

Interesting and Unusual Case of Brain Regeneration



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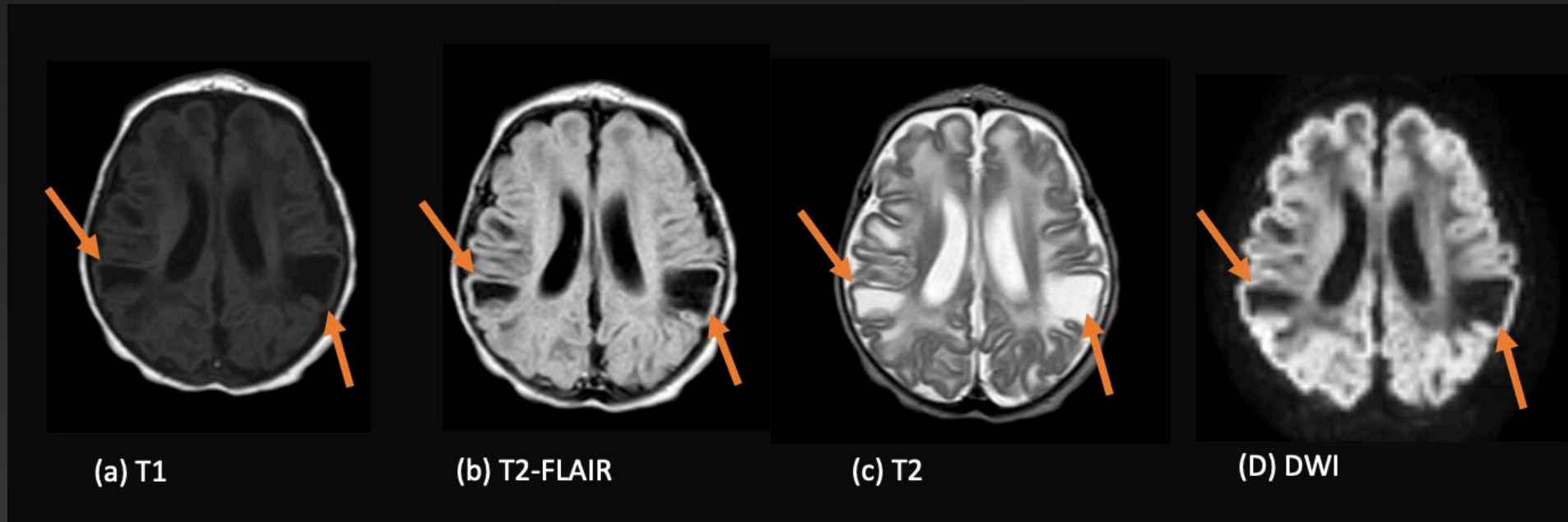

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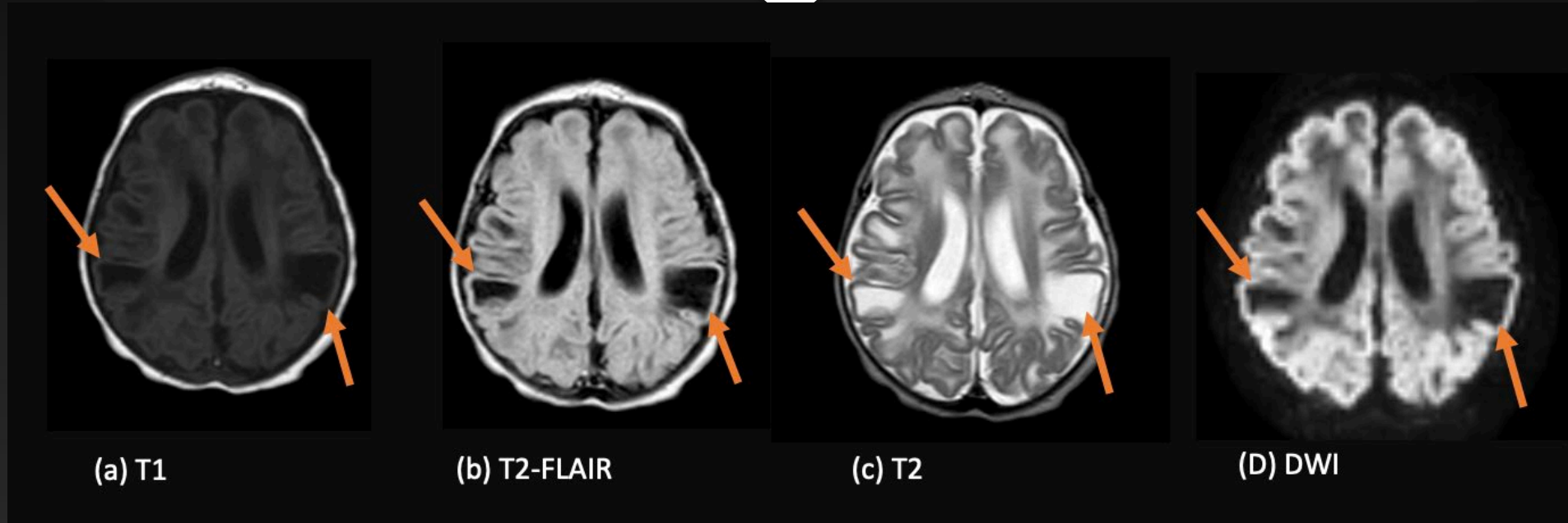
Clinical Presentation



- **Five days after full-term birth**, the patient presented episodes of stiffening and abnormal posturing consisting of bilateral upper extremity extension and internal rotation during periods of agitation lasting 30 seconds
- **Negative for seizures on EEG**, prompting the medical team to obtain a **brain MRI**



Imaging Discussion

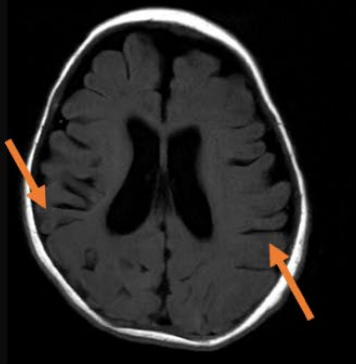


- **Bilateral cystic lesions and volume loss**, particularly on the left side were observed, **concerning for encephalomalacia**
- Areas of T2 hyperintense/T1 hypointense signal more conspicuous in the white matter of the parietal lobes, which may represent a **chronic sequela of an ischemic event in utero**.
- After two months in the NICU, the patient was stable, with negative neurological events, and was discharged.

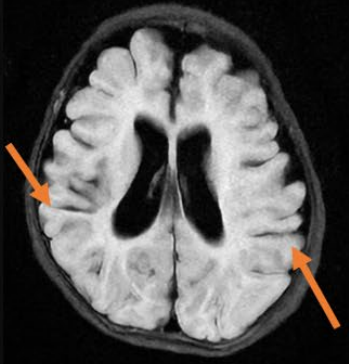
Clinical Presentation



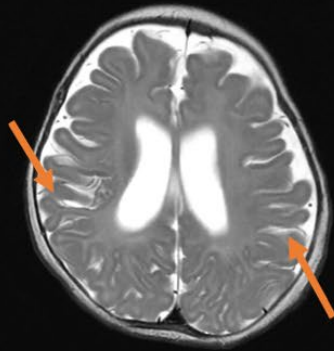
- However, **two months later**, the patient presented to the emergency room due to worsening shortness of breath, where the patient was admitted and intubated for respiratory failure.
- After observing suspected seizure episodes, the team ordered an EEG, which showed multiple tonic-clonic seizures with multifocal epileptogenicity and severe diffuse encephalopathy.
- Both a brain MRI and CT scan were conducted.



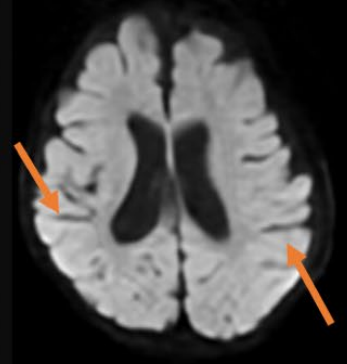
(a) T1



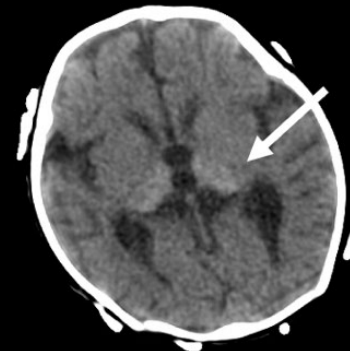
(b) T2-FLAIR



(c) T2



(c) DWI

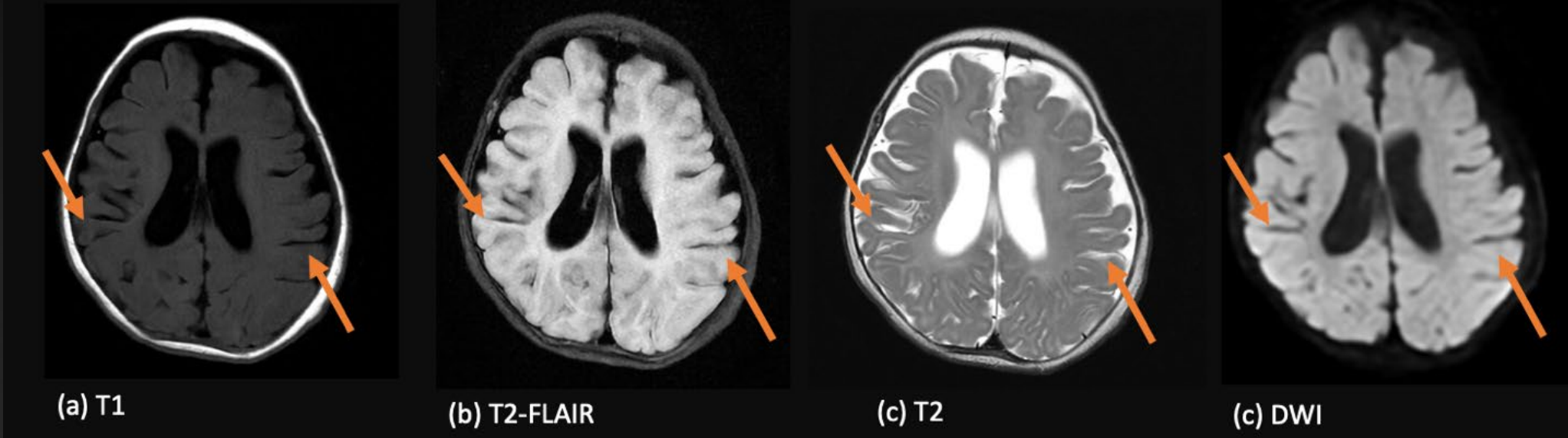


(a)



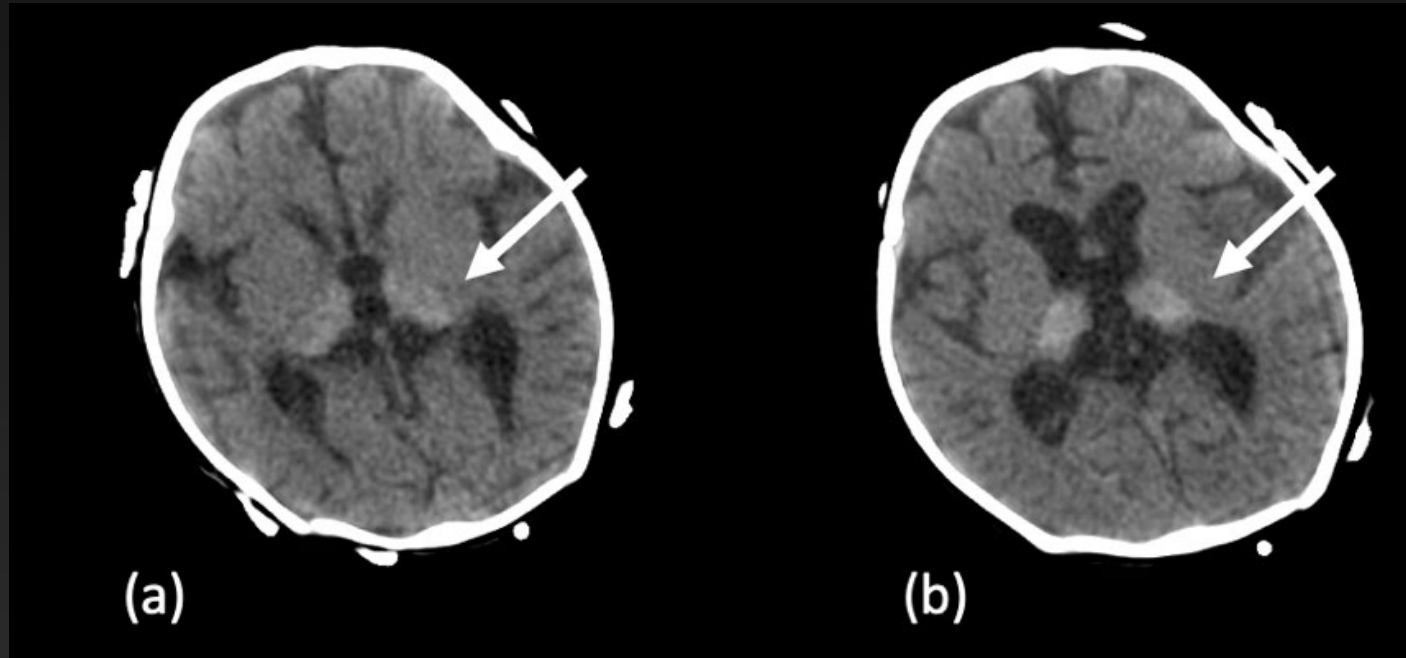
(b)

Imaging Discussion



- Remarkably, the second brain MRI showed that the bilateral cystic lesions seen in the initial MRI were filled with brain tissue, suggesting growth of brain tissue in those areas

Imaging Discussion



- The CT without contrast showed areas of hyper attenuation in the bilateral thalami and mild volume loss, further supporting a sequela of prior hypoxic-ischemic injury

Management



- Seizures were managed by sedation, continuous EEG, and multiple antiepileptics drugs.
 - Patient continued to have refractory seizures, suggesting the regenerated brain tissue could be **dysplastic**.
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- Histories and exams were conducted to determine the etiology of the disease. Interestingly, the mother reported an **uncomplicated pregnancy, extensive prenatal care, and a full-term baby**.
 - An infectious disease workup was **negative for TORCH and GBS infections**. **Genetic testing results were negative**, suggesting an **anoxic perinatal event**.
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- Due to the patient's clinical status, the family agreed to **withdraw life-sustaining therapy**

Take Home Points



Here, we observed a rare case of brain regeneration after encephalomalacia due to an anoxic perinatal event in a five-month-old infant, showcasing the remarkable adaptive ability in the pediatric population

CNS regeneration to a pre-pathological state **does not occur in adult mammalian brains**. However, a newborn's brain may be more undifferentiated, allowing it to compensate for volume loss. It is a very rare phenomenon, and we only found one study **by Rutherford et. al.** reporting this to our knowledge.

Full workup including extensive perinatal history, brain CT/MRI, infectious disease, and genetic testing to understand etiology of encephalomalacia

Continuous follow-up and imaging will help understand the prognosis and functional status of the regenerated brain tissue

References



1. Fan L, Feng L, Gan J, Luo R, Qu H, Chen X. Clinical characteristics of cystic encephalomalacia in children. *Front Pediatr.* 2024;12:1280489. doi:10.3389/fped.2024.1280489
2. Karaoglu P, Polat A, Yis U, Hiz S. Parieto-occipital encephalomalacia in children; clinical and electrophysiological features of twenty-seven cases. *J Pediatr Neurosci.* 2015;10(2):103. doi:10.4103/1817-1745.159187
3. Illis LS. Central nervous system regeneration does not occur. *Spinal Cord.* 2012;50(4):259-263. doi:10.1038/sc.2011.132
4. Rutherford MA, Pennock JM, Cowan FM, M.S. LD, Hajnal JV, Bydder GM. Does the brain regenerate after perinatal infarction? *European Journal of Paediatric Neurology.* 1997;1(1):13-17. doi:10.1016/S1090-3798(97)80005-0
5. Oommen AT. Unusual Presentation of Porencephalic Cyst in an Adult. *JCDR.* Published online 2017. doi:10.7860/JCDR/2017/22654.9374
6. Tambuzzi S, Gentile G, Zoja R. Porencephalic cyst in adult. *Autops Case Rep.* 2022;12:e2021351. doi:10.4322/acr.2021.351
7. Cornet M, Kuzniewicz M, Scheffler A, Hamilton E, Newman T, Wu Y. Perinatal hypoxic-ischemic encephalopathy: Incidence over time within a modern US birth cohort. *Pediatric Neurology.* 2023;149. doi: <https://doi.org/10.1016/j.pediatrneurol.2023.08.037>.