

Case Report

# Stroke Chameleons Manifesting as Distinct Radial Neuropathies: Expertise Can Hasten the Diagnosis

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## Keywords

Cerebrovascular disease · Stroke chameleons · Radial neuropathies · Diagnosis · Outcomes

## Abstract

**Objective:** Stroke chameleons encompass an atypical group of syndromes that do not initially appear to be cerebrovascular accidents. The objective of this study was to report patients with different lesions of central origin clinically presenting as wrist drop and with a semiology similar to that produced by peripheral lesions of the radial nerve at different topographical levels. **Methods:** This is a case series study of patients presenting with wrist drop during the acute phase of stroke who were assessed by clinical examination and CT and MRI brain scans. **Results:** Three cases presenting as monoparesis were evaluated. In all patients, the MRI revealed restricted diffusion in the pre- and post-central gyrus. Electromyography showed that the functionality of the radial, median, and ulnar nerves were intact in all three cases. The monoparesis resolved completely within 1 month of rehabilitation therapy, and no evidence of recurrent or new events was reported during the 6-month follow-up after stenting. **Conclusion:** The central message of this study is that when acute onset symptoms are present in a relatively old patient with vascular risk factors, stroke should be considered as the possible aetiology until proven otherwise, and the appropriate steps should be taken to avoid a delay in the treatment and to improve outcomes.

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Published by S. Karger AG, Basel

## Introduction

Stroke chameleons encompass an atypical group of syndromes that do not initially appear to be cerebrovascular accidents; however, they are found to be acute strokes after further analysis [1–5]. Less than 1% of strokes manifest clinically as a radial neuropathy. Of these, 30% are caused by cortical lesions, a rare condition that results in delayed diagnosis, especially during the first stroke, resulting in a negative outcome [6].

This condition is a challenge for clinicians worldwide, and expertise is required to be able to formulate the differential diagnoses correctly, recognize the clinical characteristics of the disorder, and initiate the most appropriate management, because the earlier patients are correctly diagnosed and a treatment strategy formulated, the better the outcome is [7, 8].

The objective of this study was to report on patients with lesions of central origin clinically manifesting as wrist drop and with a semiology similar to that produced by peripheral lesions of the radial nerve at different topographical levels, emphasizing the importance of diagnostic accuracy in these cases.

## Background

This is a case series study of patients presenting with wrist drop during the acute phase of stroke between July and December 2016 at the Stroke Unit of Botucatu Medical School. This study was approved by the Committee for Ethics in Research involving human subjects at Botucatu Medical School. All subjects gave their written informed consent to participate in the study in accordance with the Declaration of Helsinki II, and written informed consent was obtained from each participant prior to the publication of this case report.

### Case 1

A 67-year-old retired man with a history of diabetes and tobacco smoking had a sudden onset of right hand weakness and impaired mobility that lasted 2 h. Upon examination, he showed right-sided flaccid weakness with impaired extension of the digits and wrist (Fig. 1a), decreased brachioradialis reflex, and absent finger flexor reflexes and Babinski sign, without sensory deficits.

Brain computed tomography (CT) and spinal cord MRI results were normal. Brain magnetic resonance imaging (MRI) revealed restricted diffusion in the left precentral gyrus (Fig. 1b). The cervical angiogram showed 50–69% left internal carotid artery stenosis. The probable aetiology of the patient's symptoms was determined to be carotid artery disease. Electromyography performed within 72 h of the onset of symptoms showed that the functionality of the extensor carpi radialis longus (radial nerve), abductor pollicis brevis (median nerve), and first dorsal interosseous (ulnar nerve) were intact. The results of the laboratory tests, the electrocardiogram, and the echocardiogram were normal. The patient was managed in the stroke unit with conservative treatment.

The monoparesis resolved completely within 1 month of rehabilitation therapy, and no evidence of recurrent or new events was reported during the 6-month follow-up after stenting.

### Case 2

An 88-year-old retired man with arterial hypertension, chronic alcohol use, and polyneuropathy presented with left hand weakness and wrist drop upon waking up. Upon exam-

ination, he showed left-sided flaccid weakness of the hand digits, impaired wrist extension (Fig. 1c), decreased brachioradialis reflex, and absent Hoffmann's, Tromner's, and Babinski signs, with sensory loss on the posterior surface of the hand but preserved sensory function on the lateral and medial borders. Electromyography performed 72 h after the ictus showed that the extensor carpi radialis longus (radial nerve), the abductor pollicis brevis (median nerve), and the first dorsal interosseous (ulnar nerve) functions were intact.

Brain MRI revealed restricted diffusion in the right pre- and post-central gyrus (Fig. 1d). The spinal cord MRI results were normal. A carotid artery duplex scan showed less than 50% stenosis. The echocardiogram demonstrated left ventricular hypokinesia and an increased left atrial diameter (46 mm). A carotid artery duplex scan showed stenosis of less than 50%. The laboratory tests, an electrocardiogram, and a 24-hour Holter monitoring were normal. The patient was managed in the stroke unit with conservative treatment. The probable aetiology of the patient's symptoms was determined to be a cardioembolic stroke.

The sensorimotor loss resolved completely within 1 month of rehabilitation therapy, and no evidence of recurrent or new events was reported during the 6-month follow-up.

### Case 3

A 55-year-old woman, who was a housekeeper, with a history of papillary thyroid carcinoma and tobacco smoking experienced sudden left hand and forearm weakness a few hours after waking that resulted in complete motor disability. Upon examination, she showed left-sided flaccid weakness of the forearm, wrist, and hand (Fig. 1e), superficial hypoesthesia, decreased brachioradialis reflex, absent Hoffmann's, Tromner's, and Babinski signs, and normal bicipital reflex.

The brain MRI revealed restricted diffusion in the right pre- and post-central gyrus (Fig. 1f). The cervical angiogram showed 50–69% stenosis of the right internal carotid artery. The results of the laboratory and tumour marker tests, an electrocardiogram, and an echocardiogram were normal. The probable aetiology of this patient's clinical manifestations was an ESUS (embolic stroke of undetermined source). Electromyography performed 72 h after the ictus showed that the extensor carpi radialis longus (radial nerve), the abductor pollicis brevis (median nerve), and the first dorsal interosseous (ulnar nerve) were functionally intact. The patient was managed in the stroke unit with conservative treatment.

A mild monoparesis and sensory loss persisted for 6 months after rehabilitation therapy but without significant disability, and no recurrent or new events were reported during the follow-up.

### Discussion

In each of these three cases, different forms of wrist drop syndrome, characterized by purely motor or sensorimotor impairments involving unilateral distal upper limb manifestations with hypotonia, decreased myotatic reflexes, and normal superficial reflexes, had an underlying vascular aetiology with embolic stroke patterns suggestive of affectation of the relevant area in the precentral gyrus. This area is referred to as the "hand knob" within the cortical homunculus. It is supplied by the Rolandic artery, a branch of the M4 segment of the middle cerebral artery (Fig. 2a, b). This region was selectively damaged in case 1, while in cases 2 and 3, the lesion included the neighbouring sensory cortex, which shows a similar somatotopy [9].

The three cases showed clinical manifestations that were compatible with radial nerve injury with the relevant topography (see Fig. 3): case 1: compatible with a radial nerve injury in the forearm immediately below the elbow in the deep branch of the radial nerve after it has crossed the supinator muscle, i.e., the posterior interosseous nerve; case 2: compatible with a nerve trunk lesion in the elbow before it bifurcates into a superficial branch and a deep branch; and case 3: compatible with a radial nerve lesion in the arm within the spiral groove of the humerus after giving rise to the branches that innervate the triceps and anconeus muscles. The underlying aetiology may comprise traumatic, compressive, neoplastic, infectious, inflammatory, and toxic diseases.

In these cases, the physical examination during the acute phase may not reveal sufficient findings to differentiate between peripheral and central lesions. Thus, it is essential for the physician to be aware of 3 cardinal details in the clinical history: advanced age of the patients (all patients were older than 50 years), cardiovascular risk factors (smoking, hypertension, diabetes, and alcoholism), and the sudden onset of focal neurologic deficits, which should orientate the diagnosis towards potential cerebrovascular disease, regardless of the possible chronological association or if the clinical examination is compatible with radial nerve compression associated with Saturday night palsy.

Based on these fundamental semiology and neurology clinical practice guidelines and once initial stroke management procedures have been applied, it is necessary to investigate aetiology with brain imaging techniques. CT scanning is an effective tool to assess haemorrhages and is faster, more available and cost-effective than MRI; however, infarcts can go undetected when they are discrete. In this context, diffusion-weighted MRI of the brain plays a major role in diagnosis, which is accelerated, since it can show small lesions within minutes of stroke onset. In addition, the MRI may be useful in situations when the probability of infarction is high, such as when the patient has vascular risk factors, advanced age, an acute onset of symptoms, and other subtle exam findings [10].

Complementary tests are necessary to detect the underlying disease. In these three patients, diagnostic cardiology tests and carotid and vertebral artery imaging techniques uncovered an atheroembolic or cardioembolic source. However, the precise pathological mechanisms that explain this type of stroke chameleon are still unknown [4]. When a stroke or other possible central causes have been excluded, nerve conduction studies and needle electromyography are useful tests to determine the differential diagnoses.

### Concluding Remarks

Given the higher mortality and disability rates attributable to a delay in correct diagnosis, it is important to be aware of the possible aetiologies of wrist drop syndrome in the Emergency Department to facilitate the differentiation between peripheral and central causes. This should in turn lead to the formulation of appropriate treatments, rehabilitation therapies, better prevention of secondary episodes and improved individual and socioeconomic outcomes. The central message of this study is that when acute onset symptoms are present in a relatively old patient with vascular risk factors, stroke should be considered until proven otherwise, and the appropriate steps should be taken to avoid delaying treatment and to improve outcomes. Based on the characteristic onset of symptoms, a demyelinating peripheral lesion should be distinguished from a cerebral infarct, and the MRI should be indicated when the relevant clinical criteria are met.

### Statement of Ethics

All patients included in this study consented to the publication of the case report.

### Disclosure Statement

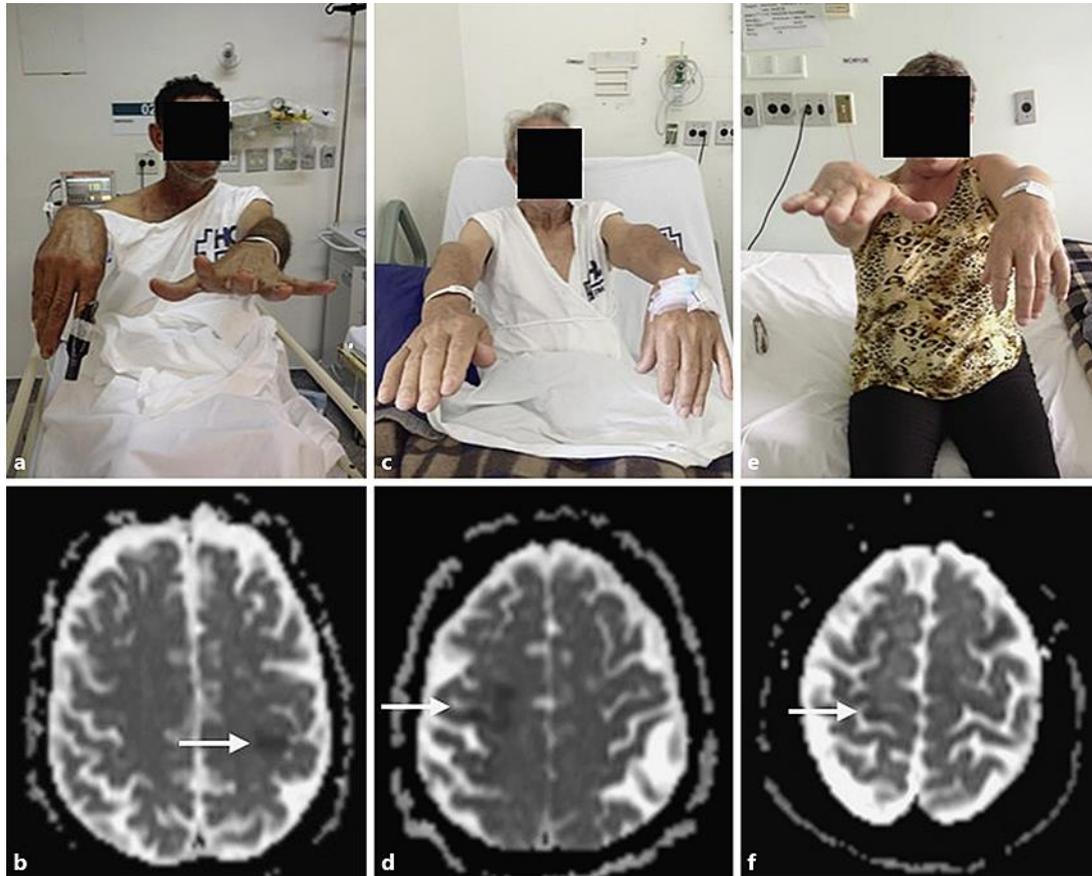
The authors report no disclosures relevant to the manuscript.

### Author Contributions

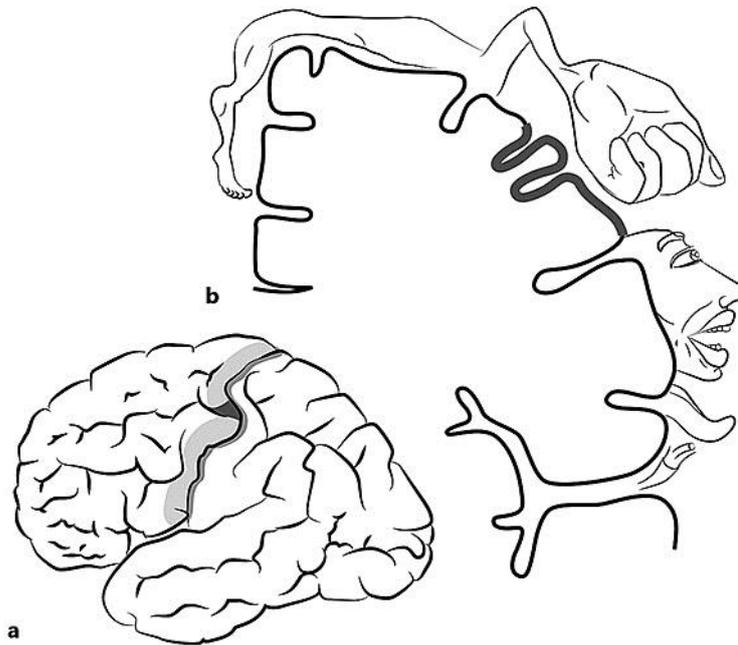
Dr. Fabrício Diniz de Lima designed and drafted the article. Dr. Rodrigo Bazan, Gabriel Pereira Braga, Arthur Oscar Schelp, and Gustavo José Luvizutto contributed to the design of the article and reviewed the manuscript.

### References

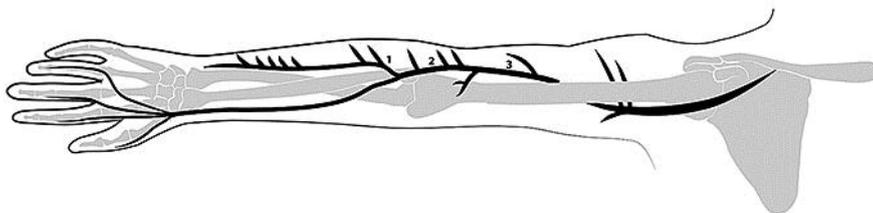
- 1 Anathhanam S, Hassan A: Mimics and chameleons in stroke. *Clin Med (Lond)* 2017;17:156–160.
- 2 Liberman AL, Prabhakaran S: Stroke Chameleons and Stroke Mimics in the Emergency Department. *Curr Neurol Neurosci Rep* 2017;17:15.
- 3 Richoz B, Hugli O, Dami F, Carron PN, Faouzi M, Michel P: Acute stroke chameleons in a university hospital: Risk factors, circumstances, and outcomes. *Neurology* 2015;85:505–511.
- 4 Dupre CM, Libman R, Dupre SI, Katz JM, Rybinnik I, Kwiatkowski T: Stroke chameleons. *J Stroke Cerebrovasc Dis* 2014;23:374–378.
- 5 Pedroso JL, Knobel M, Massaud RM, Knobel E: Acute ischemic stroke resembling Saturday night palsy. *Arq Neuropsiquiatr* 2014;72:391.
- 6 Fernandes PM, Whiteley WN, Hart SR, Al-Shahi Salaman R: Strokes: mimics and chameleons. *Pract Neurol* 2013;13:21–28.
- 7 Jusufovic M, Lygren A, Aamodt AH, Nedregaard B, Kerty E: Pseudoperipheral palsy: a case of subcortical infarction imitating peripheral neuropathy. *BMC Neurology* 2015;15:151.
- 8 Rothwell PM, Giles MF, Chandratheva A, et al: Effect of urgent treatment of transient ischaemic attack and minor stroke on early recurrent stroke (EXPRESS study): a prospective population-based sequential comparison. *Lancet* 2007;370:1432–1442.
- 9 Yousry TA, Schmid UD, Alkadhi H, et al: Localization of the motor hand area to a knob on the precentral gyrus. A new landmark. *Brain* 1997;120:141–157.
- 10 Allen LM, Hasso AN, Handwerker J, Farid H: Sequence-specific MR imaging findings that are useful in dating ischemic stroke. *Radiographics* 2012;32:1285–1297.



**Fig. 1.** Pyramidal drift test and brain MRI. Pyramidal drift test showing wrist drop in each of the three patients (a, c, e). Corresponding brain MRIs of the patients revealing restricted diffusion in the “hand knob” area (b, d, f).



**Fig. 2.** Cortical representation of hand motor function in the “hand knob” area. Lateral view of the left cerebral cortex – the precentral gyrus is shown in light grey, the path of the Rolandic artery in medium grey, and the “hand knob” area in dark grey (a). Coronal section of the left cerebral hemisphere – the cortical homunculus and the “hand knob” area are shown in dark grey (b).



**Fig. 3.** Radial nerve anatomy. Right upper limb with the radial nerve shown in black (1).