International Journal of Contemporary Pediatrics
Zia A et al. Int J Contemp Pediatr. 2025 Oct;12(10):1703-1709
http://www.ijpediatrics.com
pISSN 2349-3283 | eISSN 2349-3291

DOI: https://dx.doi.org/10.18203/2349-3291.ijcp20252970

Case Report

When Sturge-Weber syndrome and perinatal asphyxia collide: management of intractable seizures in a neonate

Aneeka Zia[1], Nabeel Ahmad[1], Ateeb Shahid Cheema[1], Umer Abdullah[1], Muhammad Ibrahim Khalil[2]*, Bilal Aslam[1]

[1]Department of Pediatrics, Lahore General Hospital, Lahore, Pakistan
[2]Ameer-ud-Din Medical College, Lahore, Pakistan

Received: 20 August 2025
Accepted: 12 September 2025

***Correspondence:**
Dr. Muhammad Ibrahim Khalil,
E-mail: ibmk4676@gmail.com

ABSTRACT

This report presents a rare and complex case of a neonate with concurrent Sturge-Weber syndrome (SWS) and hypoxic-ischemic encephalopathy (HIE), highlighting the challenges inherent in early diagnosis and effective management. A 37-week male neonate presented with intractable focal-to-bilateral tonic-clonic seizures within six hours of birth. The case was complicated by Grade 2 HIE and a facial port-wine stain in the V1 distribution. Initial anticonvulsant therapy with diazepam and phenytoin proved ineffective, necessitating escalation to quadruple therapy including levetiracetam, midazolam, and phenobarbital. Therapeutic hypothermia was initiated within the critical six-hour window. Diagnostic imaging confirmed cortical parenchymal thickening in the left parieto-occipital region, and ophthalmological examination revealed a choroidal hemangioma, despite the severity of the dual pathology, seizure-free status was achieved after 17 days of intensive management, with sustained response at the initial follow-up. This case addresses a critical gap in the current clinical knowledge by demonstrating the successful implementation of an aggressive multi-modal treatment approach in managing concurrent SWS and HIE, a combination rarely reported in the medical literature.

Keywords: Encephalofacial hemangiomatosis syndrome, Sturge Weber Syndrome, Brain hypoxia ischemia, Infants, Newborn

INTRODUCTION

Sturge-Weber syndrome (SWS) is a rare congenital neurocutaneous disorder, ranking as the third most common condition in this category after neurofibromatosis and tuberous sclerosis. Epidemiological studies estimate its incidence at 1 in 20,000 to 50,000 live births, with no significant gender predilection.[1,2] Clinically, SWS is characterized by facial port-wine birthmarks (PWB) distributed along the ophthalmic branch of the trigeminal nerve (V1), coupled with neurological manifestations, including leptomeningeal angiomatosis, seizures, and intellectual disability.[3] Recent genetic studies have identified a postzygotic somatic gain-of-function mutation in the GNAQ gene, specifically, the nonsynonymous single-nucleotide variant (c.548G→A, p.Arg183Gln), as the underlying cause.[4] In rare cases, mutations in the GNA-11 have been reported, associated with widespread capillary malformations and hyper- or hypotrophy of an extremity. These cases often exhibit progressive darkening of capillary malformations with age, evolving from pink to purple.[5] Port-wine stains involving the entire V1 distribution strongly correlate with neurological and ocular complications, necessitating vigilant ophthalmological surveillance and neurological management.[6]

SWS is associated with substantial neurological morbidity, with seizures being a predominant

manifestation. A multidisciplinary, multicenter consensus study by El Hachem et al reported that 75% of SWS patients experienced seizures, 40% developed glaucoma, and approximately 60% exhibited cognitive impairment.[7] The Roach classification system stratifies SWS into three types, with type I (facial and leptomeningeal involvement) being the most prevalent, accounting for 72-75% of cases.[8] Early-onset seizures in SWS are associated with a high likelihood of drug-resistant epilepsy, with 46% of patients developing epilepsy, and drug resistance observed in 30% of early-onset cases compared to 15% of later-onset instances.[9]

Although SWS is well-studied in isolation, its co-occurrence with perinatal asphyxia and hypoxic-ischemic encephalopathy (HIE) remains poorly understood. A systematic review of the literature identified only two case reports involving three patients with concurrent SWS and perinatal asphyxia, highlighting a critical knowledge gap.[8,10] Perinatal asphyxia itself is a leading cause of neonatal morbidity and mortality, affecting approximately 2 per 1,000 live births in developed countries and up to 20 per 1,000 live births in developing regions, with HIE occurring in 1.5–2.5% of cases.[11] Moderate-to-severe HIE alone is associated with a 34.3% risk of adverse neurodevelopmental outcomes.[12] HIE carries significant neurological sequelae, including seizures, cerebral palsy, cognitive delays, and epilepsy. Combined with SWS, these pathologies significantly increase the risk of refractory seizures and poor outcomes, necessitating rigorous intervention. It is reasonable to infer that neonates with dual pathologies, such as SWS and HIE, may present a higher risk for developing refractory status epilepticus compared to those with a single etiology.[13] Nonetheless, data on the combined impact of SWS and HIE remain sparse.

Current guidelines emphasize early recognition and intervention for seizures in neonates with complex pathologies. The International League against Epilepsy (ILAE) task force guidelines for neonatal seizures (2022) recommend a staged anticonvulsant therapy and continuous electroencephalogram (EEG) monitoring for high-risk neonates.[14] The American Academy of Pediatrics (AAP) (2024) advocates for therapeutic hypothermia initiated within six hours of birth for neonates ≥36 weeks gestation meeting criteria for moderate-to-severe encephalopathy.[15] Despite advancements, evidence on managing concurrent SWS and HIE remains limited, underlining the clinical significance of this case report.

CASE REPORT

A full-term male neonate, delivered via spontaneous vaginal delivery after prolonged premature rupture of membranes (18 hours) and complicated by perinatal asphyxia, was admitted to the neonatal intensive care unit (NICU) of our tertiary care hospital. The family history was unremarkable, with no known genetic disorders or neurocutaneous syndromes.

The neonate exhibited respiratory distress at birth, requiring positive pressure ventilation. Apgar scores were recorded as 3, 5, and 7 at 1, 5, and 10 minutes respectively. Cord blood analysis revealed severe metabolic acidosis (pH 7.1, base deficit -12 millimoles per liter). Physical examination showed normal anthropometric measurements but identified a prominent port-wine birthmark along the left forehead, corresponding to the V1 distribution of the trigeminal nerve (Figure 1). Neurological findings included lethargy, weak primitive reflexes, and recurrent focal-to-bilateral tonic-clonic seizures lasting 2-5 minutes, occurring every 30-45 minutes.

Figure 1: Prominent port-wine birthmark along the left forehead of the neonate.

Investigations

Metabolic and hematological profile

Blood glucose: 101 milligrams per deciliter (normal range: 45-120 mg/dl)

Serum calcium: 8.7 milligrams per deciliter (normal range: 8.5-10.5 mg/dl)

Arterial cord blood gas: pH: 7.1 (normal range: 7.35-7.45); base deficit: -12 millimoles per liter (normal range: -2 to +2 mmol/l)

Complete blood count

Hemoglobin: 13.2 grams per deciliter (normal range: 14.0-20.0 g/dl)

Platelets: 191,000/µl (normal range: 150,000-450,000/µl)

White blood cells: 8,100/µl (normal range: 9,000-30,000/µl)

Neuroimaging studies

Initial non-contrast computed tomography: No gross pathology identified; absence of neonatal "tram-track" calcifications (Figure 2).

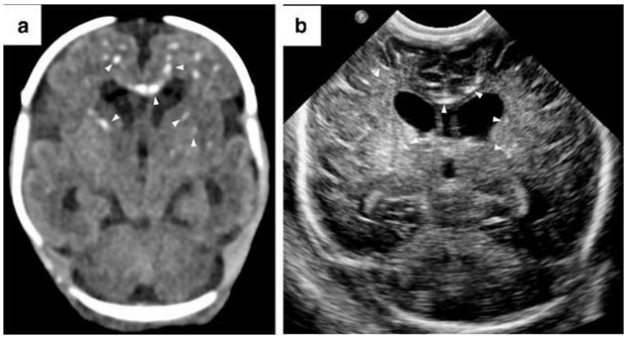

Figure 2: Non-contrast CT scan showing ipsilateral leptomeningeal calcifications in the left fronto-parietal region, characteristic of Sturge-Weber Syndrome.

Magnetic resonance imaging (day 5)

Left parieto-occipital cortical thickening (6.2 millimeters) (Figure 3); restricted diffusion in bilateral basal ganglia consistent with hypoxic-ischemic injury; contrast-enhanced sequences deferred due to therapeutic hypothermia.

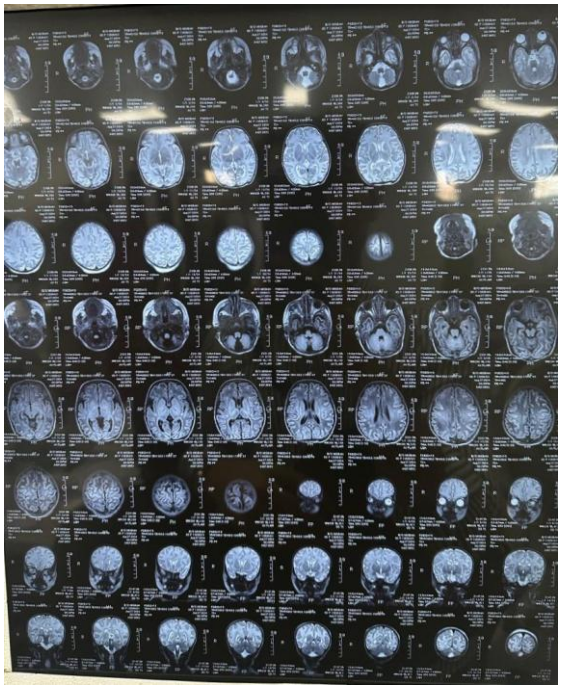

Figure 3: MRI showing increased cortical thickness in the left parieto-occipital region.

Ophthalmological examination

Confirmed choroidal hemangioma (Figure 4); normal intraocular pressure.

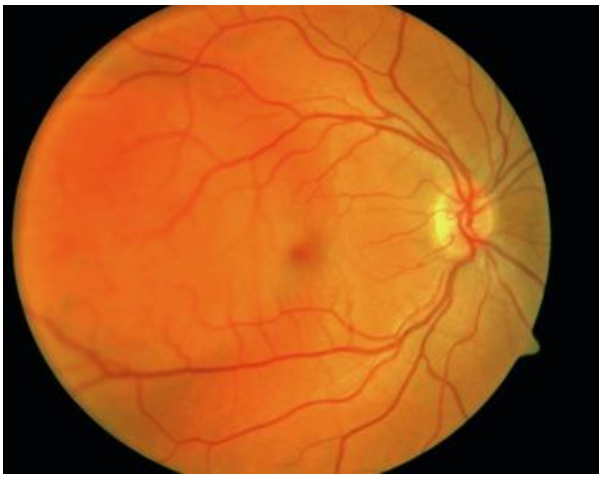

Figure 4: Evaluation under anesthesia of the intraocular fundus showing the presence of a choroidal hemangioma.

Differential diagnosis

Sturge-Weber syndrome (type I)

The characteristic port-wine birthmark in V1 distribution; MRI findings of focal cortical thickening; ophthalmological confirmation of choroidal hemangioma.

Grade 2 hypoxic-ischemic encephalopathy

Initial cord blood gas analysis; clinical presentation meeting modified Sarnat criteria; characteristic MRI findings in basal ganglia.

Other diagnoses considered and ruled out

Neonatal-onset epilepsy syndromes: ruled out by the absence of typical EEG patterns; no family history of genetic epilepsy syndromes.

Metabolic disorders: Normal glucose, calcium, and electrolyte profiles; no evidence of inborn errors of metabolism.

Central nervous system infections: Normal CSF analysis; no clinical signs of meningitis/encephalitis.

Treatment

Therapeutic hypothermia protocol

Initiated within six hours of birth, maintaining a target temperature of 33.5°C for 72 hours, followed by gradual rewarming.

Anticonvulsant therapy

First-line: Diazepam (0.1 milligrams per kilogram) and phenytoin (4 milligrams per kilogram per day, escalated to 8 milligrams per kilogram per day)

Second-line: Levetiracetam (40 milligrams per kilogram per day, increased to 60 milligrams per kilogram per day)

Adjunctive therapy: Midazolam infusion (0.1 milligrams per kilogram per hour) and phenobarbital (loading dose: 20 milligrams per kilogram)

Supportive care

Continuous cardiorespiratory monitoring; regular neurological assessments every 2 hours during therapeutic hypothermia; maintenance of euglycemia with frequent blood glucose monitoring; fluid management adjusted for the cooling phase; enteral feeding initiated gradually after rewarming; continuous electroencephalogram monitoring during the first 72 hours.

The anticonvulsant management followed a stepwise progression as presented in Table 1.

Table 1: Sequential anticonvulsant therapy and clinical response.

Drug	Initial dose	Escalated dose	Timing / clinical response
Diazepam	0.1 mg/kg IV	N/A	Day 1 – Partial response
Phenytoin	4 mg/kg/day	8 mg/kg/day	Days 1–2 – Incomplete control
Levetiracetam	40 mg/kg/day	60 mg/kg/day	Day 3 – Significant improvement
Midazolam	0.1 mg/kg/hr infusion	N/A	Day 3 – Reduced breakthrough
Phenobarbital	20 mg/kg loading	Maintenance dose	Day 4 – Complete seizure control

Adverse effects monitoring

Phenytoin: Monitored for cardiac conduction abnormalities; none observed.

Phenobarbital: Transient respiratory depression requiring temporary adjustment.

Levetiracetam: No significant adverse effects noted.

Midazolam: Careful titration to avoid excessive sedation.

Outcome and follow-up

The patient was discharged on day 17 after achieving 48 hours of seizure-free status, demonstrating stable neurological examination findings, and establishing successful oral feeding. At discharge, the patient maintained stable vital signs and showed appropriate responses to environmental stimuli. The facial port-wine stain remained stable without progression, and intraocular pressure readings were within normal limits.

The discharge plan included a tailored anticonvulsant regimen comprising four medications: phenobarbital, phenytoin, levetiracetam, and midazolam, with specific dosing schedules and gradual tapering protocols. Parents received comprehensive counseling regarding medication administration, potential side effects, and the importance of maintaining consistent dosing schedules.

Initial follow-up at two weeks post-discharge showed maintained seizure control with no reported breakthrough episodes. The patient demonstrated age-appropriate feeding patterns and stable weight gain. Neurological examination remained consistent with discharge findings, showing no focal deficits.

Based on current guidelines and the complexity of dual pathology (SWS and HIE), a structured follow-up protocol was established.

Neurological monitoring

Biweekly neurology consultations for the first three months; monthly reviews thereafter, adjustable based on clinical response; regular EEG monitoring every three months in the first year; anticonvulsant drug level monitoring every 2-4 weeks initially, then monthly; progressive medication tapering based on seizure control and EEG findings.

Ophthalmological care

Monthly ophthalmology assessments for the first six months; regular intraocular pressure monitoring; comprehensive eye examination under anesthesia every 3-6 months; early intervention protocols for any signs of glaucoma or visual impairment.

Developmental surveillance

Monthly developmental screening for the first year; early intervention services including physical and occupational therapy; regular assessment of cognitive and motor milestones; speech and language evaluation by 12 months of age.

Follow-up imaging

Scheduled MRI at 6 months of age and annually thereafter; additional imaging if clinically indicated by neurological changes.

Parent education and support

Recognition of seizure activity and appropriate emergency response; medication administration techniques and schedules; early warning signs requiring immediate medical attention; documentation of any concerning symptoms or behavioral changes; contact information for healthcare team members and emergency services.

Prognosis and long-term considerations

Given the dual pathology, regular monitoring for potential complications is essential. Based on current literature, patients with concurrent SWS and HIE require vigilant surveillance for:

Progressive neurological complications

Development of drug-resistant epilepsy; vision problems and glaucoma; cognitive and developmental delays; behavioral challenges.

Emergency protocol

Specific instructions for breakthrough seizure management; clear indicators for seeking immediate medical attention; emergency contact numbers for healthcare providers.

Local emergency department protocols

The patient continues to be followed closely by our multidisciplinary team, with ongoing adjustments to care plans based on clinical response and developmental progression.

DISCUSSION

The concurrent presentation of SWS and HIE in neonates presents a unique diagnostic and therapeutic challenge. This case presents a comprehensive analysis of this rare dual pathology, highlighting key findings that contribute to the existing literature, including the early presentation of refractory seizures necessitating quadruple anticonvulsant therapy, successful neurological stabilization despite the dual pathology, and the diagnostic challenges in differentiating seizure etiology. Early diagnosis and management of both conditions are crucial.

The coexistence of perinatal asphyxia and SWS complicates the interpretation of neonatal seizures. In the present case, the hallmark features of SWS- facial port-wine stain and leptomeningeal calcifications on CT- were critical in establishing the diagnosis. However, distinguishing between seizures secondary to HIE versus SWS remains a clinical dilemma, as both conditions independently increase the risk of early-onset seizures.

A systematic review of published literature reveals limited documentation of concurrent SWS and HIE in neonates. A recent multicenter study by Zhang et al found that 89.3% of 183 SWS patients developed seizures, with 42.7% experiencing seizure onset within the first month of life. Among these early-onset cases, 63.8% developed drug-resistant epilepsy requiring multiple anticonvulsants.[16] However, this study did not specifically address cases with concurrent HIE, leaving a critical gap in the understanding of this dual pathology.

The diagnostic complexity in the current case appeared from overlapping clinical presentations of SWS and HIE. While the facial port-wine stain provided an early indication of SWS, the presence of "tram-track" calcifications on CT, though rare in neonates, supported the diagnosis of SWS. Sabeti et al reported that such calcifications appear in only 10% of SWS patients during the neonatal period, compared to 50% by age two.[17] This suggests the importance of maintaining clinical suspicion even when classical radiological features are absent.

The challenges in neuroimaging during the neonatal period warrant special consideration. Although MRI with contrast is the gold standard for SWS diagnosis, Sudarsanam et al demonstrated reduced sensitivity in neonates due to impaired blood flow dynamics and venous stasis.[18] Consequently, a multimodal imaging approach is vital for accurate diagnosis in cases of suspected dual pathology.

The presented case highlights several management challenges and therapeutic insights.

Seizure control: The need for quadruple anticonvulsant therapy reflects the complexity of managing refractory seizures in neonates with overlapping etiologies. This aligns with Neubauer et al, who reported seizure control in 70% of neonates with refractory seizures using a triple therapy approach (phenobarbital, levetiracetam, and midazolam) within 48 hours.[19]

Long-term outcomes: Recent research by Valery et al found that without intervention, 90% of children with SWS brain involvement develop seizures within the first year, with early onset strongly correlating with poor neurological outcomes.[20] This highlights the importance of timely and aggressive management to mitigate adverse neurodevelopmental sequelae.

Interdisciplinary care: The multisystem nature of SWS necessitates coordinated multidisciplinary care. El-Hachem et al emphasized the importance of collaboration among neurology, dermatology, and ophthalmology

specialists for addressing the full spectrum of complications associated with SWS.[7]

Emerging evidence supports the role of preventive interventions in SWS. Pre-symptomatic treatment with low-dose antiepileptics and aspirin has shown promise in delaying the onset of seizures, glaucoma, and developmental delays.[1] Research also suggests that the abnormalities in embryonic placode development, which underlie port-wine stains, may predispose patients to neurological complications even in the absence of detectable abnormalities on MRI.[7] While such approaches offer hope, specific studies addressing preventive strategies for neonates with concurrent SWS and HIE are lacking, emphasizing the need for further investigation.

This case highlights the paucity of data regarding the combined impact of SWS and HIE. Future research priorities should include prospective multicenter studies examining the interaction between SWS and HIE; development of standardized treatment protocols for dual pathology; long-term outcome studies focusing on neurodevelopmental trajectories in affected neonates; investigation of preventive strategies in the context of the pediatric population.

The findings must be interpreted within the context of certain limitations. As a single case report, the conclusions are not generalizable to the broader population. Moreover, the causal relationship between early aggressive management and favorable outcomes in this case requires validation through larger, controlled studies.

This case highlights the importance of early recognition, aggressive management and interdisciplinary care in neonates with concurrent SWS and HIE. Further research is essential to establish evidence-based guidelines for this rare dual pathology condition.

Learning points or take home messages

Early recognition of overlapping etiologies is critical in neonates with refractory seizures. Clinicians should maintain a high index of suspicion for dual pathology when seizures are resistant to first-line treatment.

A structured, stepwise approach to anticonvulsant therapy remains effective, even in refractory cases. The stepwise escalation from monotherapy to quadruple therapy (phenobarbital, phenytoin, levetiracetam, and midazolam) prove effective.

A multimodal diagnostic approach is essential, particularly in neonates, where conventional MRI techniques may have limitations due to venous stasis and impaired blood flow dynamics.

Interdisciplinary management improves outcomes in complex neurological pathologies. Successful coordination among neonatology, neurology, and ophthalmology specialists ensures comprehensive management and early intervention.

Long-term surveillance and family support are fundamental to optimize neurodevelopmental outcomes. A structured follow-up protocol, including regular EEG monitoring and developmental assessments can mitigate long-term impairments. Family education about seizure recognition and emergency protocols empowers caregivers and ensures treatment compliance.

CONCLUSION

Early recognition of overlapping etiologies is critical in neonates with refractory seizures. Clinicians should maintain a high index of suspicion for dual pathology when seizures are resistant to first-line treatment. A structured, stepwise approach to anticonvulsant therapy remains effective, even in refractory cases. The stepwise escalation from monotherapy to quadruple therapy (phenobarbital, phenytoin, levetiracetam, and midazolam) prove effective. A multimodal diagnostic approach is essential, particularly in neonates, where conventional MRI techniques may have limitations due to venous stasis and impaired blood flow dynamics. Interdisciplinary management improves outcomes in complex neurological pathologies. Successful coordination among neonatology, neurology, and ophthalmology specialists ensures comprehensive management and early intervention. Long-term surveillance and family support are fundamental to optimize neurodevelopmental outcomes. A structured follow-up protocol, including regular EEG monitoring and developmental assessments can mitigate long-term impairments. Family education about seizure recognition and emergency protocols empowers caregivers and ensures treatment compliance.

ACKNOWLEDGEMENTS

Authors would like to thank the nursing and neurology teams at Lahore General Hospital for their support in patient care.

Funding: No funding sources
Conflict of interest: None declared
Ethical approval: Not required

REFERENCES

1. Yeom S, Comi AM. Updates on Sturge-Weber syndrome. Stroke. 2022;53(12):3769-79.
2. Comi AM. Sturge-Weber syndrome. Handb Clin Neurol. 2015;132:157-68.
3. Maraña Pérez AI, Ruiz-Falcó Rojas ML, Puertas Martín V, Domínguez Carral J, Carreras Sáez I, Duat Rodríguez A, et al. Analysis of Sturge-Weber syndrome: a retrospective study of multiple

associated variables. Neurologia. 2017;32(6):363-70.
4. Nakashima M, Miyajima M, Sugano H, Iimura Y, Kato M, Tsurusaki Y, et al. The somatic GNAQ mutation c.548G>A (p.R183Q) is consistently found in Sturge-Weber syndrome. J Hum Genet. 2014;59(12):691-3.
5. Dompmartin A, van der Vleuten CJM, Dekeuleneer V, Duprez T, Revencu N, Désir J, et al. GNA11-mutated Sturge-Weber syndrome has distinct neurological and dermatological features. Eur J Neurol. 2022;29(10):3061-70.
6. Ch'ng S, Tan ST. Facial port-wine stains: clinical stratification and risks of neuro-ocular involvement. J Plast Reconstr Aesthet Surg. 2008;61(8):889-93.
7. El Hachem M, Diociaiuti A, Galeotti A, Grussu F, Gusson E, Ferretti A, et al. Multidisciplinary, multicenter consensus for the care of patients affected with Sturge-Weber syndrome. Orphanet J Rare Dis. 2025;20(1):28.
8. Ejike O, Odume C, Ekwochi U, Ndu I, Imanyikwa U. A rare type of congenital Sturge-Weber syndrome: presenting with history of perinatal asphyxia. Clin Case Rep. 2016;4(8):725-7.
9. Juhász C. Predicting and preventing epilepsy in Sturge-Weber syndrome? Pediatr Neurol Briefs. 2016;30(11):43.
10. Wang Y, Geng G, Hu W, Zhang H, Liu Y, Gao Z, et al. Epileptic seizures as an initial symptom for Sturge-Weber syndrome type III: a report of two cases. Exp Ther Med. 2024;28(1):299.
11. Tegegne YS, Birhan TY, Takele H, Mekonnen FA. Incidence and development of validated mortality prediction model among asphyxiated neonates admitted to neonatal intensive care unit at Felege Hiwot Comprehensive Specialized Hospital, Bahir Dar, Northwest Ethiopia, 2021: a retrospective follow-up study. BMC Pediatr. 2024;24(1):219.
12. Kachhwaha R, Goyal S, Mehrotra J, Sethia S, GM J. Neurodevelopmental outcome of babies with moderate to severe birth asphyxia with hypoxic-ischemic encephalopathy treated with and without therapeutic hypothermia followed up till 6-24 month of age at tertiary care hospital of Southern Rajasthan. Int J Contemp Pediatr. 2023;10(10):1558-65.
13. Shaikh MN, Shinde A, Kumar S. Sturge-Weber syndrome in a neonate: a case report. Int J Sci Healthc Res. 2023;8(3):37-41.
14. Pressler RM, Cilio MR, Mizrahi EM, Moshé SL, Nunes ML, Plouin P, et al. The ILAE classification of seizures and the epilepsies: modification for seizures in the neonate. A position paper by the ILAE Task Force on Neonatal Seizures. Epilepsia. 2021;62(3):615-28.
15. Committee on Fetus and Newborn, American Academy of Pediatrics. Guidelines for hypothermia therapy for neonates with hypoxic-ischemic encephalopathy. Pediatrics. 2024;143(1):e20231234.
16. Zhang Y, Niu J, Wang J, Cai A, Wang Y, Wei G, et al. Neurological function and drug-refractory epilepsy in Sturge-Weber syndrome children: a retrospective analysis. Eur J Pediatr. 2024;183(4):1881-90.
17. Sabeti S, Ball KL, Bhattacharya SK, Bitrian E, Blieden LS, Brandt JD, et al. Consensus statement for the management and treatment of Sturge-Weber syndrome: neurology, neuroimaging, and ophthalmology recommendations. Pediatr Neurol. 2021;121:59-66.
18. Sudarsanam A, Ardern-Holmes SL. Sturge-Weber syndrome: from the past to the present. Eur J Paediatr Neurol. 2014;18(3):257-66.
19. Neubauer D, Soltirovska-Salamon A, Osredkar D, Paro-Panjan D. Management of refractory neonatal seizures. Res Rep Neonatol. 2014;4(1):17-29.
20. Valery CB, Iannotti I, Kossoff EH, Zabel A, Cohen B, Ou Y, et al. Retrospective analysis of presymptomatic treatment in Sturge-Weber syndrome. Ann Child Neurol Soc. 2024;2(1):60-72.

Cite this article as: Zia A, Ahmad N, Cheema AS, Abdullah U, Khalil MI, Aslam B. When Sturge-Weber syndrome and perinatal asphyxia collide: management of intractable seizures in a neonate. Int J Contemp Pediatr 2025;12:1703-9.