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Management and Outcome of a Neurologically Intact Infant with Pierre Robin Sequence and Dandy-Walker Variant Diagnosed with Large Hemispheric Brain Abscess – Case Report

Manejo e resultado de um bebê neurologicamente intacto com sequência de Pierre Robin e variante de Dandy-Walker diagnosticada com grande abscesso cerebral hemisférico – Relato de caso

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Abstract

Pierre Robin sequence (PRS) is a condition consisting of three essential components: micrognathia or retrognathia, cleft palate, and glossoptosis. It can be part of multiple congenital anomalies. We present the case and outcome of a 3-month-old clinically stable patient who has PRS with Dandy-Walker variant – which is a rare presentation in the literature – with a large right hemispheric brain abscess, treated with multiple minimally-invasive surgical drainage procedures with adjuvant antibiotics.

Keywords

- Pierre Robin sequence
- Dandy-Walker variant
- brain abscess

Resumo

A sequência de Pierre Robin (SPR) é uma condição que consiste em três componentes essenciais: micrognatia ou retrognatia, fenda palatina e glossoptose. Pode ser parte de várias anomalias congênitas. Apresentamos o caso e a evolução de um paciente clinicamente estável de 3 meses que tem PRS com variante de Dandy-Walker – uma apresentação rara na literatura – com um grande abscesso cerebral hemisférico direito, tratado com vários procedimentos de drenagem cirúrgica minimamente invasiva com antibióticos adjuvantes.

Palavras-chave

- sequência de Pierre Robin
- variante Dandy-Walker
- abscesso cerebral

Introduction

Pierre Robin sequence (PRS) is a condition consisting of three essential components: micrognathia or retrognathia, cleft palate, and glossoptosis. Pierre Robin sequence occurs as an isolated defect, part of a recognized syndrome, or a complex of multiple congenital anomalies. In 2007, Stevenson et al.[1] reported two novel cases of multiple congenital

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anomalies, mental disability syndrome with PRS and cerebellar hypoplasia, in two sisters. In 2008, Sasaki et al.[2] described a case of Dandy-Walker variant with PRS. Brain abscess (B.A.) is a focal central nervous system infection involving the cerebral parenchyma.[3] This condition is infrequent in the adult population and even rarer in the pediatric age group.[4] We present the case report of an infant with PRS and Dandy-Walker variant, who presented with a large right hemispheric brain abscess despite being neurologically intact, the treatment stages, and eventual outcome.

Clinical Presentation

Patient History

The patient is a full-term female who was delivered vaginally, with a birth weight of 2.2 Kg. The parents were healthy, without any medical illnesses, and non-consanguineous; they had an unaffected child; the mother (27 years old) did not receive any medication during her pregnancy. After delivery, the patient was diagnosed with PRS – the chromosomal study was normal 46 chromosomes XX – and, then, immediately admitted into the neonatal intensive care unit due to respiratory distress syndrome. A tracheostomy tube was created as part of her management for the difficulty of normal breathing due to the PRS, and, later, she developed recurrent hospital-acquired chest infections.

At the age of 3 months, the patient was in the pediatric intensive care unit for the treatment of chest infection; she was clinically well, and her vitals were within normal limits with no neurological symptoms, but regular laboratories started to show an elevation in the acute phase reactants, such as platelets raised significantly to $1{,}050 \times 10^3/mm^3$, white blood cell (WBC) count of $31.3 \times 10^3/mm^3$, and C-reactive protein 186 mg/l. Therefore, a further investigation looking for the underlying cause was performed, including a Covid-19 test, which was negative, Echocardiogram was normal with no vegetation's seen, Chest, abdomen, and pelvis computed tomography (CT) could not explain these laboratory results. Lumbar puncture results for cerebrospinal fluid analysis showed glucose 0.09 mmol/l, protein 976.1 mg/dl, WBCs 5,280 cell/ul, red blood cells (RBCs) 110 cell/ul, neutrophils 82%, negative culture, and no microorganism on gram stain was seen. Other blood and sputum cultures were negative.

Physical Examination

The patient was looking well, vital signs within the normal range, active and interactive, cranial nerves were intact, moved four limbs equally and symmetrically, anterior fontanelle was flat and soft, and had features of PRS: micrognathia, glossoptosis, and cleft palate.

Images

Chest, abdomen, and pelvis CT showed multiple patchy areas of ground-glass attenuation seen in the left upper lung lobe, mostly infectious, few fibrotic bands seen in the left upper and right middle lung lobes.

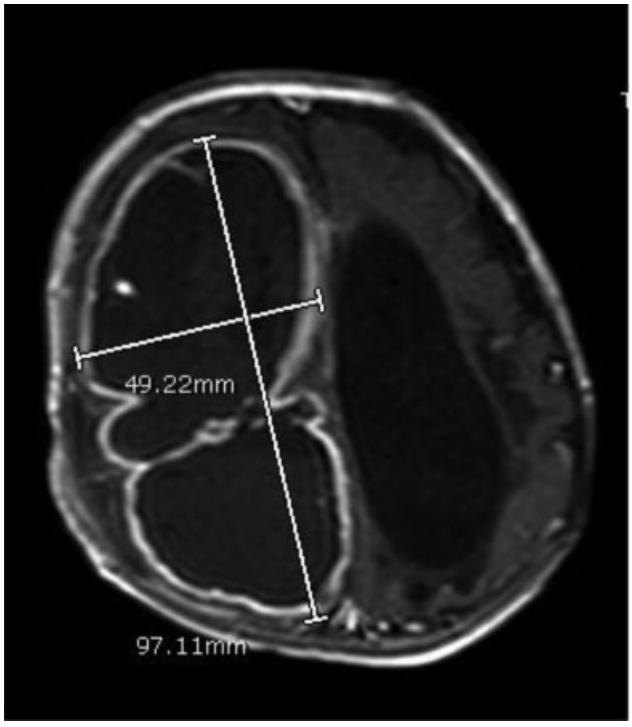

Fig. 1 Brain magnetic resonance imaging. T1 with contrast; axial view; right frontal, and parietal intra-axial multi-lobulated ring-enhancing lesions presenting brain abscess, effacing right lateral ventricle with minimal midline shift.

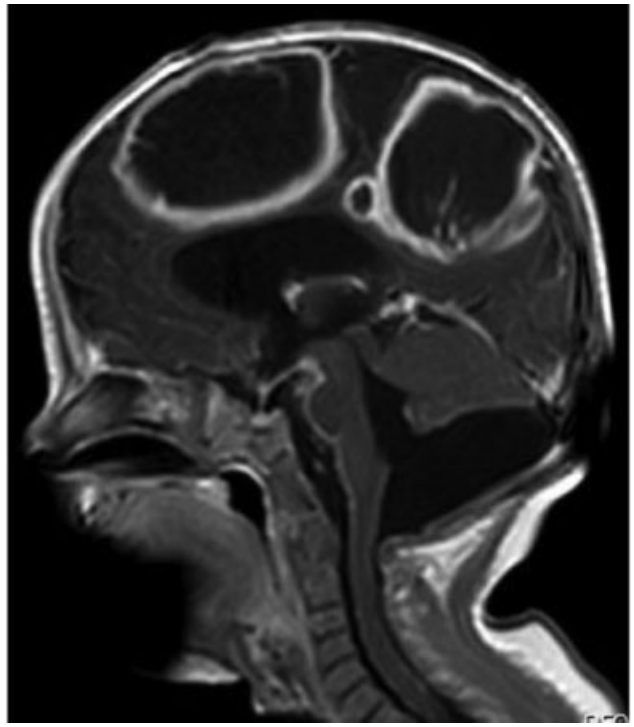

Fig. 2 Brain magnetic resonance imaging. T1 with contrast; sagittal view; right frontal, and parietal intra-axial ring-enhancing lesions presenting brain abscess, cystic dilation of the posterior fossa communicating with the 4th ventricle consistent with Dandy-Walker variant.

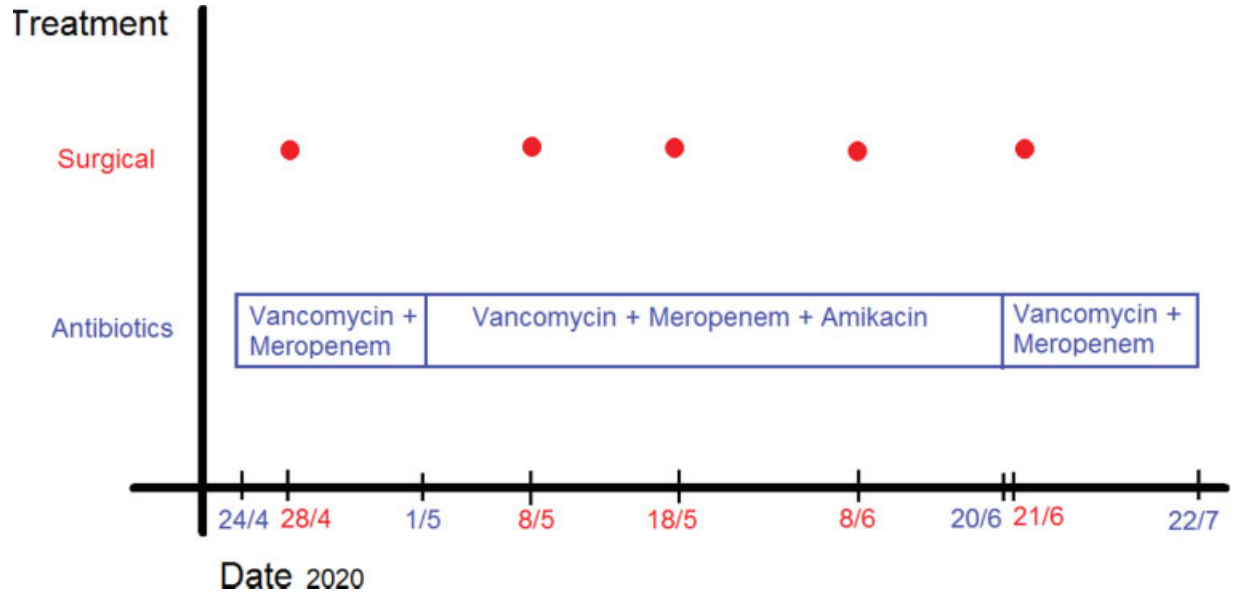

Fig. 3 Timeline of the management of the patient. The red dots represent the surgical intervention dates and the blue box represents the adjuvant antibiotics therapy. The horizontal axis represents the dates, and the vertical axis represents the treatment modality.

Magnetic resonance imaging (MRI) of the brain►**Fig. 1** showed a large well-defined thick-wall ring-enhancing intra-axial multi-loculated cystic lesion in the right cerebral hemisphere, measuring $\sim 4.5 \times 9.7 \times 7.2$ cm with surrounding vasogenic edema causing compression effect on the adjacent brain parenchyma and right lateral ventricle, with minimal midline shifting ~ 3 mm to the left side. This lesion appeared of heterogeneous high signal on T2 and FLAIR images with a fluid level, showing central diffusion restriction on diffusion-weighted images/apparent diffusion coefficient (DWI/ADC) map, associated with diffuse right cerebral hemisphere leptomeningeal enhancement. Overall findings are consistent with intracerebral abscess. Also, there is a cystic dilatation of the posterior fossa communicating with the fourth ventricle with hypoplasia of the cerebellum more on the left cerebellar hemisphere, and hypoplasia of the

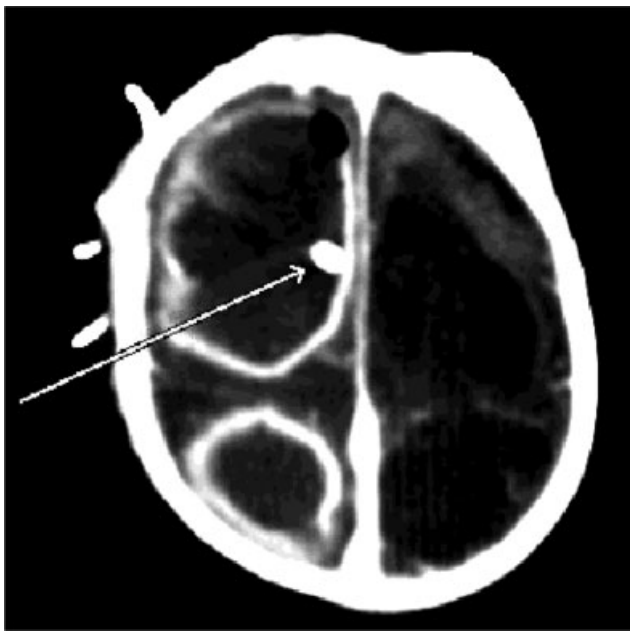

Fig. 4 Brain computer scan, brain window with contrast, axial view, post 1st surgical intervention, right frontal and parietal ring-enhancing lesions presenting brain abscess. Arrow: right frontal drain inside right frontal abscess.

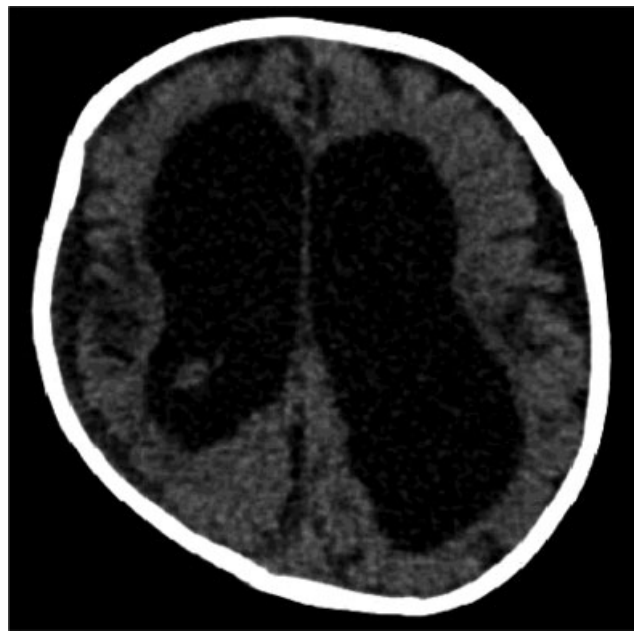

Fig. 5 Brain computer scan, brain window without contrast, axial view, last follow-up imaging shows minimal right subdural collection, dilated ventricles, no midline shift or mass effect, and resolved brain abscesses.

cerebellar vermis consistent with the Dandy-Walker variant, as seen in ►**Fig. 2**.

Treatment

The patient underwent multi-stage treatment with minimally invasive surgical drainage and adjuvant antibiotics therapy according to the pus culture; ►**Fig. 3** explains the antibiotics course's timeline with the surgical intervention dates. Antibiotics vancomycin (20 mg/kg intravenously every 6 hours) and meropenem (40 mg/kg intravenously every 8 hours) were started, followed by surgical intervention (brain abscess drainage, with the drain being kept, and specimen collected for culture), which showed a pus culture of *Klebsiella pneumonia* sensitive to amikacin. Therefore, amikacin (15 mg/kg intravenously daily) was administered for 6 weeks, after which it was discontinued, and the patient went back to vancomycin and meropenem for another 4 weeks.

Surgical intervention stages - the red dots - as seen in ►**Fig. 3**, demonstrate the dates of interventions done for the patient in a timeline with antibiotics treatment. The first surgery was an insertion of a drain to obtain pus for culture and to drain the abscess slowly, and the drain was inserted frontally, as seen in ►**Fig. 4**. Pus culture resulted in *K. Pneumonia* extended spectrum beta-lactamase (ESBL) (positive), which is sensitive to meropenem, imipenem, colistin, extended-spectrum of β-lactamase, tigecycline, chloramphenicol, and amikacin. The drain was kept for 10 days, after which it was exchanged in the 2nd surgery and then kept in place until the output was nil for 24 hours and brain CT showed resolution of the frontal abscess. The 3rd surgery was a parietal drain insertion; this drain was kept for 2 weeks and removed when no output was seen for 24 hours. Follow-up brain CT shows right-hemispheric subdural collection. Therefore, a subdural drain was inserted for drainage and kept for another 2 weeks. ►**Fig. 5** shows the patient's final brain CT .

During the management period, the patient was clinically stable and did not show any neurological or vital deterioration; active and interactive; the cranial nerves were intact; the patient moved the four limbs equally and symmetrically; laboratory findings returned normal, and her brain CT follow-up showed resolving of the brain abscess.

Discussion

Pierre Robin sequence (PRS) consists of a clinical triad of micrognathia, glossoptosis, and compromised airway with variable inclusion of cleft palate. When this constellation of findings occurs in the absence of other congenital anomalies, it is termed isolated PRS; however, PRS is sometimes found as a component of a more complex syndromic picture.[5]

The Dandy-Walker malformation is the most frequent cerebral malformation.[6] It is defined by hypoplasia and upward rotation of the vermis cerebelli, cystic enlargement of the fourth ventricle, and, in total, an enlarged posterior fossa with a cranially shifted position of the lateral sinus tentorium and torcula herophili. This malformation was first described by Dandy and Blackfan[7] in 1914, then supplemented again by Taggart and Walker in 1942.[8]

In 2007, Stevenson et al. were the first to describe two novel multiple congenital anomaly cases—mental disability syndrome with PRS and cerebellar hypoplasia—in two sisters. So, it was the first report talking about PRS with Dandy-Walker variant, although Fryns et al.[9] described multiple congenital anomalies.

Again, in 2008, Sasakin-Adam et al.[2] described a case of Dandy-Walker variant with PRS. In 2011, Ramieri et al.[10] described the case of a 5-month-old boy affected by multimalformative syndrome (PRS, Dandy-Walker variant, and Seckle syndrome) with features of microdeletion 3q syndrome.

The incidence of brain abscesses has been estimated at 0.3 to 1.3 per 100,000 people per year, but it can be considerably higher in certain risk groups.[11] The most common predisposing conditions in brain abscesses are contiguous foci of infection: otitis or mastoiditis (33%), sinusitis (10%), meningitis (6%), and odontogenic foci (5%). Metastatic infection from a pulmonary focus, heart disease, or another source of hematogenous spread was identified in 33% of patients. Neurosurgical operation preceded brain abscess in 9% of patients, and head trauma in 14%.[12] Matthijs et al. performed a systematic review and meta-analysis of studies on brain abscesses including 9,699 patients and found that the most common causative microorganisms were those of the Streptococcus and Staphylococcus species, comprising, respectively, 260 (36%) and 128 (18%) of 5,894 cultured bacteria. Only 11 cases of (2%) *K. pneumonia* were identified in the pediatric group.[12]

In this case, we are presenting a unique first case in the literature of a neurologically intact child who had a large hemispheric brain abscess diagnosed with PRS and Dandy-Walker variant. The source of the brain abscess was hematogenous from a lung infection, and the patient was a three-month-old female who was already in the pediatric intensive care unit with tracheostomy and treated for recurrent chest infections (hospital-acquired). There were no neurological or clinical signs that would suggest brain abscess, other than laboratory findings that showed an elevation in the acute phase reactants; platelets were raised to $1{,}050 \times 10^3/mm^3$, her WBC count was $31.3 \times 10^3/mm^3$, and C-reactive protein was 186 mg/l. All these findings suggested searching for a source of infection other than the chest, as the chest images could not explain this elevation. Computed tomography of the brain showed a large right hemispheric brain abscess. A brain MRI also showed the right lobar abscess reaching the periventricular area.

The brain abscess has been treated in multi-stages of minimally invasive surgical drainage with adjuvant antibacterial therapy based on the cultured microorganism, *K. pneumonia*; the treatment therapy took 3 months; at the end, her final brain CT showed resolving of the brain abscess, and her laboratory findings returned normal. From the beginning of the treatment until the discharge, the patient was clinically and neurologically intact.

In conclusion, this is a novel syndrome of PRS with Dandy-Walker variant which had a large right hemispheric periventricular brain abscess cultured with the rare pathogen *K. pneumonia*, treated in multi-stages of drainage with adjuvant antibacterial therapy, and it showed good outcome (her neurological exam was intact, and her laboratory findings returned normal, and the abscess resolved on images), with no need for invasive surgical intervention for excision of the capsule and abscess in a single surgery.

Ethical Consideration

Written informed consent was obtained from the patient's parents for publication of the case report and any related images.

Funding

The present study was not funded.

Conflict of Interests

The authors have no conflict of interests to declare.

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