

Case presentation

Clinical particularities regarding rehabilitation treatment of a young patient with right pontine ischemic stroke, resulting in dysarthria and left side brachial and crural hemiparesis, and quite recent COVID-19 history

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ABSTRACT: Introduction. Cerebrovascular attacks are one of the leading causes of mortality and morbidity in the world. The most severe are considered to be pontine strokes, because of the high risk of vital functions impairment. The clinical presentation of a pontine stroke can vary from the classical crossed syndrome (ipsilateral cranial nerve palsy and contralateral motor and/or sensory impairment) to pure motor hemiplegia or pure sensory stroke, which are less common.¹

Materials and methods. This presentation describes the case of a 39-year-old patient with a recent history of untreated SARS-COV 2 infection that was followed in the next month by a sudden onset of facial paralysis, dysarthria and a progressive left hemiplegia. The patient's functional status was assessed in our Neuromuscular Clinical Division and he underwent a rehabilitation program consisting of physical, occupational and speech therapies. Multidisciplinary efforts were made in order to find the underlying cause of the pontine ischemic stroke.

Results. The patient had a personal history of cardiovascular disease risk factors (essential hypertension and hyperlipidaemia), without other pathological brain imaging outcomes and normal bleeding tests. The suspicion of an interatrial communication was raised. The patient managed to rapidly maintain the standing posture and to practice walking with unilateral support. At discharge, the facial paralysis and dysarthria were almost completely remitted. The left brachial extremity also showed signs of improvement, as the patient was able to perform flexion and extension movements of the fingers, wrist and forearm.

Conclusion. To conclude, the patient's evolution was favourable, although the certain cause of the underlying stroke has not been clarified. The neurological complications of COVID-19 include ischemic strokes, and cases were reported in young adults too^{2,3}. If this were the case, prevention of further cerebrovascular attacks and their complications is necessary¹. Caution in terms of medium/long-term prophylactic anticoagulant therapy and careful control of associated cardiovascular disease risk factors has been proposed and discussed in the multidisciplinary team: rehabilitation physician, neurologist, cardiologist.

Keywords: *cerebrovascular attacks, COVID-19, cardiovascular disease risk factors, ischemic strokes, rehabilitation*

1. INTRODUCTION

Pons is the largest component of the brainstem located distal to the midbrain and proximal to the medulla oblongata (1). Any obstruction of blood supply to the pons, whether acute or chronic, causes pontine infarction, a type of ischemic stroke (1).

The most common causes of pontine infarction include small artery disease, large artery atherosclerosis, and cardiogenic emboli, with the latter two being less frequent causes (4). The majority of the blood supply of pons is from the paramedian perforating arteries and the short circumferential arteries which arise from the basilar artery of the posterior circulation (1).

Risk factors for pontine stroke: hypertension, diabetes, smoking, hypercholesterolemia, history of ischemic heart disease, hypercoagulable states, and vasculitis (1).

Infarction can also result from atheromatous plaques in the larger arteries (vertebral or basilar artery), which in turn can obstruct blood flow to the smaller perforating arteries of pons (microatheromas) (5).

Materials and Methods:

Having the patient's consent, this article presents the case of a 39-year-old male patient with a recent history of untreated SARS-COV 2 infection (late March 2021) that was followed in the next month by a sudden onset (12.04.2021) of facial paralysis, dysarthria and progressive left hemiplegia with crural (moderate) and brachial (severe) motor deficit.

On 16.04.2021 he was admitted in the National Institute of Neurology and Neurovascular Disease, where he was diagnosed with right pontine ischemic stroke.

He was admitted in our Neuromuscular Rehabilitation Clinic on 23.04.2021 where he underwent a rehabilitation program consisting of physical, occupational and speech therapies.

Regarding the patient's medical history, of great importance were hypercholesterolemia and hypertension which are cardiovascular risk factors, and also iron deficiency anemia.

On admission, the patient was fully conscious and oriented, in a good general state and he was able to maintain the sitting and standing positions, with a discreet balance disorder. He presented asymmetrical facial expression with central type left facial paresis.

Cardiovascular system examination on admission

- normal heart sounds, with no pathological murmurs
- Pulse = 105 bpm
- BP = 140/70 mmHg

Respiratory system examination on admission

- bilateral vesicular murmur present
- no signs of respiratory failure
- SpO₂ = 96% spontaneously

Digestive system examination on admission

- supple abdomen
- painless on superficial/deep palpation,
- liver and spleen within normal limits

Urogenital tract examination on admission

- impalpable kidneys
- physiological urination

Cranial nerves examination on admission

- symmetrical pupils
- asymmetrical facial expression with central type left facial paresis
- dysarthria, dysphonia

Muscle tone examination on admission

- predominantly left brachial hemiplegia
- muscular force LEFT upper & lower limbs: proximal and intermediary MRC=3/5 and distal MRC=1/5

Sensitivity examination on admission:

- discrete left hemi-body hypoesthesia

OTR (osteo-tendinous reflexes) examination on admission:

- reduced on all levels, but more visible on the LEFT side
- Babinski reflex: positive on the LEFT side

Functional evaluation

The patient was dynamically evaluated using the following scales: Barthel Index, MOCA (Montreal cognitive assessment), Ashworth, GOS-E (Glasgow outcome scale extended), Rankin, QOL (quality of life scale), FAC. (functional ambulation categories), ADL (activities of daily living scale), MRC (muscle power scale). As it can be observed in the table below, considerable favorable evolution has been made, especially if analyzing the Barthel Index (65/100 on admission and 80/100 points on discharge) and ADL scale (3/6 on admission and 5/6 on discharge).

Table 1. Scales on admission vs. discharge

SCALES	ON ADMISSION	ON DISCHARGE
Barthel Index	65/100	80/100
MOCA	24/30	27/30
Ashworth	1+	1
GOS-E	4	5
Rankin	4	3
QOL	74/112	82/112
FAC	2	4
ADL	3/6	5/6

Moreover, important muscle power development has been made, considering the patient's MRC scores on admission in comparison to discharge. On admission, our patient scored a 1 (Flicker or trace of contraction) for distal force in his left limbs and on discharge he scored a 3 (Active movement against gravity), whereas for proximal and intermediary force on the same side, he scored a 3 on admission (Active movement against gravity) and a 4 on discharge (Active movement against gravity and resistance).

Table 2. MRC Muscle Power Scale

Score	Description
0	No contraction
1	Flicker or trace of contraction
2	Active movement, with gravity eliminated
3	Active movement against gravity
4	Active movement against gravity and resistance
5	Normal Power

Interdisciplinary consultations**Cardiology:**

- EKG= R wave hypovoltage in V1
- Blood tests show high CK & CK-MB. and inflammatory syndrome
- Recommendations: transoesophageal echocardiogram to exclude interatrial communication

Neurology (April 26th):

- No signs of meningeal irritation
- Central left facial paresis, moderate dysarthria
- Reduced on all levels, but more visible on the LEFT side
- Hemiplegic gait with unilateral support
- Recommendations: antiaggregant therapy (aspirin), lipid lowering treatment (statins), antihypertensives and cerebral MRI

Neurology (May17th):

- Reduced left hemiparesis compared to earlier consultation

- Upper LEFT limb: finger flexion 4/5, extension 3/5, hand flexion on arm 3-4/5, arm flexion on forearm 4/5
- Lower LEFT limb: proximal and intermediary 4/5
- Hemiplegic gait without unilateral support

Paraclinical examination

Cerebral MRI: Right hemipons lesion in T2 hypersignal, T1 hypersignal, without restrictions on the diffusion sequences. Post right hemipons ischemic CVA status. No other lesions observed.

Doppler echocardiography: Left ventricle- normal kinetic energy. Normal ejection fraction.

Cardiac ultrasound: raises suspicion of an interatrial aneurysm -> thrombophilia tests and additional cardiologic investigations are recommended.

Thrombophilia tests (CRP, Lupus anticoagulant, S protein, C protein, Activated protein C resistance APCR, anti- β -2-Glycoprotein-1 antibodies, IgM, IgA) were all negative.

Transoesophageal echocardiogram: Left ventricle- normal contractility & emptying velocity. Left & right ventricle systolic frequency- normal. Mitral valve- supple cusps, normal regurgitation. Aortic valve- 3 supple cusps. Congenital malformations: hypermobility of interatrial septum without visible communication on Doppler examination; contrast agent did not pass the valves.

Case particularity

Multidisciplinary efforts were made in order to find the underlying cause of the pontine ischemic stroke (Cardiology, Neurology, Oro and Maxillofacial surgery). Thrombophilia tests were all negative, and other investigations showed no important modifications and the cerebral MRI showed no signs of vascular anomalies.

Taking all the investigations and consultations into consideration, it is very possible that the cerebrovascular attack was favoured by the patient's cardiovascular risk factors and post SARS COV-2 infection status.

Clinical diagnosis

Left side brachial and crural hemiparesis, dysarthria and dysphagia, due to a right pontine ischemic stroke that happened shortly after an untreated SARS COV-2 infection.

Rehabilitation program- general objectives

Considering the patient was diagnosed with left side brachial and crural hemiparesis, dysarthria and dysphagia, the rehabilitation program's objectives consisted of full body mobilisation, walking practice, fine grasp practice with left hand, vocal re-education and dysphagia resolution.

These objectives have been met through ergotherapy, logopaedics and kinesiotherapy, consisting of the following exercises:

- Elbow articulation
- Shoulder articulation
- Hand muscles, fist and fingers articulations
- Lower limb articulation
- Knee articulation
- Foot muscles, ankle and foot articulations

Results

The patient managed to rapidly maintain the standing posture and to practice walking (with unilateral support if necessary) on long distances. On discharge, the facial paralysis and dysarthria were almost completely remitted. Moreover, the left brachial extremity also showed signs of improvement, as the patient was able to perform flexion and extension movements of the fingers, wrist and forearm.

Recommendations on discharge

The following recommendations have been made on discharge:

- Adequate hydration (2 litres/day), normocaloric diet (high protein, high fibre, low fat)
- Correction of iron deficiency anaemia

- Avoidance of screen exposure (TV, Laptop etc.) for more than 2 hours/day, with a distance of at least 3.5 meters when watching TV
- Continuation of kinesiotherapy exercises. A cane is to be used when walking longer distances
- Active and passive exercises of hand and fingers of the upper left limb.
- Maxillary and neck muscles strengthening exercises as indicated by the Logopaedic specialist

Conclusions

To conclude, the patient's evolution was favourable, although the certain cause of the underlying stroke has not been clarified. The neurological complications of COVID-19 include ischemic strokes, and cases were reported in young adults too (2,3). If this were the case, prevention of further cerebrovascular attacks and their complications is necessary (1). Caution in terms of medium/long-term prophylactic anticoagulant therapy and careful control of associated cardiovascular disease risk factors has been proposed and discussed in the multidisciplinary team: rehabilitation physician, neurologist, cardiologist (6-12).

Conflict of interest

No conflict of interest declared. This study has approval of the **Ethics Commission** of the Clinical Emergency Hospital "Bagdasar-Arseni" (N.O. 24389/28.06.2021)

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