Doppler harmonic patterns were initially described in the examination of cardiac structures, mainly stenotic valves, as a manifestation of turbulent flow through a narrow space. The so-called musical murmur, in its pure tone quality, is a rare presentation in cerebrovascular diseases. They are often associated with subarachnoid hemorrhage (SAH), and to our knowledge, have never been documented in association with reversible cerebral vasoconstriction syndrome (RCVS).

**CASE**

A 40-year-old male presented to the neurological Emergency Department with a history of severe left-sided headache four days earlier. He was evaluated at a secondary care facility on the first day but was discharged home a few hours later after a normal computed tomography (CT) scan and with the prescription of symptomatic medications. Twenty-four hours later he referred a new episode of a thunderclap headache associated with right hemiparesis which resolved within 40 minutes and was admitted to our facility presenting only slight right hypoesthesia. The admission CT scan revealed no signs of bleeding or ischemia. Cerebrospinal fluid (CSF) analysis revealed normal cytology, protein, glucose, and negative microbiology (including gram stain, fungi and acid-fast bacilli) and also negative venereal disease research laboratory test (VDRL) and fluorescent treponemal antibody absorption test (FTA-ABS). The patient underwent an extensive diagnostic workup including the following tests: antinuclear antibodies (ANA), VDRL, Chagas Disease, HIV, B and C

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**Key Words:** musical murmur; tin whistle sound; RCVS; doppler effect
Hepatitis. His erythrocyte sedimentation rate (ESR) was of 12 mm and C-reactive protein (CRP) was 1.99 mg/L. An magnetic resonance angiography showed severe stenosis of the M1 and distal M2 segments of left middle cerebral artery (MCA). A less severe stenosis of the right M1 segment of right MCA is also seen (Fig. 1).

Transcranial doppler ultrasound (TCD) was also performed, revealing increased mean velocity at both MCAs (116 cm/s on the right and 181 cm/s on the left). During the examination, a “tin whistle” or sound with spectral harmonic representation was identified close to the highest velocity sign of the left MCA (Supplementary Video 1; Fig. 3). The patient was treated with analgesics, oral nimodipine, IV fluids, and daily TCD monitoring. A progressive decline of left MCA mean velocity was observed since admission. After 16 days, the mean left MCA velocity was 126 cm/s and he was discharged home with no headache recurrence or neurological deficits.

Diagnosis of RCVS was made based on clinical criteria associated with complementary CSF, laboratory tests and image analysis. He remained with no deficits. A Follow-up magnetic resonance angiography (MRA) was performed 10 months later and revealed disappearance of the left MCA stenosis (with only a slight irregularity of the left MCA-M1 segment considered not clinically significant) (Fig. 2).

**DISCUSSION**

Musical murmurs (MM), often described as “seagull or...
goose cry", are physical phenomena of harmonic sound reverberation between two nodes when blood flows through a narrow space. They are represented on Doppler waveforms as strings oscillations that mirror each other (Fig. 3). The turbulence generated by this kind of flow is frequently described as a result of vortex shedding, such as Kármán vortex street. Its dynamic is manifested in bodily fluids, wind flowing, and even channelized to create resonance as an ancient musical instrument like the aeolian harp.

MM are still considered a rare cerebrovascular disease manifestation (0.5%) and are related to severe stenotic patterns mainly in intracranial vessels. Case reports were described in association with cerebral vasospasm due to SAH, arteriovenous malformation, and carotid dissection. To our knowledge, this is the first case report of musical murmur described in a patient with RCVS. TCD is still underused in the emergency setting and can be particularly useful in situations where intracranial stenosis is suspected. MM may not be a rare occurrence, since it is not promptly recognized. Identifying this phenomenon at the emergency department may lead to an earlier diagnosis of critical stenosis and improved follow-up such as in RCVS.

SUPPLEMENTARY MATERIALS

Supplementary materials related to this article can be found online at https://doi.org/10.31728/jnn.2023.00141.

Ethics Statement
This report was approved by the institution’s ethics committee under CAAE number 70426623.0.0000.5040. A written consent from the patient was obtained.

Availability of Data and Material
All data related to this study are included in the main text.

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Conflicts of Interest
No potential conflicts of interest relevant to this article was reported.

REFERENCES
Supplementary Video 1. “Tin whistle” or “seagull/goose cry” musical sound characteristic of severe stenosis.