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Florid Autonomic Features Associated with Medullary Lacunar Stroke

Muaz Elsayed[1,2*], Akram Harazeen[1], Asma Shams[1], Pournamy Sarathchandran[1], Feras Alrawi[1], Tayseer Zain[1], Samia Noor[1]

[1]Department of Neurology, Al Qassemi Hospital (EHS) Emirates Health Services, Sharjah, UAE
[2]Faculty of Medicine and Health Sciences, Omdurman Islamic University, Omdurman, Sudan

Email: *muaz_muaz@hotmail.com

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Abstract

Introduction: Autonomic nuclei affection results in variations in hemodynamics, temperature, sweating and ECG. Medullary strokes are challenging in their presentation, bizarre clinical signs, work and neurological outcome. The commonest cause is infarction of the posterior inferior cerebellar artery (PICA). Anatomical areas affected include the inferior cerebellar peduncle, dorsolateral medulla, nuclei of the Trigeminal, vestibular nuclei, Ninth and Vagus nerves. The descending sympathetic tracts and spin thalamic tracts. Serious cardiopulmonary events can complicate 11% of cases. Case Presentation: A middle-aged female developed sub-acute dizziness associated with vomiting and right head pains. She was unable to walk but remained cognitively clear. Her gastrointestinal symptoms were disabling and this was the main factor for presenting to the emergency room. The risk factors included hypertension and diabetes mellitus. Imaging studies were essential for posterior circulation stroke diagnosis and follow-up. She manifested remarkable autonomic features regarding the skin and hemodynamics. Nevertheless, the hospital course was controllable. **Discussion:** This case report was consistent with relevant literature in the contra lateral vaso motor changes and drop in body temperature during the acute phase. Moreover, our patient developed clinical and radiological extension through double antiplatelets. Superiority of the magnetic resonance imaging (MRI) scans in this patient enabled better diagnostic accuracy in a brainstem stroke. **Conclusion:** The autonomic features, in this case, represent major symptomatology and clinical signs. The variation in the hemodynamics and persistence of symptoms is thought provoking. This increases the awareness of emergency doctors for acute stroke presenting with autonomic features will enable early detection and helps outcome.

Keywords

Autonomic, Medullary Infarction, Wallenberg's Syndrome, Brainstem Stroke

1. Introduction

Stroke is the major neurological disorder across the world affecting communities and health systems. It has significant impact on patient's physical ability and quality of life. Autonomic disturbance was described with central and peripheral insults, mainly stroke and Guillain Barre' syndrome. Cerebrovascular disease of the brainstem can cause central temperature, hyperhidrosis, cardiopulmonary and ECG changes, Cheyne-stokes breathing or sleep apnoea, Spinal lesions were associated with episodic hypertension [1] [2]. Infarction of the posterior inferior cerebellar artery (PICA) is the most famous form of medullary infarction known also as Wallenberg's syndrome/Lateral medullary syndrome. This affects middle-aged population and lateral medullary syndrome has a more favorable outcome than medial medullary as demonstrated in a large series which enrolled 387 patients [3]. In this cohort, uncontrolled diabetes and atherosclerosis were the more common independent risk factors for medial medullary syndrome than lateral medullary syndrome. The vertebral artery may be responsible in other cases. Pathological damage involves the inferior cerebellar peduncle, dorsolateral medulla, descending spinal tract, neucli of the trigeminal and Vagus nerves, descending sympathetic tracts, ventrolateral tract (spinothalamic), vestibular nuclei and ninth cranial nerve [4]. The symptoms include vertigo, ipsilateral facial pain, ipsilateral Horner's syndrome, bulbar weakness, ipsilateral ataxia, contralateral thermoanesthesia and reduced sensations [5]. Though the clinical phenotype of PICA is uniform among patients but individual patients' manifests individual variations [6]. This was confirmed further by matching the lesion topography and neurophysiological testing of brainstem reflexes. Although the afferent branch of the reflexes was always affected, patients showed variations in responses [7]. The risk of fatal cardiopulmonary autonomic dysfunction was found in a previous report to be 11% in the acute phase of lateral medullary infarction while the relapse of stroke during the follow-up period was uncommon [8] [9]. Headache may be the most common symptom of PICA ranging from 54% - 76% [10]. Previous studies targeting patients with lateral medulla infarctions documented the frequent long-term reduction of body temperature and vasomotor changes on the contralateral side consistently in the acute phase, at one month and at 6 months [11] [12].

Thermography was found to be a useful tool to differentiate between pontine infarction and Wallenberg's syndrome using the body service temperature [13]. Commonly, sympathetic over activity is more reported in medullary infarction than the parasympathetic features [14]. The first is caused by direct damage of the sympathetic tracts within the infarcted core while the parasympathetic signs result from either irritation of the superior Salivatory nucleus or disparity between the neuronal discharges between autonomic inputs. The sympathetic nervous system may not affect the cerebral blood flow velocity or mean arterial pressure in patients with infarction of the lateral medulla [15]. Moreover, the Hemorrhage within the lateral medulla may rarely contribute to myocardial in-

jury [16] [17]. Other mechanisms of autonomic dysfunction in patients with cerebrovascular disease demonstrated a relation to atherosclerosis and inflammation reflecting a possible multifactorial background [18].

The outcome of pure lateral medullary infarction was compared to other syndromes of lateral medullary infarction plus other areas infarcted in a large number of patients (248). It was found that the short-term outcome of the lateral medullary infarction pure was better than lateral medullary plus (extra lateral medullary lesions) patients. Interestingly, the long-term outcome was better in patients with lateral medullary infarction plus. The localization of the lesion in both groups affected the final outcome [19]. Patients with pure lateral medullary infarction tend to have more residual symptoms of dizziness, dysphagia and sensory changes than others [19]. Poor prognostic features in medullary stroke were investigated in a multi-center study which included 179 patients. They found that poor long-term results and all cause mortality were not uncommon in medullary infarction. Age, dysphagia and recurrent strokes were the main predictors for that [20].

The objective of this case report is to reflect the possibility of a serious localization stroke presenting with uncommon symptoms. The overlook of the diagnosis may lead to delay in management and investigation with parallel disability. It is important to increase the awareness of emergency physicians that the brainstem stroke may present with acute dysautonomia which may be life-threatening. The modern medical technologies must be utilized to monitor the clinical scenario changes and upgrade patient's care if needed.

2. Case Presentation

This 45-year-old female from an Asian descent, presented with 3 days history of a sub-acute dizziness. The condition was associated with right face pain and right occipital headache that was moderate to severe sometimes. Her dizziness was not associated with tinnitus or hearing impairment. However, she had right ear deafness due to childhood infection. Moreover, she has hypertension and diabetes for few years for which she was taking relevant medications. The patient symptoms worsened over 3 days and she developed repeated vomiting. Moreover, she described occasional periods of remarkable sweating of her trunk on the right side. On further questioning, there were no neck pains, visual symptoms, facial numbness, mouth deviation, voice changes or swallowing issues. She reported no limb symptoms but being too dizzy to walk. The clinical examination showed an average weight and height female with blood pressure of 182/92 mmHg and RBS of 184 mg/dL.

She was conscious, and oriented with normal speech and memory. There was right partial ptosis with small size reactive pupil on the right side. There was asymmetrical oedema and redness of the right cheek. The patient had evidence of left facial nerve weakness (2/5) which was of lower motor neuron (LMN) but had no ipsilateral ear signs. There were normal bulbar nerves as well as fundi.

She had no postural tremors, but her right hand was clumsy and there was a pronator drift on the right side. Her hand tapping and dysdiadochokinesia testing were normal while the finger nose test showed mild distal tremors and subtle ataxia.

She had pale cold left hand and forearm as well as the left leg and foot while sensations were normal (**Figure 1** and **Figure 2**). During the admission period, she was always covering her right side with a blanket to reduce the sense of coldness.

The peripheral pulses were well appreciated as well as sensations for the pin prick (PP), vibration sense (VS), and touch. Tendon reflexes were depressed even with re-enforcement while planters were bilaterally withdrawal. There was no urinary incontinence.

Observation of the blood pressure showed erratic fluctuations in the systolic BP mainly.

The patient had normal routine blood tests but HB A1c and random blood sugar (RBS) were high as well as the fasting lipid profile. The initial CT Brain was reported as normal (**Figure 3** and **Figure 4**) while the MRI diffusion showed a lateral right lacunar medullary infarction (**Figure 5** and **Figure 6**).

Figure 1. Showing right upper limb pallor in pronation position.

Figure 2. Showing right upper limb and hand pallor in supination position.

Figure 3. A non-contrast brain CT showing no acute vascular insult.

Figure 4. Accidental basal ganglia calcifications.

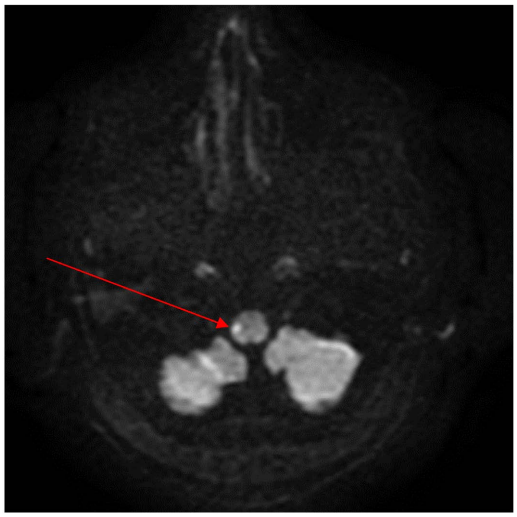


Figure 5. Showing diffusion MRI sequence with lateral medullary acute ischemia. The hyper intense signal in the lateral medulla is indicated by the red arrow.

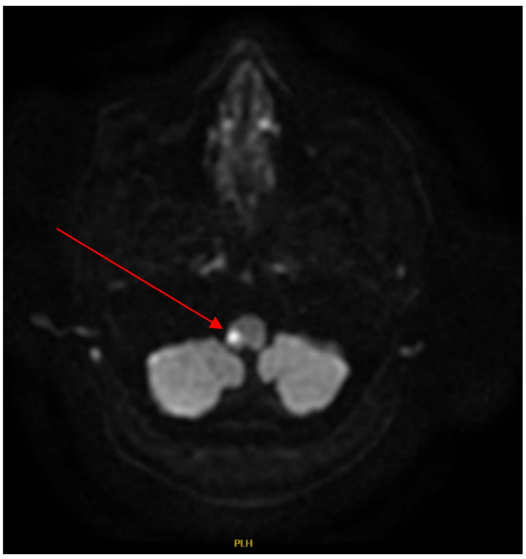


Figure 6. Extension of the infarction is shown. Increase in the size of the hyper intense signal in the lateral medulla is indicated by the red arrow.

The patient was started on aspirin, clopidogrel, statins, Betahistine tabs plus enoxaparin DVT prophylaxis and balance exercises. Her Echo was normal and Covid-19 PCR test was negative. Two days down the course of admission, the patient developed worsening dizziness, repeated vomiting and pain on swallowing. The re-examination showed a dizzier patient with right palatal weakness but no aspiration.

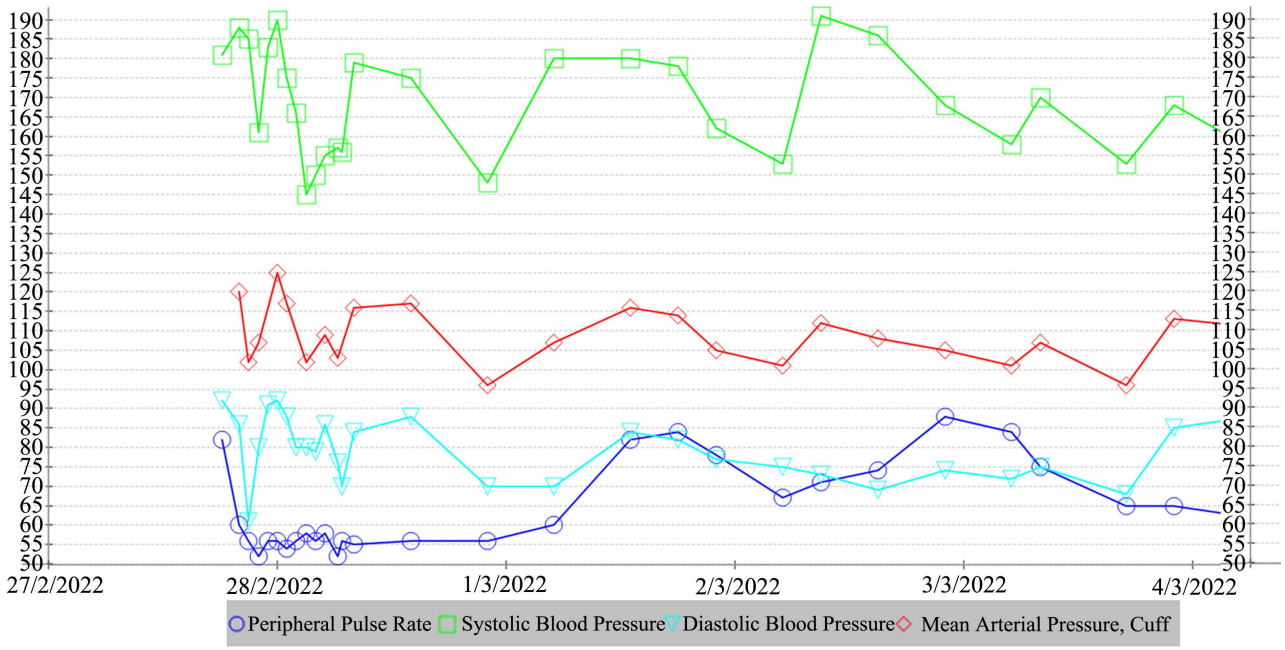
The fluctuations in the heart rate, blood pressure was still persistent, as shown in **Graph 1** below.

The graph represents the blood pressure and heart rate of the patient during her hospital stay. It can be observed that the fluctuations in the blood pressure (systolic, diastolic, and mean) and heart rate were synchronized and changed throughout the day. Where, whenever there was a spike in the blood pressures, the heart rate would also rise, but in variable ranges. Such fluctuations, with the systolic blood pressure ranging from 190 mmHg to 145 mmHg, the diastolic blood pressure scaling between 93 mmHg and 60 mmHg, and the heart rate between 85 bpm and 53 bpm in a small time period can be attributed to central dysautonomia secondary to the stroke.

An urgent repeat of the brain MRI showed expansion of the pre-existing lacunar stroke and no new infarctions or hemorrhages (**Figure 3** and **Figure 4**).

Symptomatic treatment with metoclopramide, Pantoprazole, increase in the Betahistine dose and a nocturnal dose of Dimenhydrinate was used. The patient was re-assured and continued on combination antiplatelets plus hydration. A brain Computerized Angiography (CTA) was normal. The patient had normal autonomic testing on electrophysiology.

The patient was referred to the physical therapy department as early as possible. She received physiotherapy, swallowing assessment, balance exercises and trial of standing. However, this was not successful due to remarkable dizziness.



Graph 1. Showing the Systolic BP (mmHg), Diastolic BP (mmHg), Mean Arterial Pressure (mmHg) and the Heart Rate (beats per minute—bpm) during the patient's hospital stay.

Frequent sessions and encouragement were provided to facilitate the functional outcome.

A neuropsychological assessment was done on day five of admission. Her grooming was adequate and she was cooperative with the examination. The patient reported that her mood was "Good" while her affect was mildly constricted. The speech had little delay with normal tone and average volume. Our patient was coherent and goal directed with intact higher functions. Her proverb interpretations were clear as well as judgment, reliability, and insight. The patient expressed mild guilt feeling related to neglecting her physical health that lead to an extent to her current state. She denied any other mood symptoms. This patient showed good motivational effort talking about rehabilitation and recovery. Hamilton depression rating scale was done and she scored (3/17) which is within the normal range. There was no evidence of formal thought disorder or abnormal thought content. She did not have any past psychiatric history or family history. Reassurance was done along with motivation to start the rehabilitation journey with the team.

The clinical condition of the patient improved slowly over 3 days and on discharge, her dizziness reduced to a limit and she remained with florid symptomatic right side autonomic skin features and right Horner's syndrome.

The patient was reviewed in the neurology outpatient department 5 weeks later. She attended on a wheelchair and reported that her dizziness is still troubling. The modified Rankin Scale was 4. Moreover, there were left body burning sensations. The residual signs included the facial swelling and redness though less, Horner's syndrome, pallor of the left upper and lower limbs. The patient was

adherent to medications and her vital signs were within normal levels. The patient continued on the medical recommendation and exercises. A round six months down the course of stroke, she was able to walk without support though not back to baseline, do her daily home activities, the right hemi-sensory symptoms are almost gone and burning sensation is now negligible. The modified Rankin score became almost 1.

3. Discussion

The manifestation of vascular risk factor as a stroke is a common encounter in neurology practice. However, the uncommon localization reflects a challenging diagnostic, intervention and management puzzle [21]. This case of lateral medullary infarction is similar to other reported cases in the main symptomatology of dizziness, Horner's syndrome, vomiting and subtle pyramidal symptoms. It is also consistent in localization to the lateral medulla. However, the patient in this case report manifested more uncommon features like the minimal ataxia, preserved speech initially, absent ipsilateral ear symptoms, florid vasomotor changes on the contralateral side and the fluctuations of the BP over the first week of admission. The chronic right ear deafness since childhood is the likely cause in the absence of right ear symptoms of tinnitus and deafness.

Moreover, she developed extension of the infarction at day three despite the use of combination of anti-platelets and good hydration. Though the management followed the current recommendations of treating minor strokes in the acute stroke best practice [22] but the extension may have reflected the status of her collateral circulation and activity of the risk factors. Another point to mention here are the rapid fluctuations of the systolic blood pressure secondary to the stroke related central dysautonomia. Literature had included development of atrial arrhythmias like supra ventricular tachycardia following a left insular stroke [23] as well as ventricular arrhythmias [24].

This case report conforms to literature in the persistence of dizziness and disturbing sensory symptoms almost 3 months following this pure lateral medullary infarction [19]. On the other hand, it differs fortunately in the non-development of cardio respiratory arrest and need for ICU care [9].

The risk of relapse of ischemic stroke is related to multiple factors and time linked. Swallowing dysfunction escalates the disability scale and compromises cognitive function and this is associated with extension of the damaged brain tissues [25]. This was investigated in a study performed in a stroke unit investigating the association. This reported case had good prognostic signs including age and absence of dysphagia as proved in a multi-center study [20]. Hence, it was important after the development of swallowing symptoms to perform radiological re-evaluation in this case which was consistent with the new symptomatology. Our patient is similar to other cases in the presence of penetrating artery disease (PAD) as the commonest mechanism of meduulary infarction as revealed by her Brain CTA [26].

The recognition of the vasomotor changes secondary to the autonomic tracts

ischemia in this syndrome is essential for addressing the diagnostic problem, localization and patient's concerns. Affection of the autonomic fibers with unbalanced neuronal discharges from the parasympathetic fibers will be the likely explanation despite a normal peripheral autonomic testing. It is also an important clinical sign to recognize and differentiate pontine versus medullary ischemic lesions. The early recognition and management will add to the better outcome.

The daily bedside evaluation of acute stroke phase is of paramount importance in detecting serious complications like extension of the infarct. This is guided by the basic medical tools of history and examination. The details of which revealed the deterioration in dizziness, worsening vomiting, headache and new onset dysarthria and discomfort on swallowing. The superiority of the MRI scan here carries a high diagnostic value and helps in determining of further endovascular interventions in cases out of the thrombolysis window [27]. From the patient's prospective, this will determine more on prognosis and outcome.

The learned lesson from this case is that whenever dizziness is associated with new onset focal neurological signs, a central cause should be suspected. The normal CT image should not distract emergency doctors from serious vascular conditions. Moreover, the florid autonomic features should not be missed even if the patient is not recognizing it. This is meant to raise doctor's awareness of critical neurological examination in relevant cases. It is essential to use modern imaging techniques to re-evaluate a patient who deteriorated while still on secondary prophylaxis of stroke.

4. Conclusion

Attention to atypical stroke presentation is essential as it remains the leading cause of adult disability. Judicious and timely use of modern imaging techniques will have a good impact on management and outcome. Unexplained gastrointestinal symptoms may be related to a central cause. While new onset dizziness deserves critical imaging in patients with vascular risk factors. The presence of new onset autonomic symptoms and signs can guide the clinical diagnosis of brainstem stroke. Close monitoring of such patients will guard against serious cardiac and respiratory complications.

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We acknowledge the consent given by the patient to publish this case report.

Ethical Approval and Consent Participate

Ethical approval was obtained from the research ethical committee of the ministry of health and prevention (EHS) UAE for the publication of the case report and upper limb photos. The patient willingly provided her written consent for publication and photos.

Availability of Supporting Data

Data are available in the electronic database of Al Qassimi Hospital Sharjah UAE

and kept confidential as per the regulations of the Ministry of Health and Prevention (MoHAP).

Authors' Contributions

Dr. Muaz Elsayed who is a senior consultant neurologist and an adjunct clinical professor, came with the report idea, did the literature search and wrote the Abstract, literature, discussion and references. He shared writing the case presentation. Dr. Akram Harazeenwho is a general practioner, wrote the vital signs section in the case presentation and designed the graph. Dr. Asma Bin SHAMS who is a psychiatry resident, did the psychological assessment, and wrote it. Dr. Pournamy Sharathchandran who is a senior consultant neurologist, shared the clinical management of the patients and edited the text. Dr. Firas Alrawi who is a neurophysiology consultant, did the Autonomic testing and wrote the section related in the case presentation. Dr. Tayseer Zain who is the head department of neurology, and Dr. Samia Noor who is a neurology specialist, shared the management and follow-up of the patient.

Conflicts of Interest

No conflicts of interest.

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