# **CASE REPORT**



# Infarction in bilateral corona radiata presented as unilateral peripheral facial paralysis: a case report

Gao Zheng-hua<sup>1</sup>, Lu Yao<sup>1</sup>, Lin Song-jun<sup>2\*</sup>, Cai Hao-bin<sup>2</sup> and Cai Tian-tian<sup>2</sup>

# Abstract

A 56-year-old man presented with right-sided drooping of the mouth corner and eyelid, along with weakness in the left lower limb. His MRI revealed a corona radiata lacunar infarction on the left and an acute infarction on the right. However, the needle electromyography (EMG) results were unremarkable. It was determined that his unilateral peripheral facial paralysis (PFP)-like symptoms were secondary to bilateral corona radiata infarctions. This case highlights that some patients with cerebral strokes may present with PFP-like symptoms. To minimize misdiagnosis, clinicians should consider the possibility of central lesions manifesting as PFP.

Keywords Bilateral corona radiata infarction, Peripheral facial paralysis, Central facial paralysis

# Introduction

Peripheral Facial Paralysis (PFP) is a prevalent condition, with Bell's palsy is the most common subtype, exhibiting an annual incidence rate of approximately 20–30 per 100,000 individuals [1]. Its onset is abrupt and typically unilateral [2]. The majority of cases are attributed nonspecific facial neuritis originating in the stylomastoid foramen. Fortunately, 85% of patients are able to recover their facial nerve function, and more than 70% may achieve full recoverey [3]. Unlike central facial paralysis (CFP), PFP is typically characterized by the absence of forehead wrinkling [4] and lagophthalmos on the ipsilateral side [5]. Nerve conduction study, such as needle electromyography (EMG) serves as a critical auxiliary

Lin Song-jun

lingsozh@163.com

<sup>1</sup>The fourth Clinical Medical College of Guangzhou University of

Chinese Medicine, No.1 Fuhua Road, Futian District, Shenzhen 518033,

Guangdong, China

examination for diagnosing PFP. However, some patients with cerebral stroke but without peripheral lesions may exhibit symptoms resembling PFP, which could result in inappropriate treatment. Therefore, we present a case wherein the progression as despicted in Fig. 1, was highly unique, thereby underscoring the importance of meticulous diagnosis and timely treatment.

# **Case presentation**

A 56-year-old man with a history of Type-2 diabetes mellitus (T2DM) and untreated hypertension was admitted to our emergency. He presented with right-sided deviation of the mouth, right lagophthalmos lasting one week, and acute onset of left lower limb weakness within the past 14 h. The patient denied any history of coronary artery disease but reported a long-standing smoking habit exceeding 40+years, averaging one pack (20 cigarettes) per day. Upon admission, his clinical manifestations included left lower limb weakness, shuffling gait, right-sided facial deviation with tongue deviation, shallow nasolabial folds, difficultly in frowning and furrowing, right lagophthalmos, air leakage from bulging



© The Author(s) 2025. **Open Access** This article is licensed under a Creative Commons Attribution-NonCommercial-NoDerivatives 4.0 International License, which permits any non-commercial use, sharing, distribution and reproduction in any medium or format, as long as you give appropriate credit to the original author(s) and the source, provide a link to the Creative Commons licence, and indicate if you modified the licensed material. You do not have permission under this licence to share adapted material derived from this article or parts of it. The images or other third party material in this article are included in the article's Creative Commons licence, unless indicated otherwise in a credit line to the material. If material is not included in the article's Creative Commons licence and your intended use is not permitted by statutory regulation or exceeds the permitted use, you will need to obtain permission directly from the copyright holder. To view a copy of this licence, visit http://creativecommons.org/licenses/by-nc-nd/4.0/.

<sup>\*</sup>Correspondence:

<sup>&</sup>lt;sup>2</sup>Shenzhen Traditional Chinese Medicine Hospital, No.1 Fuhua Road, Futian District, Shenzhen 518033, Guangdong, China

1	φ	One week before admission	Patient exhibited symptoms such as right-sided deviation of the mouth, right lagophthalmos, shallow forehead folds, and water leakage while drinking.
2	φ	14 hours before admission	Added symptoms include limb weakness, right-sided tongue deviation, shallow nasolabial folds, and difficulty in frowning and furrowing, all of which are observed on top of the previous symptoms.
3	•	The day of admission	Cranial MRI revealed a left corona radiata lacunar infarction and an acute infarction on the right, whereas his MRA and brainstem MRI showed no significant abnormalities.
4	φ	5 days after admission	Bilateral facial nerve conduction studies revealed no significant abnormalities, suggesting that his PFP-like symptoms were likely caused by cerebral lesions.
5	•	On the 12th day of hospitalization	The patient exhibited full recovery of forehead wrinkling, a reduction in NIHSS score to 0 (from 1 previously), absence of pathological signs, and 5-/5 muscle strength in the affected limb. However, a slight residual deviation of the mouth corner persisted.
6	φ	9 months after admission	The patient reported good recovery without recurrence, and then lost contact.
	•		

Fig. 1 The progression of this case



Fig. 2 Three consecutive layers of CT scan (Panels A-C). Arrows indicate lesions of infarction in the bilateral corona radiata of the patient

cheeks, cheek food retention, water leakage while drinking, nausea and vomiting, dysarthria, blurred vision, and no other significant symptoms such as coughing.

During the physical examination, the patient's blood pressure was recorded at 192/114 mmHg. Neurological examination revealed grade 4 + muscle strength in the left lower limb, with normal muscle strength and tone in the remaining limbs. The left Babinski sign was positive, and the NIHSS score was 1 point due to involvement of the affected limb. An urgent CT scan demonstrated multiple lacunar infarctions (as shown in Fig. 2).

Upon admission to the encephalopathy department, cranial MRI revealed a left corona radiata lacunar

infarction and an acute infarction on the right (Fig. 3). However, his MRA did not showed any remarkable abnormalities (Fig. 4). Color Doppler ultrasound demonstrated bilateral carotid atherosclerosis with plaque formation in the left common carotid artery (Fig. 5), as well as atherosclerosis with plaque involvement in both lower limbs. Concurrently, laboratory tests, including complete blood count, coagulation function, liver and kidney function, serological tests for antibodies (syphilis, HIV, anticardiolipids, autoimmune vasculitis), and rheumatic markers are all within normal limits. Based on the current clinical presentations and diagnostic findings, we preliminarily diagnosed the patient with bilateral corona



Fig. 3 Two adjacent layers of FLAIR (Fig. A & D), DWI (Fig. B & E), and ADC (Fig. C & F). Arrows indicate lesions of infarction in the bilateral corona radiata of the patient

radiata cerebral infarction (small artery occlusion type). Furthermore, additional evaluations are necessary to ascertain the presence or absence of PFP.

After admission, the patient was treated with intravenous butylphthalide at a dose of 100 mg per day to promote collateral circulation formation. Furthermore, oral aspirin (100 mg/day) and clopidogrel (75 mg/day) were administered as part of a dual antiplatelet therapy regimen, while oral atorvastatin (40 mg/day) was prescribed for lipid regulation and plaque stabilization. The patient also received standard management of blood pressure and blood glucose levels.

Five days after the initial assessment, the muscle strength of the affected limb had improved. Additionally, a marked improvement was observed in several symptoms, including right-sided deviation of the mouth and eye, tongue protrusion, shallow nasolabial folds, difficulty in frowning and furrowing, and right lagophthalmos. Based on these clinical observations, a needle EMG was planned to assess whether the condition corresponded to PFP. However, the bilateral facial nerve conduction studies revealed no significant abnormalities, resulting in a diagnosis of CFP. Given the absence of pontine lesions observed in the cranial MRI (Fig. 6), a thin-layer MRI scan was proposed to further investigate potential underlying pathological conditions. Unfortunately, due to financial constraints, the patient declined additional examinations and opted to continue treatment according to the original plan. On the 12th day of hospitalization, the patient demonstrated complete recovery of forehead wrinkling, an NIHSS score of 0, absence of pathological signs, and nearly normal muscle strength in the affected limb (5-/5). Subsequently, the patient was discharged. Nevertheless, a slight residual deviation of the mouth corner persisted.

Nine months after his discharge, we finally managed to reach him by telephone. He reported a good recovery with no recurrence. However, we subsequently lost contact with him again.

# Discussion

Based on the chronological progression of the patient's disease course, as well as the findings from CT, MRI imaging, and needle EMG, we infer that the patient's PFP-like symptoms are likely secondary to bilateral corona radiata infarction. And we should conduct a



Fig. 4 No abnormalities were detected in anterior sagittal (Fig.A), right coronal (Fig.B), posterior sagittal (Fig.C), and left coronal (Fig.D) MRA of the patient

thorough diagnosis and comprehensive evaluation based on the medical history and symptoms, ensuring that we are not misled by the superficial presentation of the patient's symptoms.

According to the location of the lesion, FP can be categorized into CFP and PFP. CFP is typically caused by damage to the conduction pathway between the cerebral cortex and the facial nerve nucleus, leading to a lack of innervation in the contralateral facial muscles and a shallower nasolabial fold on the side opposite to the lesion [6]. PFP, on the other hand, is characterized by pathological changes in the facial nerve nucleus or its distal peripheral nerves, resulting in paralysis of the muscles innervated by the ipsilateral facial nerve. The key distinction between these two types lies in the involvement of the upper face. The temporal branch of the facial nerve receives conduction signals from both hemispheres of the cortex [7], meaning that CFP with lesions above the facial nerve nucleus generally does not cause shallow forehead wrinkles or eyelid ptosis. In contrast, tongue protrusion is governed primarily by the hypoglossal nerve. When a unilateral supranuclear lesion occurs, the genioglossus



**Fig. 5** Color Doppler ultrasonography of the patient revealed plaque formation measuring 9.0 mm × 2.0 mm in the left common carotid artery (Fig. **B** & **C**, indicated by red arrows). In contrast, the intima-media thickness (IMT) of the right common carotid artery was approximately 1.5 mm (Fig. **A**, indicated by a red arrow)



Fig. 6 Three adjacent layers of FLAIR (Fig. A-C), DWI (Fig. D-F), and ADC (Fig. G-I). No lesions were detected in the patient's pons, as indicated by the white and red rectangles

muscle on the affected side weakens, causing the tongue to deviate towards the opposite side. While the patient exhibited symptoms such as right-sided deviation of the mouth, right lagophthalmos, shallow forehead folds, and water leakage while drinking one week before admission. And it was on the day of admission that he experienced limb weakness, as well as difficulty in frowning and furrowing. Thus his multiple lacunar infarctions in the left corona radiata were likely to be partly responsible for symptoms such as right-sided facial deviation and shallow forehead folds. The subsequent acute infarction in the right corona radiata accounted for the remaining symptoms.

The patient had a history of T2DM, with previous blood glucose levels reaching up to 16 mmol/L, indicating suboptimal glycemic control. According to electrophysiological studies, T2DM is recognized as a risk factor for PFP [8, 9]. However, based on the findings of his needle EMG report, it can be concluded that peripheral nerve damage secondary to diabetes has been effectively ruled

References	Patient(age, sex)	Nationality	Lesions	Ocular/Facial symptoms	Other neurolog- ical symptoms
Kubota-Hanya et al. [15]	82y, female	Japan	Infarction of left lenticulostriate artery	Right pseudoptosis	Right hemiparesis
Hebant et al. [16]	78y, female	France	Infarction of left precentral gyrus	Right lagophthalmos	None
Hebant et al. [17]	35y, female	France	Hemorrhage of left precentral gyrus hemangioma	Right lagophthalmos	None
Onder et al. [18]	69y, female	Turkey	Infarction of right frontal lobe cortex and subcortex	Left lagophthalmos	Right hemiparesis
Oh et al. [19]	72y, female	Korea S.	Left pontine infarction	Drooping left eyebrow	None
Saito et al. [20]	41y, male	Japan	Infarction of bilateral medial medullary and the left tegmentum of the pons	Left lagophthalmos	Bilateral limb paralysis (mainly right hemiparesis)
Nagaraja et al. [21]	22y, female	USA	Multiple cerebral Venous Sinus Thrombosis	Left eye ptosis and right PFP	None
Chen et al. [22]	50y, male	China	Occlusion of right AICA	Left PFP	Gait ataxia
Present Study	56y, male	China	Infarction of bilateral corona radiata	Right lagophthalmos	Left hemiparesis

Table 1 Nine cases, including the one reported in this Article, presented with PFP-like symptoms attributable to central infarction

out. The patient exhibited left lower extremity weakness and positive left pathological signs. Consequently, analysis of the patient's MRI images suggests that the aforementioned symptoms may be attributed to a right acute corona radiata cerebral infarction, while the deviation of the tongue to the right side could be due to multiple left corona radiata infarctions. The vessel responsible for the new infarct focus is located in the peripheral branch of the basilar artery. At discharge, the patient demonstrated favorable recovery, which was facilitated by the administration of butylphthalide to establish collateral circulation and ensure adequate blood supply to neurons within the affected conduction pathways.

According to previous studies [1, 10, 11], both hypertension and a smoking history exceeding 40 years significantly increased the patient's risk of ischemic stroke. Color Doppler ultrasound findings revealed bilateral cervical atherosclerosis, providing robust evidence for this assertion. Additionally, the retrospective study conducted by Voorhees et al. in 1972 [12] indicated that facial vascular hemorrhage might represent a pathophysiological mechanism underlying PFP in hypertensive patients, potentially elucidating another pathway through which hypertension could lead to PFP. A retrospective cohort study published in South Korea in 2021 [13] demonstrated a strong positive correlation between ischemic stroke and smoking. As reviewed by Klein J et al., nicotine exposure may induce endothelial dysfunction [14]. During the nine-month follow-up period post-discharge, the patient did not experience a recurrent stroke, suggesting that smoking cessation might have played a critical role in preventing recurrence.

From the perspectives of neuroanatomy [7], neurophysiology, and neuropathology, it is widely accepted that the facial nerve conduction pathway undergoes mutual crossing during the synaptic transmission process within the facial nerve nucleus located in the pons. However, as illustrated by the aforementioned case, a significant observation arises: due to the variability in the location of the infarction focus, an increasing number of cases exhibit "discrepancies" between the lesion site and clinical manifestations. This phenomenon is further substantiated by numerous cases across different age groups, genders, and even countries [15–22], as showed in Table 1. Consequently, given the diversity and complexity of the etiology and neuroanatomical pathways associated with FP, it becomes evident that greater diagnostic rigor is required to enhance the accuracy of diagnosis, which in turn influences subsequent treatment strategies.

# Limitations of the study

However, there maybe some possible limitations in this study. On the one hand, MRI (3.0T plain scan) can only exclude ischemic infarction lesions in the pons. Nonischemic lesions, such as tumors or inflammations, require additional examinations for exclusion, including gadolinium-enhanced MRI and thin-slice CT scanning of the brainstem. On the other hand, further research is warranted to investigate the unilateral peripheral-like facial palsy after bilateral stroke.

# Conclusion

The case highlights the possibility that patients with central lesions may present with PFP. Consequently, clinicians should consider this possibility, as exemplified above, to minimize misdiagnoses.

#### Supplementary Information

The online version contains supplementary material available at https://doi.or g/10.1186/s12883-025-04195-4.

Supplementary Material 1	3.
Supplementary Material 2	4.

#### Acknowledgements

The authors are supported by Sanming Project of Medicine in Shenzhen (No. SZZYSM202111011), National Natural Science Foundation of China (No. 82305113), Department of Science and Technology of Guangdong Province (No. 2023A1515030265), Department of Science and Technology of Guangdong Province (No. KA1810331). We thank Dr. Dong-bin Cai for assistance with manuscript preparation.

### Author contributions

ZHG contributed to paper conception, data collection, analysis and interpretation, literature review and paper drafting. YL contributed to data collection, analysis and interpretation, literature review and paper drafting. SJL, HBC contributed to data collection, analysis and critical review. ZHG, SJL, HBC, TTC contributed to paper conception, supervised data analysis and interpretation, critically reviewed the paper.

#### Funding

Supported by Sanming Project of Medicine in Shenzhen (No. SZZYSM202111011); National Natural Science Foundation of China (No.82305113); Department of Science and Technology of Guangdong Province, Grand/Award (No. 2023A1515030265); Department of Science and Technology of Guangdong Province, (No. KA1810331).

#### Data availability

All authors approved the final manuscript and the submission to this journal. Written informed consent was obtained from the patient for publishing their clinical details and any identifying images in this study prior to the publication of this case report.

#### Declarations

# Ethics approval and consent to participate

The whole study had been approved by the Ethics Committee of Shenzhen Traditional Chinese Medicine Hospital and had therefore been performed in accordance with the ethical standards laid down in the 1964 Declaration of Helsinki and its later amendments. Written informed consent was obtained from the patient before the publication of this case report.

#### Consent for publication

All authors approved the final manuscript and the submission to this journal. Written informed consent was obtained from the patient for publishing their clinical details and any identifying images in this study prior to the publication of this case report.

#### **Competing interests**

The authors declare no competing interests.

Received: 13 February 2025 / Accepted: 15 April 2025 Published online: 23 April 2025

#### References

 Psillas G, Dimas GG, Sarafidou A. etc. Evaluation of effects of diabetes mellitus, hypercholesterolemia and hypertension on Bell's palsy. J Clin Med. 2021;10(11):2357.

- 2. Warner MJ, Hutchison J, Varacallo M. Bell Palsy. 2023 Aug 17.
- Garro A, Nigrovic LE. Managing peripheral facial palsy. Ann Emerg Med. 2018;71(5):618–24.
- Khurshid A, Khurshid M, Sohail A, Raza IM, Ahsan MK, Alam Shah MUF, Taseer AR, Nashwan AJ, Ullah I. Facial palsy as a manifestation of COVID-19: A systematic review of cases. Health Sci Rep. 2022;5(6):e887.
- Fu L, Patel BC, Lagophthalmos. 2023 Jul 24. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2024 Jan&#8211.
- Ottaiano AC, Gomez GD, Freddi TAL. The facial nerve: anatomy and pathology. Semin Ultrasound CT MR. 2023;44(2):71–80.
- Dulak D, Naqvi IA, Neuroanatomy, Cranial Nerve 7 (Facial). 2023 Jul 24. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2024 Jan–. PMID: 30252375.
- Stamatiou I, Papachristou S, Papanas N. Diabetes mellitus and Bell's palsy. Curr Diabetes Rev. 2023;19(1):e080322201913.
- Kiziltan ME, Uluduz D, Yaman M, Uzun N. Electrophysiological findings of acute peripheral facial palsy in diabetic and non-diabetic patients. Neurosci Lett. 2007;418(3):222–6.
- Truelsen T, Krarup LH. Stroke awareness in Denmark. Neuroepidemiology. 2010;35(3):165–70.
- Wang H, Shen L, Zhao C, Liu S, Wu G, Wang H, Wang B, Zhu J, Du J, Gong Z, Chai C, Xia S. The incomplete circle of Willis is associated with vulnerable intracranial plaque features and acute ischemic stroke. J Cardiovasc Magn Reson. 2023;25(1):23.
- 12. Voorhees RL, Zeitzer LD, Ross M. Hypertension and associated peripheral facial paralysis. Laryngoscope. 1972;82(5):899–902.
- Lee SM, Oh CM, Kim MH, Ha E, Hong M, Ryoo JH. Current smoking status as a predictor of cerebral infarction in men: a retrospective cohort study in South Korea. BMJ Open. 2021;11(4):e042317.
- 14. Klein J, Diaba-Nuhoho P, Giebe S, Brunssen C, Morawietz H. Regulation of endothelial function by cigarette smoke and next-generation tobacco and nicotine products. Pflugers Arch. 2023;475(7):835–44.
- Kubota-Hanya M, Kitani K, Takahashi H, Kasai T. A case of lenticulostriate artery infarction presenting with peripheral type facial palsy. Rinsho Shinkeigaku. 2024 Jun 20.
- 16. Hebant B, Costentin G, Slama M, et al. Precentral gyrus infarct presenting as isolated contralateral peripheral-type facial palsy. Neurology. 2018;91:421–2.
- Hebant B, Richard C, Ahtoy P, et al. Isolated peripheral-type facial palsy due to contralateral precentral gyrus Cavernoma hemorrhage. J Clin Neurosci. 2020;2:452–3.
- Onder H, Albayrak L, Polat H. Frontal lobe ischemic stroke presenting with peripheral type facial palsy: a crucial diagnostic challenge in emergency practice. Turk J Emerg Med. 2017;17:112–4.
- Felicio AC, Bichuetti DB, Marin LF, dos Santos WA, Godeiro-Junior C. Bilateral horizontal gaze palsy with unilateral peripheral facial paralysis caused by Pontine tegmentum infarction. J Stroke Cerebrovasc Dis. 2009 May-Jun;18(3):244–6.
- Saito M, Kawano H, Amano T, Okano H, Iwamoto T, Hirano T. [A case of bilateral medial medullary and left tegmentum of Pontine infarction in whom DSA-MR fusion imaging identified infarct-relevant arteries]. Rinsho Shinkeigaku. 2020;60(6):434–40. Japanese.
- Nagaraja N, Sabu S. Nonabducent cranial neuropathies in cerebral venous sinus thrombosis: A case report and literature review. Neurologist. 2021;26(3):90–7.
- 22. Chen Y, Li Y, Zhan T. Anterior inferior cerebellar artery occlusion accompanied by hemorheology-documented increased blood viscosity: a case report. J Int Med Res. 2023;51(6):3000605231169435.

## Publisher's note

Springer Nature remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.