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# EXPLORING THE COMPLEXITIES OF FIRST-TIME REFRACTORY STATUS EPILEPTICUS (NORSE): A DIVERSE EXPERIENCE

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## ABSTRACT

*Objective: Refractory first-time status epilepticus (NORSE) poses a high risk of death and lasting neurological decline, even after extensive evaluations. The management of NORSE is an ongoing discussion among healthcare professionals. Strategies such as immunotherapies, early administration of intravenous anaesthetic treatments (IVAT), and rapid seizure cessation may help to reduce illness and death. We aimed to assess the critical care management of patients with NORSE, analysing patient demographics, clinical features, potential causes, treatment effectiveness, prognosis, and outcomes. We examined neuroimaging, lab investigations and the impact of timely interventions. Additionally, we compared NORSE to other forms of*

*status epilepticus and highlighted the comprehensive evaluation and management challenges associated with this condition.*

*Case summary: The study included three patients, all over 18 years of age, consisting of one male and two females. All patients had elevated body temperature, one reported a headache, and all had spontaneous epileptic seizures. Initial tests, including brain imaging, show normal results. However, two patients had bilateral hippocampal diffusion limitations, while one had hyperintense signals in the fossa. Cerebrospinal fluid (CSF) analysis revealed that two patients had 10 cells/l, and one had a higher count. Continuous monitoring of burst suppression patterns was performed while receiving IVAT. The typical duration of hospital stay was approximately 33.33 days, with a mean ICU stay of 28.66 days. Identified causes included a cryptogenic origin for two cases and a possible infectious aetiology for one.*

*Conclusions: With appropriate management approaches, improved outcomes for patients with NORSE are achievable.*

**Keywords:** Status epilepticus (SE); CSF: cerebrospinal fluid; IVAT: Intravenous anesthetic treatment.

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## Introduction

According to the epilepsy league (ILAE), SE is characterised by recurrent seizures lasting less than five minutes without the patient regaining consciousness. (1) Patients who continue to experience seizures despite receiving appropriate doses of benzodiazepines (first-line antiepileptics) and effective second-line antiepileptic drugs are classified as having status epilepticus, which is refractory (RSE). (2) If seizures persist or recur within 24 hours of anaesthesia, it is called super-refractory epilepsy (SRE). (3) Reports suggest that 4–12% of people with SE may eventually develop SRE, with in-hospital death rates as high as 40–50% (4).

In our intensive care unit, we identified three patients with SRE, characterised by the following criteria:

1. Status epilepticus that does not respond to first and second-line antiepileptic drugs provided in appropriate doses.
2. Seizures that occur without a clear acute cause, such as toxins, metabolic disturbances, or structural issues in patients who do not have pre-existing neurological disorders, including those with autoimmune or viral conditions. When the cause is not identified, it is “Cryptogenic NORSE”.

There are several possible etiologies, including paraneoplastic (a newly diagnosed tumour despite the presence of antibodies), autoimmune (presence of autoantibodies without a tumour), and infectious (identification of pathogens in cultures).

****CASE 1**:

An 18-year-old female presented with fever and seizures persisting for three days. During her episodes, she did not regain consciousness and had no prior experiences of seizures, headaches, or vomiting. Upon examination, she appeared lethargic and disoriented and was unable to recognise her surroundings or identify people. Testing revealed normal cranial nerve function and motor abilities, alongside negative neck rigidity tests. She had a temperature of 99°F and stable vital signs. Initial continuous EEG (cEEG) indicated bi-hemispheric dysfunction without epileptiform activity, while the second cEEG showed generalised electrographic seizures. Lumbar puncture results for CSF analysis indicated elevated protein levels and mild pleocytosis. Tests for meningoencephalitis, RIF MTB genetics, autoimmune diseases, and a paraneoplastic workup were all negative. Blood tests, including a complete hemogram, renal function, and electrolytes, remained normal, although mild hypocalcemia was noted and treated accordingly. All liver function tests and chest/abdominal CT scans were also normal. An MRI performed eight days later showed DWI/T2 hyperintense signals in both hippocampi, indicative of postictal changes. The patient was managed with benzodiazepines to control seizures, followed by antiepileptic medications. Due to persistent refractory status epilepticus, she was intubated, and IVAT was utilised at maximal doses, including midazolam, propofol, fentanyl, thiopentone, and ketamine, either alone or in combination during electrographic seizures monitored by cEEG. Burst suppression patterns were successfully established and maintained for 36 hours, followed by gradual tapering of the IVAT agents. Long-acting intravenous antiepileptic medications were concurrently administered. Treatment

included IV antibiotics, antiviral drugs, pyridoxine, steroids, immunoglobulins, and a ketogenic diet.

Due to her prolonged need for ventilator support, she underwent a tracheostomy. Despite receiving various treatments, she continued to experience clinical and electrographic seizures. After being treated with intravenous steroids and intravenous immunoglobulin, the plan was to start her on intravenous Rituximab. However, the initiation of this treatment was postponed due to the onset of a new fever. Unfortunately, she was lost to follow-up when she was transferred to a different medical centre. Ultimately, she succumbed to her illness after a 45-day hospital stay.

**CASE 2:**

A 20-year-old male presented with a 10-day history of headache, a mild fever lasting 4 days, and experienced seizure episodes during the first 2 days, followed by an additional 2-3 generalised tonic-clonic seizures (GTCS) that were managed with benzodiazepines and anti-epileptic drugs. On examination, he exhibited movement in all limbs, with pupils that were equal and reactive. He was lethargic but could be aroused with pain and responded to light stimuli. There was noticeable neck stiffness, and plantar responses were inconclusive. His body temperature was recorded at 99 degrees Fahrenheit, and his vital signs remained stable. Notably, he had no previous history of seizures or head trauma. The continuous electroencephalogram (cEEG) indicated bilateral hemisphere impairment, while the initial MRI of the brain appeared normal. Analysis of his cerebrospinal fluid (CSF) through lumbar puncture showed slight pleocytosis and elevated protein levels. The testing for various conditions, including meningoencephalitis, autoimmune and paraneoplastic syndromes, gene x-pert RIF for MTB, and serum MOG-NMOSD, returned negative results. Routine blood tests, including comprehensive hemograms and renal function assessments, were all within normal limits, and infectious studies excluded any infections. He was treated for existing hypocalcemia, and a follow-up brain MRI revealed no significant changes. The patient received empirical treatment with IV Acyclovir, which was discontinued due to the onset of acute renal impairment, and was managed with two sessions of hemodialysis. As his seizures were refractory, intubation became necessary, and he was started on an IV infusion of midazolam, subsequently combined with propofol, with CEEG monitoring in place. A mixture of midazolam and thiopental sodium was introduced to address right-sided focal epileptiform discharges, achieving burst suppression for 48 hours. Adjustments in anti-seizure medications were made based on his clinical response, with intravenous therapy administered in maximum tolerated doses. He underwent a treatment

regimen including antibiotics, antivirals, IV pyridoxine, IV methylprednisolone, a ketogenic diet, five cycles of plasmapheresis, and IV Rituximab, in that sequence. Extubation was successfully performed, though a tracheostomy was initially planned. Following extubation, he continued to experience focal seizures and showed altered sensorium. Monitoring of serum ammonia levels and phenobarbital from repeated liver function tests indicated normal values. After a hospital stay lasting 34 days, he was eventually discharged.

**CASE 3:**

A 57-year-old woman with fever, muscle aches, decreased urine output for three days, and altered mental status- she responded to deep, painful stimuli but did not follow instructions- was admitted to our hospital. Her pupils were uniform and sensitive to light. On examination, she had neck stiffness and uncertain bilateral plantar responses. Her temperature was recorded at 100 degrees Fahrenheit, and her vital signs were stable. She had no history of head trauma or seizures. Given her critical neurological condition and the need to protect her airway, she was intubated. Laboratory tests showed metabolic acidosis, reduced urine output, and raised creatinine and blood urea nitrogen levels, which led to a nephrology consultation. Extended low-efficiency dialysis (SLED) was initiated. Forty-eight hours after admission, he presented with generalised seizures (GTCS), which were treated with benzodiazepines and antiepileptic drugs. Empiric treatment included intravenous acyclovir and doxycycline. Initially, her platelet count was low, and an MRI was not performed due to hemodynamic instability; however, a CT scan showed normal findings. When her platelet count improved, a lumbar puncture was performed, revealing an elevated lymphocyte count and elevated protein levels in the spinal fluid. Continuous electroencephalogram (CEEG) monitoring showed focal epileptiform discharges, while her initial CEEG showed signs of dysfunction in both hemispheres. Several diagnostic tests, including the Gene Xpert RIF TB test, a meningoencephalitis panel, and autoimmune and paraneoplastic workup, were negative. A complete blood count and additional tests showed an elevated creatinine and total count, with negative infectious agent cultures. Her low serum calcium was successfully corrected. A follow-up MRI showed diffusion restriction in both hippocampal regions. Due to persistent seizures that did not respond to treatment, intravenous anaesthetic therapy (IVAT) was administered with maximally tolerated doses of midazolam, propofol, fentanyl, thiopental, and ketamine, alone or in combination, under supervision. After successful seizure suppression and maintenance for 48 hours, the IVAT dose was gradually tapered. Tracheostomy was performed while she was in a coma, but her urine

output began to improve, eliminating the need for additional dialysis. She was treated with antibiotics, antivirals, antiepileptics, intravenous pyridoxine, and IV methylprednisolone. Focal seizures were controlled with clobazam. After 24 days of hospitalisation, she was transferred to a rehabilitation centre for continued neurological recovery, where she showed gradual improvement. The case was diagnosed as a possible infectious aetiology in the context of first refractory status epilepticus (NORSE).

**Discharge Outcome**: Two patients were discharged with scheduled follow-up appointments, and one patient died at an external facility. The typical length of stay in the intensive care unit was 28.66 days, and the total length of stay in hospital was 33.33 days on average. Complications during hospitalisation included one case of pneumonia (VAP), two cases of acute kidney injury requiring renal replacement therapy, one case of liver dysfunction, electrolyte imbalance (hypernatremia and calcium), two cases of sepsis, and two cases of critical illness neuromyopathy.

TABLES:

TABLE 1: HISTORY AND EVALUATION

| **patient** | **Age/gender** | **Prodrome** | **Initial blood tests** | **CSF analysis** | **Brain imaging** | **EEG** | **Other investigations** | **Other imaging** | **Cause** |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 18/f | Fever | Low blood calcium | RBC-2 cells/cumm, lymphocytes 99%, neutrophils 1%, and cells 10/cumm. Glucose: 67 mg/dl, protein 81 mg/dl. | Hyperintense DWI/T2 signals, including both hippocampi | Bi-hemisphere dysfunction was present in the initial cEEG, and generalised electrographic seizures were seen in the subsequent CEEG | 1. Panel for meningoencephalitis, paraneoplastic, and autoimmune diseases: negative | CT abdomen and<br><br>CT chest: | Unknown |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | 2. Normal initial CBC, RFT, and LFT<br><br>3. Infectious workup: negative (dengue spot, malaria antigen, Leptospira IgM, and Weil-Felix Ig M ) | Normal | |
| 2 | 20/m | Fever, headache | Low serum calcium | Protein and glucose levels were normal; there were 7%/cumm cells with 99% lymphocytes and 1% neutrophils. | DWI/T2 hyper-intense signals<br><br>?hyperoxygenation status | Initial cEEG-bihemispheric dysfunction,<br><br>Followed by multifocal epileptiform discharges | 1. Panel for Autoimmune, paraneoplastic, and meningoencephalitis: negative<br><br>2. Initial CBC, RFT, LFT: Normal<br><br>3.Infective workup-(dengue spot, Malaria Antigen,Leptospira IgM, Weil felix Ig M): negative | CT abdomen and<br><br>CT chest:<br><br>Normal | Unknown |
| 3 | 57/f | Fever, myalgia, altered sensorium | Low serum calcium | CSF-72 cells/cumm, mainly lymphocytes, proteins 119mg/dl | First CT brain: normal | First cEEG-bihemispheric dysfunction, | 1. Panel for Autoimmune, paraneoplastic, and meningoencephalitis: negative. | CT KUB: Normal | |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | MRI: diffusion restriction involving bilateral hippocampi, bilateral frontoparietal and temporal occipital white matter, left hemipons, symmetric involvement of b/l internal capsule, middle cerebellar peduncle. | Subsequent had focal epileptiform discharges | 2. Initial CBC-TC-14,400x$10^6$/microlitre<br><br>Creatinine:4.2mg/dl<br><br>BUN: 77mg/dl<br><br>LFT: total bilirubin 1.9mg/dl<br><br>SGOT/SGPT:64/55<br><br>3. Infective workup-negative for dengue spot, Malaria Antigen, Leptospira IgM, Weil felix Ig | | |

TABLE 2: DRUGS USED

| patient | First-line agents | Traditional AEDs | IV Anaesthetics | Comments regarding anaesthetics | First-line immunotherapy | 2nd line immunotherapy |
|---|---|---|---|---|---|---|
| **1.** | IV midazolam (up to 15 mg/hr) and lorazapam (4 mg) | Na valproate, topiramate, clobazam, perampanel, lacosamide, levetiracetam, phenobarbitone, and fosphenytoin | Propofol (200mg/hr), thiopentone (up to 300 mg/hr), fentanyl (up to 300ug/kg/h), Ketamine (300 mg/hr) | Clinical and EEG seizures were minimal with thiopentone, but prolonged weaning and hypernatremia | a long tapering course of steroids, IVIG | Did not receive given high-grade fever |

| | | | | | | |
|---|---|---|---|---|---|---|
| | | | | were of concern. | | |
| **2.** | IV Lorazepam 4mg, Infusion of midazolam (up to 15mg/hr) | fosphenytoin, levetiracetam, phenobarbitone, Na valproate, topiramate, clobazam, perampanel and lacosamide) | Propofol (150 mg/hr), thiopentone (up to 300 mg/hr), fentanyl (up to 300ug/kg/h) | | a long tapering course of steroids, Plasmapheresis. | Rituximab 1000 mg infusion during the 2nd week of hospital stay, and was repeated after two weeks. |
| **3.** | IV Lorazepam 4mg, Infusion of midazolam (up to 5mg/hr | fosphenytoin, levetiracetam, Na valproate, clobazam, and lacosamide) | Propofol (100 mg/hr), thiopentone (up to 100 mg/hr), fentanyl (up to 200ug/kg/h) | Clinical and EEG seizures were minimal with thiopentone, but prolonged weaning and hypernatremia were of concern. | a long tapering course of steroids, SLED | |

## DISCUSSION:

New-onset refractory status epilepticus (NORSE) refers to cases of status epilepticus with no preceding history of epilepsy, where the underlying cause remains elusive even after initial investigations. This rare neurological condition presents significant long-term morbidity and mortality. A notable number of patients develop status epilepticus after unsuccessfully undergoing multiple anaesthetic treatments. The mortality rate for adults ranges from 16% to 27%. Many of the survivors eventually require antiepileptic medications, leading to the necessity of long-term monitoring and potential cognitive and functional impairments. Poor prognosis in older individuals is often associated with prolonged critical care unit stays, suboptimal clinical outcomes, extended barbiturate-induced comas, and the administration of multiple anaesthetic agents. It is critical to perform viral testing for pathogens such as enterovirus and HSV-1 in affected patients. (5) While the most common finding remains autoimmune or paraneoplastic encephalitis, the cause of NORSE is still not fully understood despite extensive research. (6) Although lymphocytosis may be present in the cerebrospinal fluid, with various abnormalities, and negative results in electroencephalograms and neuroimaging, no specific aetiology has been identified. NORSE typically manifests in childhood, with many affected individuals, particularly women, lacking any historical seizures or neurological disorders. (7) According to research conducted by Costello, the average duration of NORSE spans 36 days, with individual cases ranging from 6 to 68 days. (7). In the cases discussed, seizure activity persisted for an average of 29.33 days.

Treatment approaches often involve intravenous anaesthetics and antiepileptic drugs, either alone or in combination. For patients whose seizures remain uncontrolled, therapies such as intravenous ketamine and inhalational anaesthetics may be indicated.

Current practice favours the use of intravenous midazolam and propofol over longer-acting agents like pentobarbital, which can cause cardiovascular complications and necessitate extended ventilation periods.

Propofol infusion can lead to Propofol Infusion Syndrome (PRIS), which has higher death rates and problems compared to midazolam and ketamine, especially at excessive doses over prolonged periods. Careful monitoring is essential during its use (8).

Anti-NMDA type of encephalitis is a common form of autoimmune encephalitis, primarily affecting women, and often starts with fever-like symptoms in adolescents.

Cryptogenic NORSE patients typically present with early-onset status epilepticus (SE), lengthy illness durations, lack of overt behavioural symptoms, reliance on ventilators, and poor clinical outcomes (9). Continuous anaesthetic administration is vital for managing refractory status epilepticus to effectively suppress seizures. Current guidelines recommend maintaining intravenous anaesthetic therapy for 24 to 48 hours before attempting to alleviate seizures or terminate a coma episode.

**Dosage Protocols**: -

*Midazolam:* Initial loading dose of 0.2 mg/kg IV, followed by a continuous infusion of 0.05 to 2 mg/kg/hour.

*Propofol:* Administer 2 mg/kg IV bolus, followed by a maintenance infusion of 20 to 250 µg/kg/min.

*Pentobarbital*: Start with a 5 mg/kg IV bolus, then a continuous infusion of 1 to 10 mg/kg/hour.

*Ketamine:* Begin with a loading dose of 0.5-4 mg/kg, followed by maintenance infusion of 0.3 to 5 mg/kg/hour.

The first-line options for immunotherapy are steroids, intravenous immunoglobulins, and plasmapheresis. For second-line treatment, effective alternatives include anakinra, cyclophosphamide, rituximab, and tacrolimus.

Notably, immunotherapy has shown potential in enhancing seizure control and improving outcomes in adult patients. (9)

In our cases, all subjects were healthy adults with a history of febrile illness preceding the onset of seizures and no prior neurological conditions. Due to the resistance of seizures to initial therapeutic approaches, intravenous anaesthetics and other antiepileptic medications were necessary interventions. Although these measures successfully reduced seizure frequency, improvement in sensorium was not observed. All patients suspected of having meningoencephalitis received antibiotics upon presentation. In the event of a suspected autoimmune aetiology and lack of response to initial treatment, anti-inflammatory drugs were administered.

For all three cases, intravenous pulse-dose methylprednisolone was given over five days as prophylaxis. Plasmapheresis (PLEX) was utilised for one patient, and intravenous immunoglobulins were administered for another. Intravenous anaesthetic therapy was maximised based on clinical response to achieve sufficient burst suppression. After achieving seizure control through burst suppression, attempts to reduce intravenous anaesthetic therapy typically begin within 24 to 48 hours. (10)(11).

However, if seizures persist, frequency adjustments may be dictated by continuous EEG data and/or adverse effects experienced by the patient. Antiepileptic medications are tailored based on clinical requirements, often employing various combinations including phenytoin, levetiracetam, phenobarbital, valproate, and topiramate, along with adjuncts such as clonazepam, clobazam, perampanel, and lacosamide.

Brain MRI may reveal DWI/T2 hyperintensities similar to those seen in infections, inflammation, or traumatic brain injury. Additionally, cerebrospinal fluid evaluations may show moderate pleocytosis, potentially due to encephalitis or ictal events. In our instance, initial continuous EEG findings indicated bi-hemispheric dysfunction with status epilepticus, followed by gradual focal epileptiform discharges in two cases and generalised discharges in one.

In our situation, there were no immunological conditions such as vascular illnesses, neoplasms, paraneoplastic, metabolic disorders, or diseases brought on by toxins.

One patient experienced a clinical response with seizure control while taking multiple AEDs, however, the second patient passed away from sepsis at a different facility.

Infections (e.g., pneumonia, urine infections), cardiac issues (such as hypotension requiring vasopressors and arrhythmias), digestive tract complications (including hepatic dysfunction and gastric ulcers), hematological disorders (like anemia and thrombocytopenia), electrolyte imbalances (such as hyponatremia and metabolic acidosis), and gastrointestinal

complications are commonly linked to prolonged intravenous anesthesia therapy (IVAT) used to induce burst suppression coma. (11)

In addition to long-acting conventional AEDs, our patients received infusions of midazolam, propofol, thiopental, and ketamine, and two of them reported fewer seizures.

Although there is ongoing debate on which endpoints should be titrated and interictal pattern control, these findings highlight the necessity of thorough monitoring in the form of continuous electroencephalography (CEEG) in the intensive care unit to prevent IVAT side effects.

There are non-pharmacological treatments for status epilepticus (SE), especially first-onset refractory status epilepticus (NORSE). Vagal Nerve Stimulation (VNS), deep brain stimulation (DBS), and electroconvulsive therapy (ECT) provide effective alternatives when medications fail to work. Developing human-based research models is crucial for understanding SE and testing new therapies. Global collaboration on diagnostic criteria, treatment guidelines, and biorepositories is essential. Although emerging evidence suggests immune system abnormalities in NORSE, small studies limit broader conclusions. Further research into immune markers and larger studies are needed to improve understanding and treatment. (12)

**Conclusion:**

New- refractory status epilepticus (NORSE) is a rare condition with no known cause, and about half of the cases are cryptogenic, leading to diagnostic challenges and the need for varied therapeutic strategies. It has high mortality rates and can cause long-term neurological impairments. Implementing active treatment, including adjustments of intravenous anaesthesia therapy (IVAT) with continuous electroencephalogram (cEEG) monitoring, can reduce side effects and improve outcomes. Collaboration between neurology and immunology is vital, with future efforts focusing on understanding the neurobiology and identifying effective therapies.

**References**

[1] Trinka E, Cock H, Hesdorffer D, Rossetti AO, Scheffer IE, Shinnar S, Shorvon S, Lowenstein DH. A definition and classification of status epilepticus--Report of the ILAE Task Force on Classification of Status Epilepticus. Epilepsia. 2015 Oct;56(10):1515-23. [PubMed]

[2] Brophy GM, Bell R, Claassen J, Alldredge B, Bleck TP, Glauser T, Laroche SM, Riviello JJ, Shutter L, Sperling MR, Treiman DM, Vespa PM., Neurocritical Care Society Status Epilepticus Guideline Writing Committee. Guidelines for the evaluation and management of status epilepticus. Neurocrit Care. 2012 Aug;17(1):3-23. [PubMed]

[3] Shorvon S, Ferlisi M. The treatment of super-refractory status epilepticus: a critical review of available therapies and a clinical treatment protocol. Brain. 2011 Oct;134(Pt 10):2802-18. [PubMed]

[4] Strzelczyk A, Ansorge S, Hapfelmeier J, Bonthapally V, Erder MH, Rosenow F. Costs, length of stay, and mortality of super-refractory status epilepticus: A population-based study from Germany. Epilepsia. 2017 Sep;58(9):1533-1541. [PubMed]

[5] Gaspard N, Foreman BP, Alvarez V, Cabrera Kang C, Probasco JC, Jongeling AC, Meyers E, Espinera A, Haas KF, Schmitt SE, Gerard EE, Gofton T, Kaplan PW, Lee JW, Legros B, Szaflarski JP, Westover BM, LaRoche SM, Hirsch LJ., Critical Care EEG Monitoring Research Consortium (CCEMRC). New-onset refractory status epilepticus: Aetiology, clinical features, and outcome. Neurology. 2015 Nov 03;85(18):1604-13. [PMC free article] [PubMed]

[6] Rossetti AO, Milligan TA, Vulliémoz S, Michaelides C, Bertschi M, Lee JW. A randomised trial for the treatment of refractory status epilepticus. Neurocrit Care. 2011 Feb;14(1):4-10. [PubMed]

[7] Costello DJ, Kilbride RD, Cole AJ. Cryptogenic new-onset refractory status epilepticus (NORSE) in adults—infectious or not? J Neurol Sci 2009;2013:26 31 [PubMed] [Google Scholar] [Ref list]

[8] Murthy JMK. Refractory status epilepticus. Neurol India 2006;2013:354 58 [PubMed] [Google Scholar] [Ref list]

[9] Iizuka T, Kanazawa N, Kaneko J, Tominaga N, Nonoda Y, Hara A, Onozawa Y, Asari H, Hata T, Kaneko J, Yoshida K, Sugiura Y, Ugawa Y, Watanabe M, Tomita H, Kosakai A, Kaneko A, Ishima D, Kitamura E, Nishiyama K. Cryptogenic NORSE: Its distinctive clinical features and response to immunotherapy. Neurol Neuroimmunol Neuroinflamm. 2017 Nov;4(6):e396. [PMC free article] [PubMed]

[10] Bhatia K, De Jesus O. New Onset Refractory Status Epilepticus. [Updated 2023 Aug 23]. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2023 Jan-. Available from: https://www.ncbi.nlm.nih.gov/books/NBK567765/

[11] Nakamura T., Igarashi H., Ito T., Jensen R.T.: Important of case-reports/series, in rare diseases: using neuroendocrine tumors as an example. World J Clin Cases 2014; 2: pp. 608-613.

[12] Champsas Dimitrios, Zhang Xushuo, Rosch Richard, Ioannidou Evangelia, Gilmour Kimberly, Cooray Gerald, Woodhall Gavin, Pujar Suresh, Kaliakatsos Marios, Wright Sukhvir K.: NORSE/FIRES: how can we advance our understanding of this devastating condition?: Frontiers in Neurology: 2024;15

URL=https://www.frontiersin.org/journals/neurology/articles/10.3389/fneur.2024.1426051

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