Resonance Imaging (MRI) findings show the presence of several cerebral spinal fluid (CSF) clefts, lined by grey white matter, which extend from the lateral ventricle to the peripheral of CSF space seen at the right fronto-temporal lobe, left parieto-temporal lobe and left frontal lobe in keeping with open-lip schizencephaly. Broad, thickened gyri in keeping with heterotopic grey matter appear along the cleft. Lissencephaly is seen on the left frontal lobe, represented as smooth gyri.

A diagnosis of bilateral open-lip schizencephaly with global developmental delay was made. The child was seen by a pediatric neurologist, and an electroencephalogram (EEG) brain scan and audiometry were arranged for further assessment. The EEG showed frequent bursts of sharp wave discharge over the right mid-parietal and posterior temporal region; polymorphic slow wave discharge over the parieto-temporal region with radiation to the left mid-parietal region; and some in-phase reversing pattern over the temporal region. However, no seizure occurred. Her audiometry was normal. She was referred to a physiotherapist and a speech therapist for early intervention. Her condition was explained to her foster parents, with future anticipated problems such as seizure, speech delay and learning difficulties. They were quite sad after hearing the news; however, they had accepted the baby from the beginning, viewing her as their beloved child adopted from their own sibling, and were committed to continuing accepting and caring for her as she was.

The patient is currently on regular speech therapy and physiotherapy to improve her speech and motor development. She has also been referred to social welfare services, which will allow her to greatly benefit from government aid, such as a monetary fund of $72.00 USD per month, free special school placement, subsidized public transport, and exemption from income tax. During follow-up, she showed good progress in her motor and speech development milestones, and both her foster parents were happy with her improvement.

Discussion

Schizencephaly is a very rare congenital anomaly. There is little local statistical data regarding schizencephaly. A study was done by Abdullah et al in 2001, reporting on hydrocephalic children presenting to a Malaysian community-based university hospital over an 8-year period.[4] It showed the congenital anomaly causes of hydrocephalus; aqueductal stenosis was the most common (34%), followed by Dandy Walker variants (28.7%) and others (e.g. schizencephaly, holoprosencephaly) that accounted for 64 cases (36.8%).[4]

Schizencephaly in children is about of neuronal migration characterised by a cerebrospinal-fluid-filled cleft, lined by gray matter.[5] The cleft extends across the entire cerebral hemisphere, from the ventricular surface (ependyma) to the periphery (pial surface) of the brain.[5] The clefts may be unilateral or bilateral and may be closed (fused lips), as in schizencephaly type I, or separated (open lips), as in schizencephaly type II.[5]

The actual cause of schizencephaly is unknown, but it has been linked to both genetic and non-genetic causes. A few patients with schizencephaly have been found to have mutations in one of these four genes: EMX2, SIX3, SHH, and COL4A1.[3] The non-genetic causes are young maternal age; certain medications such as warfarin and recreational drugs; exposure to organic solvents; infections such as cytomegalovirus; trauma; and amniocentesis. It has also been associated with alloimmune thrombocytopenia and various other syndromes.[2] Non-genetic causes involve a destructive process mediated by vascular injury that causes impairment of the blood supply to the fetus.[2]

This patient's father was actively involved in substance abuse, which could appear to be one of the factors in her condition. The infant's CMV IgG positive could also be a possible contributing cause of schizencephaly in this patient.

Presentation and outcome are variable depending on whether the lesion shows unilateral or bilateral involvement. Patients usually present with seizures, hemiparesis, and developmental deficits.[3] In this case, the infant presented with left hemiparesis, microcephaly and global developmental delay, but no seizures occurred.

Differential diagnosis of an infant presenting with hemiparesis includes trauma of the brain, developmental anomalies of the brain, neoplastic intracranial space-occupying lesions, and central nervous system infections, such as encephalitis, meningitis or abscesses.[6] Other disease entities that should also be considered in the differential diagnosis of schizencephaly are acquired cysts of the brain such as those from post-traumatic, postoperative, post-haemorrhage, or postictal events.[7] In such cases, an MRI scan shows areas of gliosis such as glial scars surrounding the fluid-filled lesions.[7] Open-lip schizencephaly should also be differentiated from hydrocephalus and from holoprosencephaly where extensive intracranial fluid-filled spaces are seen in the MRI.[7]

The diagnosis of schizencephaly is confirmed via imaging. The full thickness cleft, or pial-ependymal seam, may be difficult to detect on a CT scan but is easily discernible in MRI images.[8] MRI is the imaging modality of choice because of its ability to identify grey matter lining the cleft, which is the pathognomonic finding that differentiates schizencephaly from porencephaly.[8] The most important differentiating element in imaging studies is the presence of heterotrophic grey matter: this lines the margins of the cleft in cases of schizencephaly, while it is absent in arachnoid cysts or in fluid-filled spaces with other backgrounds.[8] Moreover, arachnoid cysts may cause a mass effect manifested as displacement of the longitudinal fissure of the brain, compression of the ventricular system, or local obliteration of brain sulci and fissures, which are not evident in schizencephaly.[8]

In managing schizencephaly, a multidisciplinary approach is applied. The therapeutic management of both types of schizencephaly predominantly consists of rehabilitating motor deficits and mental retardation and treating epilepsy.[9] Some cases need surgical treatment, such as schizencephaly with concomitant hydrocephalus or intracranial hypertension.[9]

Surgical management is associated with a risk of such complications as postoperative bleeding, empyemas, meningitis, hydrocephalus, and distension of the paracerebral fluid spaces forming subdural hygromas or hygro-hematomas.[7] When shunting, which has a complication rate of approximately 50%, is employed as the therapeutic modality, the patient may additionally develop such complications as shunt system impatency, pulling and detachment of the drain, and ascites.[7] If drainage is maintained for longer periods, complications may also include endocarditis and shunt nephritis.[7] Therefore, schizencephaly itself and its associated symptoms are treated conservatively.[7,9]

The way that primary care providers approach an infant with hemiparesis is crucial, as they will be the first-contact care in establishing a diagnosis. Early referral to the appropriate team is important to ensure the patient receives early intervention. Primary care providers also need to follow up to ensure continuity of care, community rehabilitation and appropriate learning and education programs during the child's school years.

Conclusion

Primary care practitioners play an important role in screening and recognizing any abnormal signs and symptoms or delayed developmental milestones in infants. As the front-liner, it is prudent for them to be aware of schizencephaly as a differential diagnosis; this may permit early evaluation and intervention to significantly improve the infant's quality of life.

Conflicts of Interest

No potential conflict of interest relevant to this article was reported.

Consent for publication

The patient's parent provided us informed consent for the publication of this case report.

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