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Review Article

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Stroke mimics: A review

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Abstract

Acute ischemic stroke is a time-sensitive emergency requiring rapid accurate diagnosis and treatment. Stroke Mimic (SM) is a noncerebrovascular condition that presents with acute focal neurological deficts and masquerades as a real stroke. SMs account for 20-40% of stroke presentations in the emergency department. The purpose of this review is to make a summary of SMs, so that clinicians, especially emergency physicians, can improve their knowledges and make accurate diagnoses and treatment.

Keywords: Stroke mimic; Misdiagnosis; Emergency; Focal neurological deficit.

Abbreviations: SM: Stroke Mimic; AIS: Acute Ischemic Stroke; CT: Computed Tomography; CTP: Computed Tomography Perfusion; MA: Migrainous Aura; FSM: Functional Stroke Mimic; MIDS: Mitochondrial Disorders; HFNS: Hypoglycemia With Focal Neurological Signs; CVST: Cerebral Venous Sinus Thrombosis; HSV-1: Herpes Simplex Virus-1; GBS: Guillain-Barre Syndrome; CIE: Contrast-Induced Encephalopathy; MIE: Metronidazole Induced Encephalopathy.

Introduction

Stroke is the second leading cause of disability and death globally. 87% of them are ischemic strokes [1]. Acute Ischemic Stroke (AIS) is a time-sensitive emergency that requires accurate diagnosis promptly [2]. Rapid treatment of AIS improves outcomes [3,4]. Early alteplase adiministration is recommended for patients within 3 hours of onset of AIS [4,5]. However accurate early recognition and diagnosis is extremely challenging. Stroke Mimic (SM) is a noncerebrovasbular condition that presents with acute focal neurological deficts and masquerades as a real stroke. They account for 20-40% of stroke presentations in the emergency department [3]. Although in most previous studies low risk of complication has been conferred and the overall risk of hemorrhagic complications is low when thrombolysis was used in a SM, unnecessary administration of alteplase may result in patient harm for some individuals [6,7]. Besides, it can not only add needless expense and radiation and contrast exposure from Computed Tomography (CT) but also lead to delayed and inappropriate management. The purpose of this review is to make a summary of SMs, so that clinicians, especially emergency physicians, can improve their knowledges and make accurate diagnoses and treatment.

Seizure

Some studies show that seizure was the most common causes of SMs, acounting for 17-28.5% [6,8,9], and could also be one of the initial manifestations of acute stroke [7]. It is frequently difficult to make a accurate diagnosis of seizure immediately. TODD's paralysis after convulsive seizures can mimic stroke especially when there is no history of epilepsy [10]. Additionally, it is easily neglected that isolated speech impairment is also a challenging clinical manifestations of SM because it is very rare among adult-onset epilepsy [11,12]. A retrospective study of 72 patients with sudden onset of aphasia admitted for a suspected stroke, done by Polverino P et al, shows that 50 patients were diagnosed eventually as cerebrovascular etiology while 22 patients were diagnosed as epileptic SM [12]. Computed Tomography Perfusion (CTP) is a reliable tool to differentiate acute seizures from acute stroke [13]. A study shows that there were perfusion changes in over 25% SM patients who were diagnosed epilepsy eventually [7].

Migrainous Aura (MA)

The acute-onset of MA can be classified as SM [14]. Nearly 2% of all possible stroke patients evaluated emergently were diagnosed MA ultimately, and about 18% of all SM patients treated with intravenous thrombolysis were diagnosed MA finally [15]. A retrospective study that reviewed the 10-year medical records of patients treated with acute stroke management protocol shows as follows: Among those MA patients presenting with SM, Sensory and brainstem auras were the most common auras followed by motor, visual, and verbal deficits. These auras were difficult to differentiate from stroke sometimes [16]. CTP and susceptibility-weighted imaging may be useful to distinguish them [14,17]. A study shows that a novel CTP-based quantitative tool which used mean transit time, Cerebral blood flow, and cerebral blood volume parameters could be helpful to differentiate MA from AIS [18].

Functional neurological disorders

Functional neurological disorder which has also been defined as conversion disorders is a common SM [19]. A case of a SM patient who was treated with intravenous alteplase on four separate occasions in four different hospitals and was finally diagnosed as Functional Stroke Mimic (FSM) was reported by Liberman et al [20]. Compared with stroke, FSMs were younger, showed a higher prevalence among female, had a lower socioeconomic status, received less education, were more frequent in developing countries, and presented more with weakness/numbness but less with reduction of consciousness or verbal deficits [21,22]. FSMs often present with dramatic physical signs and symptoms [23]. Hoover's sign was very specific for the diagnosis of functional weakness [24].

Metabolic diseases

Some metabolic diseases can mimic stroke. Mitochondrial Disorders (MIDs) can present SM in both clinical manifestations and imagings. Of various MIDs, particularly of mitochondrial encephalopathy, lactic acidosis, and stroke- like episode syndrome, stroke-like episodes are a common phenotypic feature and stroke-like lesions are a unique feature which can change their appearance over time [25,26].

Hypoglycemia with Focal Neurological Signs (HFNS) in patients with diabetes mellitus, especially type 1 can be SM [27]. Because it may also display a hyperintense lesion by DWI with decreased values on the ADC map, it is hard to be distinguished from AIS. Disproportionally small lesson in contrast to neurological signs may be helpful for differentiation [28]. Glucose correction treatment can be effective [29]. CTP might be helpful to discriminate HFNS from AIS, but further evidence is still needed [27]. Hyperosmolar hyperglycemic state which is a life-threatening complication of type 2 diabetes can also mimic strokes for the reason that it often presents with neurological symptoms [30]. Early CT and/or MRI can be useful in such circumstance. Nonketotic hyperglycemia-associated chorea can be misdiagnosed as stroke and it can give a hemorrhagic stroke alert because of false-positive interpretation of CT [31]. It is recommended that MIDs such as hypoglycemia should be taken into consideration in all suspected patients no matter whether they are known to have diabetes or not [32].

Vascular diseases

Vascular diseases may mimic stroke sometimes. Cerebral Venous Sinus Thrombosis (CVST) can present with stroke-like syndrome [33]. Patients with CVST have a higher risk of thrombolysis-related intracranial hemorrhage compared to other SMs [34]. Diagnosis is often delayed due to its nonspecific clinical manifestations [35]. MRV venography, CT venography, and DSA is useful for the confirmation of the diagnosis of CVST [36].

Some special diseases can mimic stroke such as intracranial idiopathic acute epidural hematoma [37], spinal epidural hematoma [38-40], and aortic dissection [41,42]. But intravenous thrombolysis can lead to disastering result for these diseases. Besides, some case reports show that internal carotid artery dissection [43], basilar artery aneurysm [44], Squamous cell carcinoma of the neck [45], and acute thrombotic occlusion of subclavian artery can also mimic stroke.

Infections

Infections can play a role in the pathogenesis of stroke in some circumstances probably by triggering a latent pro-thrombotic state or damaging the vascular endothelium. They can also occur as stroke-like syndromes which may be hard to make a correct diagnosis immediately. Treatment of stroke or stroke-like syndromes of infectious origin with alteplase administration can be related to a higher hemorrhagic risk and a more extension of the ischemic lesion [46]. Herpes Simplex Virus-1 (HSV-1) encephalitis can mimic stroke when it occasionally shows the development of unilateral brain MRI lesions with extensive cytotoxic edema [47]. Detection of HSV-1 DNA in the cerebrospinal fluid can confirm its diagnosis. Additionally, varicella zoster meningitis [48], tick-borne encephalitis [49], and cephalic tetanus can mimic stroke according to some case reports.

Creutzfeldt-Jakob disease is a rare fatal human prion diseaseand its annual incidence is about one per million [50,51]. It has various initial symptoms and may mimic a stroke during its early stage [52]. But it is characterized by rapidly progressive dementia and neurologic degeneration that is often followed by behavior disorders, ataxia, myoclonus, and akinetic mutism [50,52]. Parasitic encephalopathy may present as SM and initial brain CT scan may suggest AIS sometimes. But personal history, parasitic serology, MRI, and antiparasitic treatment can be helpful in differentiation [53]. In addition, Streptococcal pneumoniae meningitis secondary to acute mastoiditis, Escherichia coli meningitis, and Pseudomonas meningoencephalitis had also been reported mimicking stroke in the previous literatures [54-56]. COVID-19 infection may present as a stroke, also it can mimic a stroke even there is no respiratory syndrome at all [57-60]. Detection of SARS-CoV-2 in Cerebrospinal Fluid is important in such circumstances. HIV type 1 infection may also mimic SM sometimes [61].

Immune diseases

A retrospective study shows that there were 6 cases presenting with hemiparesis/stroke-like episodes among 24 patients diagnosed as Anti-N-methyl-D-aspartate encephalitis [62]. Guillain-Barre Syndrome (GBS) is characterized by symmetrical limb weakness and are flexia, but it can have various initial manifestations some of which may mimic stroke [63]. Miller-Fisher syndrome, is a variant of GBS. Triads of ataxia, are flexia and ophthalmoplegia are its characteristic features which may

mimic posterior circulation stroke [64,65]. Susac's syndrome is characterized mainly by encephalopathy, hearing loss and branch retinal artery occlusions. However its initial stroke-like symptoms may be not the aforementioned feature [66]. Myasthenia graves may mimic stroke, but it has the characteristics of atigability and diurnal variation [67-69]. Besides, fulminant inflammatory demyelination and anti-MOG antibody-associated disorder can mimic stroke sometimes [70,71].

Malignant tumors

Brain malignant tumors may mimic stroke sometimes while they are absolute contraindication for thrombolysis therapy [72,73]. They are rarely seen on a brain non contrast CT scan. The mismatch between neurologic examination and CTP may suggest a SM in some cases [5]. Intravascular large B-cell lymphoma may mimic stroke [74]. It is difficult to be diagnosed when it is limited to the central nervous system. Biopsy can confirm the diagnosis [75].

Toxicity, and medication side effects

Since alcohol intake is one of the risk factors for stroke [76], it's difficult to differentiate acute alcohol toxicity from stroke sometimes. Alcohol toxicity can mimic a posterior stroke because they have the similar symptoms such as dysarthria, gait disturbance and nystagmus. A prospective observational single-center study shows that of all patients presenting as suspected stroke, 6% also drank alcohol, 1% was diagnosed as acute alcohol toxicity (accounting for 7% of the SMs) [77].

Contrast-Induced Encephalopathy (CIE) may present as SM clinically and subarachnoid hemorrhage radiologically [78-81]. CTP and EEG may be helpful in the differentiation between CIE related SMs and stroke [79].

Toxicity of lamotrigine which is a antiseizure medication may mimic stroke because it can share symptoms such as vertigo, ataxia and diplopia with posterior circulation stroke. Concentration of it is an effective way to reduce the risk of misdiagnosis [81].

Methotrexate encephalopathy can present with stroke-like symptoms. But the rapid reversal of MR abnormalities in parallel with neurological symptoms contribute to its diagnosis [83,84]. Metronidazole Induced Encephalopathy (MIE) can also mimic stroke. It has the clinical features of cerebellar dysfunction, altered mental status and extrapyramidal symptoms [85]. The classical manifestations of MIE on MR are as follows: the splenium of the corpus callosumas shows T2 hyperintensity and the dentate nucleus and/or brainstem shows symmetric T2 lesions [86].

Toxicity of some other medications such as 5-Fluorouracil [87], anesthetic and transdermal scopolamine exposures [88,89], and acetazolamide may mimic stroke according the published literatures [90]. Bismuth-related acute neurotoxicity can lead to SMs as well as toxicity of Stramonium, tetrahydrocannabinol edible ingestion, abuse of nitrous oxide and so forth [91-94].

It is of great importance to take a careful medical history, alcohol history, medication history, occupational history and exposure history so as to diagnose such patients correctly.

Hereditary diseases

It has been reported that some types of Charcot-Marie-Tooth could present as SMs [95,96]. So it is essential to make a careful family history assessment, physical examination, nerve conduction studies, MRIs and genetic testing in order to make a accurate early diagnosis. Other cases of unusual hereditary diseases such as hereditary angioo-edema with C1 inhibitor deficiency type I, and atypical glutaric aciduria type I have also been reported [97,98].

Other diseases

Various cerebral diseases can present as SMs. It has been reported that posterior reversible encephalopathy syndrome, central pontine myelinolysis, grey matter heterotopia, and cerebral lymphomatoid granulomatosis can mimic stroke. The clinical features of Parkinson's disease are usually asymmetrical at presentation and so it can be misdiagnosed as stroke initially [99-103]. Meningioma can also mimic a stroke when it compresses the premotor cortex [104].

Some neurologic symptoms caused by many diseases such as thyrotoxic hypokalemic periodic paralysis, hepatic encephalopathy, paraneoplastic cerebellar degeneration, and transient headache, neurological deficits and lymphocytic pleocytosis in the cerebrospinal fluid can mimic stroke sometimes [105-108].

Conclusion and prognosis

Not all focal neurological deficits are strokes actually. SM should be considered in the differential diagnoses of AIS with atypical presentation even in fast-paced settings. The range of SM diagnoses, unclear differentiating clinical features and the short treatment window for AIS bring many challenges for early identification. It is vital to be alert to SMs. Further studies on refining triage and transport of suspected acute stroke may be useful. It is hopeful to reduce the misdiagnoses of stroke by extensive knowledge of brain vascular anatomy, differential diagnoses for stroke, detailed collection of medical history, careful physical examination, and comprehensive evaluation of suspected manifestations. Special techniques of assistant examination methods, and development of effective tools to predict SM are also expected in the future.

References

1. Saini V, Guada L, Yavagal DR. Global epidemiology of stroke and access to acute ischemic stroke interventions. Neurology. 2021; 97: S6-S1.
2. Tu TM, Tan GZ, Saffari SE, et al. External validation of stroke mimic prediction scales in the emergency department. BMC Neurol. 2020; 20: 269.
3. Shaw L, Graziadio S, Lendrem C, et al. Purines for Rapid Identification of Stroke Mimics (PRISM): study protocol for a diagnostic accuracy study. Diagn Prong Res. 2021; 5: 11.
4. Albright D, Alunday R, Schaller E, et al. Evaluating target: Stroke guideline implementation on assessment and treatment times for patients with suspected stroke. AM J Emerg Med. 2021; 42: 143-149.
5. Lin YL, Ho SW, Liu LJ. Non-contrast-enhancing glioma mimicking acute ischemic stroke with in three hours of on set. Ann Emerg Med. 2021; 78: 682-685.
6. Chtaou N, Bouchal S, Midaoui AEL, et al. Stroke mimics: experience of a Moroccan stroke unit. J Stroke Cerebrovasc. 2020; 29: 104651.
7. Kim SJ, Kim DW, Kim HY, et al. Seizure in code stroke: Stroke mimic and initial manifestation of stroke. Am J Emerg Med.

2019; 37: 1871-1875.

8. Sundar K, Panwar A, Bhirud L, et al. Changing demographics of stroke mimics in present day stroke code era: need of a streamlined clinical assessment for emergency physicians. J Neurosci Rural Pra. 2021; 12: 550-554.

9. Tunnage B, Woodhouse LJ, Dixon M, et al. Pre-hospital transdermal glyceryl trinitrate in patients with stroke mimics: data from the RIGHT-2 randomised-controlled ambulance trial. BMC Emerg Med. 2022; 22: 2.

10. Order H. Todd's paralysis: A crucial entity masquerading stroke in the emergency department. J Emerg Med. 2017; 52: e153-e155.

11. Manganotti P, Furlongs G, Ajcevic M, et al. CT perfusion and EEG patterns in patients with acute isolated aphasia in seizure-related stroke mimics. Seizure-Eur J Epilep. 2019; 71: 110-115.

12. Polverino P, Caruso P, Ridolfi M, et al. Acute isolated aphasia as a challenging symptom in the emergency setting: predictors of epileptic mimic versus ischemic stroke. J Clin Neurosci. 2019; 67: 129-133.

13. Khoo CS, Kim SE, LEE BI, et al. Characteristics of perfusion computed tomography imaging in patients with seizures mimicking acute stroke. Eur Neurol. 2020; 83: 56-64.

14. Ridolfi M, Granao A, Polverino P, et al. Migrainous aura as stroke-mimic: The role of perfusion-computed tomography. Clin Neurol Neurosur. 2018; 166: 131- 135.

15. Otlivanchik O, Liberman AL. Migraine as a stroke mimic and as a stroke chameleon. Curr Pain Headache R. 2019; 23: 63.

16. Park JJ, Kim SJ, Kim HY, et al. Migraine with aura as a stroke mimic. Can J Neurol Sci, 2020; 47: 242- 244.

17. Miller C, Goldberg MF. Susceptibility-weighted imaging and computed tomography perfusion abnormalities in diagnosis of classic migraine. Emerg Radiol. 2012; 19: 565-569.

18. Granato A, D'Acunto L, Ajcevic M, et al. A novel computed tomography perfusion-based quantitative tool for evaluation of perfusional abnormalities in migrainous aura stroke mimic. Neurol Sci. 2020; 41: 3321-3328.

19. Popkirov S, Stone J, Buchan AM. Functional neurological disorder: A common and treatable stroke mimic. Stroke. 2020; 51: 1629-1635.

20. Liverman AL, Antoniello D, Tversky S, et al. Multiple administrations of intravenous thrombolytic therapy to a stroke mimic. J Emerg Med. 2020; 58: e133-e136.

21. Jones AT, O'Connell NK, David AS. Epidemiology of functional stroke mimic patients: A systematic review and meta-analysis. Eur J Neurol. 2020; 27: 18-26.

22. Serinken M, Karcioglu O. Patients with acute stroke presenting like conversion disorder. Prehosp Disaster Med. 2018; 33: 451-453.

23. Tobago PS, Wang HE, McCausland JB, et al. A case of conversion disorder presenting as a severe acute stroke. J Emerg Med. 2006; 30: 283-286.

24. McWhirter L, Stone J, Sandercock P, et al. Hoover's sign for the diagnosis of functional weakness: A prospective unblinded cohort study in patients with suspected stroke. J Psychosom Res. 2011; 71: 384-386.

25. Finsterer J, Aliyev R. Metabolic stroke or stroke-like lesion: Peculiarities of a phenomenon. J Neurol Sci. 2020; 412: 116726.

26. Finsterer J. Knowledge about the characteristics of stroke-like lesions is expandable. Metab Brain Dis. 2021; 36: 1697-1698.

27. Sartor-Pfeiffer J, Lingel M, Stefanou MI, et al. Regional computed tomography perfusion deficits in patients with hypoglycemia: Two case reports. Neurol Res Pract. 2022; 4: 36.

28. Ohshita T, Imamura E, Nomura E, et al. Hypoglycemia with focal neurological signs as stroke mimic: Clinical and neuroradiological characteristics. J Neurol Sci. 2015; 353: 98-101.

29. Sharma M, Menon B, Manam G. Hypoglycemic hemiparesis as stroke mimic with transient splenial lesion and internal capsule involvement: A reversible clinico-radiological concurrence. J Postgrad Med. 2022; 68: 109-111.

30. Marren SM, Beale A, Ylin GS. Hyperosmolar hyperglycaemic state as a stroke cause or stroke mimic: an illustrative case and review of literature. Clin Med. 2022; 22: 83-86.

31. Nassal M, San Miguel C. Level 1 hyperglycemia alert: A case report. Clinical Practice Cases Emerg Med. 2022; 6: 216- 219.

32. Wareing W, Ho B, Ewins D, et al. Reactive hypoglycaemia: A rarely considered 'stroke mimic' in non-diabetic individuals. BMJ Case Rep. 2018.

33. Engelmann A, Di Pastina K, Liu T. The ugly duckling of aphasia: Cerebral venous sinus thrombosis as a mimic of TIA and stroke. J Community Hosp Intern Med Prospect. 2021; 11: 156-157.

34. Lin PY, Chen YC, Sun YT. Cerebral venous thrombosis mimicking acute ischemic stroke in the emergency assessment of thrombolysis eligibility: Learning from a misdiagnosed case. Acta Neurol Taiwan. s2021; 30: 155-161.

35. Penailillo E, Bravo-Grau S, Plaza N, et al. Cerebral venous thrombosis: Review of diagnosis, follow-up, late complications and potential pitfalls. Curr Probl Diagn Rad. 2021; 50: 725-733.

36. Ferro JM, Bossier MG, Canhao P, et al. European Stroke Organization guideline for the diagnosis and treatment of cerebral venous thrombosis - endorsed by the European Academy of Neurology. Eur Stroke J. 2017; 2: 195-221.

37. Koketsu Y, Tanei T, Kate T, et al. Intracranial idiopathic acute epidural hematoma presenting with a stroke-like attack and rapid neurological deterioration: a case report. NMC Case Rep J. 2022; 9: 25-30.

38. Anatomi Y, Nakajima M, Yonehara T. Spinal epidural hematoma as a stroke mimic. J Stroke Cerebrovasc. 2020; 29: 105030.

39. Szeto CLC, Hui KF. Spontaneous spinal epidural hematoma mimicking stroke and its outcome post intravenous thrombolysis. Cerebrovasc Dis. 2022; 51: 265-269.

40. Romaniuc A, Maier S, Burin M, et al. Spontaneous spinal epidural haematoma mimicking acute ischaemic stroke: case report. Acta Neurol Belg. 2020; 120: 495-497.

41. Nedunchelian M, Patil SB, Kumar ES, et al. Aortic dissection masquerading as stroke. Neurol India. 2021; 69: 1129- 1130.

42. Pires JR, Teixeira M, Ferreira M, et al. Aortic dissection with haemothorax mimicking a stroke. Our J Case Intern Med. 2019; 6: 001277.

43. Simpson D, David O, Nasr F. An unusual presentation of dysarthria in a young patient, a stroke mimic. Acute Med. 2021; 20: 140-143.

44. Shrestha GS, Keyal N. Basilar artery aneurysm presenting as a stroke mimic. Neurol India. 2021; 69: 1434-1435.

45. Obinwanne V, Bauler L, Bergeon D, et al. Squamous cell carci-

noma of the neck: An unlikely stroke mimic. J Emerg Med. 2021; 61: e133-e136.

46. Pagliano P, Spera AM, Ascione T, et al. Infections causing stroke or stroke-like syndromes. Infection, 2020; 48: 323-332.

47. Kargiotis O, Oikonomi K, Geka A, et al. HSV-encephalitis resembling acute cerebral infarction in a patient with atrial fibrillation: Beware of stroke mimics. Neurologist. 2021; 27: 30-33.

48. Linda E, Campos F, Javaid S, et al. Stroke-like symptoms as presenting signs of varicella zoster meningitis in an immunocompetent adult. Cureus. 2022; 14: e22062.

49. Eleftheriou A, Lundin F, Petropoulos EA. Tick-borne encephalitis: Stroke-like presentation. J Stroke Cerebrovasc. 2019; 28: e119-e120.

50. Oliver M, Dyke L, Rico A, et al. Rapidly progressing sporadic Creutzfeldt-Jakob disease presenting as a stroke. Case Rep Neurol. 2018; 10: 261- 265.

51. Vakilian A, Fakir M, Farahmand H. Creutzfeldt-Jakob disease presenting with dementia and mimic a stroke during one year: Case report and review of literatures. Galen Alen Med J. 2019; 8: e1357.

52. Okamoto K, Abe T, Itoh Y. A case of Creutzfeldt-Jakob disease with stroke-like onset. J Stroke Cerebrovasc. 2020; 29: 104788.

53. Ghasemi R, Rowe A, Shah R, et al. Neurocysticercosis presenting as a 'Stroke Mimic'. Acute Med. 2016; 15: 79-83.

54. Mathern R, Calestino M. An unusual presentation of hemiparesis: Rapidly progressing Streptococcal pneumoniae meningitis secondary to acute mastoiditis. ID Cases. 2020; 21: e00831.

55. Lim J, Maggs C, Athan E. Unusual stroke mimic: A rare case of Escherichia coli meningitis. Intern Med J. 2021; 51: 1969-1970.

56. Williams CJ, Foote A, Choi P. Pseudomonas meningoencephalitis masquerading as a stroke in a patient on to cilizumab. BMJ Case Rep. 2019; 12.

57. Avula A, Nalleballe K, Narula N, et al. COVID-19 presenting as stroke. Brain Behav Immun. 2020; 87: 115-119.

58. Zuurbier SM, Verschelde HL, Vantyghem S, et al. Be aware: COVID-19 the new stroke mimicker. Acta Neurol Belg. 2021; 121: 309- 310.

59. Alam S, Dharia RH, Miller E, et al. Coronavirus positive patients presenting with stroke-like symptoms. J Stroke Cerebrovasc. 2021; 30: 105588.

60. Glavin D, Kelly D, Wood GK, et al. COVID-19 Encephalitis with SARS-CoV-2 detected in cerebrospinal fluid presenting as a stroke mimic. J Stroke Cerebrovasc. 2021; 30: 105915.

61. Finelli PF. Misdiagnosis of treatable stroke mimic: The case for HIV screening in practice guidelines. Neurohospitalist. 2013; 3: 190-193.

62. Gowda VK, Vignesh S, Natarajan B, et al. Anti-NMDAR encephalitis presenting as stroke-like episodes in children: A case series from a tertiary care referral centre from southern India. J Pediatr Neurosci. 2021; 16: 194-198.

63. Sun J, Gao Y, Chi L, et al. Case report: early-onset Guillain-Barre syndrome mimicking stroke. Front Neurol. 2021; 12: 525699.

64. De Castillo LLC, Diestro JDB, Ignacio KHD, et al. A rare mimic of acute stroke: rapidly progressing Miller-Fisher Syndrome to acute motor and sensory axonal neuropathy variant of Guillain-Barre syndrome. BMJ Case Rep. 2019; 12.

65. Kamarul Bahrin MH, Abidi SMA, Ling K, et al. Not all facial droops are stroke: Miller Fisher syndrome presenting as a stroke mimic. Cureus. 2020; 12: e9383.

66. Onat Demirci N, Hacimustafaoglu AM, Kenangil G, et al. Susac's syndrome as a rare arterial stroke mimic. Neuroradiol J. 2019; 32: 200-202.

67. Yamaguchi Y, Fujimoto T, Hayashi N, et al. A case of elderly-onset myasthenia gravis mimicking stroke with dysarthria and left upper extremity paresis. Rinse Shinkeigaku. 2021; 61: 234-238.

68. Patel HC, Hayward C, Manohar S. Myasthenia gravis as a 'stroke mimic'. Clin Med. 2015; 15: 212.

69. Shaik S, Ul-Haq MA, Emsley HC. Myasthenia gravis as a 'stroke mimic'--it's all in the history. Clin Med. 2014; 14: 640-642.

70. Sacco S, Callegari I, Canavero I, et al. Fulminant inflammatory demyelination presenting as stroke-in-evolution in an elderly subject. Brain Behave. 2021; 11: e01967.

71. Tutmaher MS, Chen DF, Hallman-Cooper J, et al. A stroke mimic: anti-MOG antibody-associated disorder presenting as acute hemiparesis. Pediatr Neurol. 2020; 108: 123- 125.

72. Andersen KK, Tybjerg AJ, Babore AD, et al. Occult primary brain cancers manifesting in the aftermath of ischaemic and haemorrhagic stroke. Eur Stroke J. 2020; 5: 237-244.

73. Powers WJ, Rabinstein AA, Ackerson T, et al. 2018 guidelines for the early management of patients with acute ischemic stroke: A guideline for healthcare professionals from the American Heart Association/American Stroke Association. Stroke. 2018; 49: e46-e110.

74. Rota E, Pitino A, Pastorino R, et al. Intravascular large B-cell lymphoma: A forgotten stroke "mimic". Acta Neurol Belg. 2020; 120: 745-746.

75. Wu M, Lin Y, Huang X, et al. Intra vascular large B-cell lymphoma presenting as rapidly progressive dementia and stroke: A case report. MEDICINE. 2021; 100: e27996.

76. Smyth A, O'Donnell M, Rangarajan S, et al. Alcohol Intake as a Risk Factor for Acute Stroke: The INTERSTROKE Study. Neurology. 2022.

77. Hassing LT, Verschoof MA, Koppen H. Alcohol Intoxication as a Stroke Mimic and the Incidence of Acute Alcohol Intoxication in Stroke. J Stroke Cerebrovasc. 2019; 28: 104424.

78. Li J, Qi G, Zhang H, et al. Contrast-induced encephalopathy mimicking stroke after a second cerebral DSA: an unusual case report. BMC Neurol. 2021; 21: 430.

79. Furlongs G, Manganotti P, Ajcevic M, et al. CT Perfusion and EEG Patterns in Contrast-Induced Encephalopathy Stroke Mimic. Can J Neurol Sci. 2022; 49: 140-143.

80. Harada Y, Kairamkonda SR, Ilyas U, et al. Pearls & Oy-sters: Contrast-induced encephalopathy following coronary angiography: a rare stroke mimic. Neurology. 2020; 94: e2491-22494.

81. Deb-Chatterji M, Schafer L, Grzyska U, et al. Stroke-mimics: An acute brainstem syndrome after intravenous contrast medium application as a rare cause of contrast-induced neurotoxicity. Clin Neurosur. s2018, 174: 244- 246.

82. Ramey P, Osborn M, Kirshner H, et al. Misdiagnosis of lamotrigine toxicity as posterior circulation transient ischemic attack or stroke. Epilepsy Behav. 2020; 111: 107284.

83. Mass RPPWM, Pegge SAH, Evers D, et al. Methotrexate-induced toxic leukoencephalopathy: an uncommon stroke mimic. Neurol Sci. 2019; 40: 1307-1309.

84. Yamanaka K, Okata T, Sambongi Y, et al. Subacute Methotrexate Encephalopathy Mimicking Ischemic Stroke With Dynamic Changes on Magnetic Resonance Imaging. J Stroke Cerebrovasc. 2018; 27: e233-e235.

85. Takada K, Maki Y, Kinosada M, et al. Metronidazole Induced Encephalopathy Mimicking an Acute Ischemic Stroke Event. Neurol Med-Chir. 2018; 58: 400-403.

86. Yedavalli V, Lanzman B. A potential new role for ASL perfusion imaging: Diagnosis of metronidazole induced encephalopathy-two companion cases. Radiol Case Rep. 2019; 15: 77-81.

87. Ozer M, Dumas B, Horta L, et al. 5-Fluorouracil associated neurovascular toxicities. Curr Prob Cancer, 2021; 45: 100746.

88. Hyland SJ, Kavi TR, Smith NR, et al. Transient Bilateral Ophthalmoplegia: A Case of a Forgotten Anesthetic Medication Effect. Cureus. 2021; 13: e18802.

89. Uhegwu N, Bashir A, Dababneh H, et al. Stroke Mimic Secondary to IV Fentanyl Administration. J Vascular Interv Neurol. 2015; 8: 17-19.

90. Mendes TM. Stroke Mimic Caused by Acetazolamide. Our J Case Rep Intern Med. 2018; 5: 000822.

91. Brigandl A, Rizzo V, Ziccone V, et al. Bismuth-related acute neurotoxicity as stroke mimic: A case report. Neurol Sci. 2019; 40: 653-654.

92. Corella M, Strada L, Bianchini D, et al. Stroke or Stramonium? A novel stroke mimic. Neurol Sci. 2019; 40: 631-632.

93. Finch N, Vilke GM. Unknown tetrahydrocannabinol edible ingestion resulting in acute stroke presentation. J Emerg Med. 2020; 59: 719.

94. Egan W, Steinberg E, Rose J. Vitamin B12 deficiency-induced neuropathy secondary to prolonged recreational use of nitrous oxide. Am J Emerg Med. 2018; 36: 1717.e1-1717.e2.

95. Huang H, Zhang Y, Yang M, et al. Case Report: Early-Onset Charcot-Marie-Tooth 2N With Reversible White Matter Lesions Repeatedly Mimicked Stroke or Encephalitis. Front Pediatric. 2022; 10: 935721.

96. Hardy DI, Licht DJ, Vossough A, et al. X-linked Charcot-Marie-Tooth Disease Presenting with Stuttering Stroke-like Symptoms. Neuropediatrics. 2019; 50: 304- 307.

97. Molina-Gil J, Azofra J, Gonzalez-Fernandez L. Hereditary angio-oedema with C1 inhibitor deficiency type I, an unusual stroke mimic. BMJ Case Req. 2022; 15.

98. Demailly D, Vianey- Saban C, Acquaviva C, et al. Atypical glutaric aciduria type I with hemidystonia and asymmetric radiological findings misdiagnosed as an ischemic stroke. Mov Disorder Clinical Pract. 2018; 5: 436-438.

99. Weinstein JD, Haman O, Urrutia VC, et al. Added value of arterial spin labeling in detecting posterior reversible encephalopathy syndrome as a stroke mimic on baseline neuroimaging: A single center experience. Front Neurol. 2022; 13: 831218.

100. Kusel K, Azzam O, Youssef A, et al. Alcoholic pontine myelinolysis: Beware the stroke mimic. BJR Case Rep. 2021; 7: 20210005.

101. Yasir Raflq M, Casey L, Abdullah M, et al. Grey matter heterotopia mimicking acute stroke. J Roy Coll Phy Edin. 2022; 52: 52- 53.

102. Marano M, Brunelli C, De Marco C, et al. Neuroimages and neuropathology of a stroke-like cerebral lymphomatoid granulomatosis. CAN J Neuol Sci. 2021; 48: 114- 115.

103. Catlike R, Taylor KS, Counsell CE. Parkinson's disease misdiagnosed as stroke. BMJ Case Rep. 2009.

104. Mavridis I, Lontos K, Anagnostopoulou S. Meningioma compressing the premotor cortex misdiagnosed for a stroke. Anz J Surg. 2012; 82: 857.

105. Lajeunesse M, Young S. Stroke Mimic: A Case of Unilateral Thyrotoxic Hypokalemic Periodic Paralysis. Clinical Practice Cases Emergency Med. 2020; 4: 75-78.

106. Younes K, Gonzales NR, Sarraj A, et al. Hepatic Encephalopathy Mimicking Acute Dominant Middle Cerebral Artery Ischemic Stroke: A Case Report. Case Rep Neurol. 2019; 11: 304- 311.

107. Randhawa NK, Shastri T, Hassanin EH, et al. Initial Presentation of Cirrhosis Mimicking an Ischemic Stroke. Cureus. 2021; 13: e19474.

108. Offersen CM, Meden P, Egidius K. HaNDL is transient headache, neurological deficits and lymphocytic pleocytosis in the cerebrospinal fluid. Ugeskr Laeger. 2019; 181.