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# Clinical/Scientific Notes

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## ZIKA VIRUS INFECTION–ASSOCIATED ACUTE TRANSIENT POLYNEURITIS

Zika virus (ZIKV) has been associated with various neurologic complications in adults, including Guillain-Barré syndrome (GBS), transverse myelitis, meningoencephalitis, and ophthalmologic manifestations. Though some of these syndromes may be due to a postinfectious (molecular mimicry) mechanism, a direct viral pathogenic mechanism may be responsible in others. We present 3 cases of a newly described syndrome of ZIKV-associated acute transient polyneuritis.

**Methods.** This article describes a case series of 3 patients admitted to a tertiary hospital in Rio de Janeiro during the 2016 outbreak of Zika virus infection in Brazil.

**Standard protocol approvals, registrations, and patient consents.** This study was approved by the HUAP-UFF institutional review board. All patients or their surrogates were consented for participation in this study.

**Zika virus diagnosis.** Blood and CSF collected at admission were tested in duplicate using real-time reverse transcriptase PCR (rRT-PCR) for ZIKV following published methods at the Oswaldo Cruz Foundation Flavivirus Laboratory. Urine rRT-PCR was tested in one case.

**Other diagnostics.** Electrophysiology studies (EMG and nerve conduction studies) were performed by certified neurologists with specialty training in neuromuscular disease using criteria endorsed by the European Federation of Neurological Societies/Peripheral Nerve Society and American Association of Neuromuscular and Electrodiagnostic Medicine (e-Methods at Neurology.org). All examinations included nerve testing in both upper and lower extremities and F wave testing. Nerve ultrasound was performed of the bilateral median nerves (1–2 cm proximal to the carpal tunnel) and bilateral superficial peroneal nerves (5 cm above the medial malleolus). Brain and spine 3T MRI with gadolinium administration and nerve ultrasound were interpreted by independent, board-certified neuroradiologists. Other blood testing was conducted to rule out alternative causes of muscular/peripheral nerve disease (e-Methods).

**Results.** Three patients presented to the Antonio Pedro University Hospital of Universidade Federal Fluminense in Rio de Janeiro, Brazil, with signs and symptoms of distal pain, stocking-glove hypoesthesia, mild distal weakness, and hyporeflexia within 1–2 days of ZIKV symptom onset. Clinical examination, imaging, electrophysiologic, and outcome findings for these patients are delineated in the table. Nerve ultrasound demonstrated bilaterally enlarged median nerves in patients 1 and 2 (figure e-1). Mental status, cranial nerves, and cerebellar examination were normal for all patients, as were muscle enzyme testing, inflammatory serology testing, and other routine laboratory studies. No patient met Brighton[1] or electrophysiologic criteria for GBS.

**Discussion.** We report acute ZIKV infection accompanied by clinical findings consistent with a mild, self-limited, distal, sensorimotor neuropathy. Because nerve ultrasound in 2 patients demonstrated enlargement of symptomatic nerves, followed by concomitant improvement in symptoms and nerve diameter on serial ultrasound, the mechanism of this syndrome may be related to nerve swelling. It has been described that some forms of infections might result in segmental nerve inflammation with edema, compromising nerve function in an acute fashion.[2,3] For the most part, the Schwann cells are the target of the infectious agent resulting in demyelination, which could evolve into a rapid resolution or further progress, depending on the host's immune response.[2,3] Since symptoms and imaging findings tracked closely with ZIKV viremia, we hypothesize that there may be a direct neuropathic effect of ZIKV leading to inflammation and nerve swelling. Others have published reports of weakness developing soon after the first few days of ZIKV infection symptoms, considered early for postinfectious molecular mimicry mechanism of nerve injury, but in this case series the patients developed clinical, laboratory, and electrophysiologic findings highly suggestive of GBS.[4] We report 3 cases that do not fit the usual criteria for GBS, as weakness was mild and limited to the extremities, a predominance of sensory symptoms was observed, and rapid improvement of symptoms within the first

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**Table** Clinical and laboratory findings in patients with Zika virus–associated polyneuritis

| | Case 1 | Case 2 | Case 3 |
|---|---|---|---|
| **Clinical presentation** | | | |
| **Age, y** | 23 | 39 | 24 |
| **Sex** | Female | Female | Female |
| **Medical history** | None | None | None |
| **Viral prodrome** | Fever, rash, malaise | Fever, rash, arthralgias | Fever, rash, conjunctival injection |
| **Neurologic symptoms** | Burning pain in hands and feet, distal weakness of upper and lower extremities bilaterally | Paresthesias in hands and feet, pain with joint motion, and distal > proximal weakness in arms and legs bilaterally | Numbness, pain, and mild weakness of hands and feet bilaterally |
| **Time from viral prodrome to neurologic symptoms, h** | 24 | 48 | 48 |
| **Neurologic examination** | | | |
| **Motor** | MRC 4 muscle strength distally (wrist extensors and flexors, intrinsic muscles of the hand, foot, dorsiflexion and plantar flexion, foot inversion and eversion); MRC 5 strength proximal upper and lower extremities | MRC 3 muscle strength distally (wrist extensors and flexors, intrinsic muscles of the hand, foot, dorsiflexion and plantar flexion, foot inversion and eversion); MRC 4 muscle strength proximally (deltoids, biceps, triceps, hip flexors, quadriceps, hamstrings) | MRC 4 muscle strength distally (wrist extensors and flexors, intrinsic muscles of the hand, foot, dorsiflexion and plantar flexion, foot inversion and eversion); MRC 5 strength proximal upper and lower extremities |
| **Sensory** | Hypoesthesia to light touch and pain in a stocking-glove distribution | Hypoesthesia to light touch and pain in a stocking-glove distribution | Hypoesthesia to light touch and pain in hands and feet bilaterally and circumferentially |
| **Reflexes** | 1 + Patella and ankle, 2 + biceps and triceps; negative Babinski sign | 1 + Patella, ankle, biceps, and triceps; negative Babinski sign | 1 + Patella and ankle, 2 + biceps, triceps; negative Babinski sign |
| **Diagnostic studies** | | | |
| **ZIKV RT-PCR results (time from rash to collection)** | CSF and blood positive (24 h); urine not tested | Blood and urine positive (48 h); CSF not tested | CSF and blood positive (96 h); urine not tested |
| **EMG/NCS (time from symptom onset)** | Normal motor and sensory amplitudes, distal latency, conduction velocities, and F waves; normal needle study (days 3 and 60 post viral symptom onset) | Normal motor and sensory amplitudes, distal latency, conduction velocities, and F waves; normal needle study (days 4 and 90 post viral symptom onset) | Normal motor and sensory amplitudes, distal latency, conduction velocities, and F waves; normal needle study (days 5 and 30 post viral symptom onset) |
| **MRI brain and spine with gadolinium** | Normal | Normal | Normal |
| **Nerve ultrasound cross-sectional area (time from symptom onset)[a]** | Day 5 | Day 6 | Not performed |
| **Median nerve, $mm^2$** | | | |
| **Left** | 18 | 20 | |
| **Right** | 16 | 27 | |
| **Superficial peroneal, $mm^2$** | | | |
| **Left** | 5 | 6 | |
| **Right** | 5 | 5 | |
| | Day 52 | Day 65 | |
| **Median nerve, $mm^2$** | | | |
| **Left** | 11 | 15 | |
| **Right** | 10 | 18 | |
| **Superficial peroneal, $mm^2$** | | | |
| **Left** | 3 | 3 | |
| **Right** | 2.5 | 3 | |
| **CSF** | Cell count: 0, protein: 27 mg/dL, glucose: 75 mg/dL | Cell count: 1, protein: 38 mg/dL, glucose 87 mg/dL | Cell count: 0, protein: 22 mg/dL, glucose: 81 mg/dL |

*Continued*

Table Continued

| | Case 1 | Case 2 | Case 3 |
|---|---|---|---|
| **Management and outcome** | | | |
| **Treatment** | Supportive | IV gammaglobulin for 5 d | Supportive |
| **Time to resolution of neurologic symptoms, d** | 7 | 10 | 8 |
| **3-Month reexamination** | Asymptomatic with normal strength and reflexes | Asymptomatic with normal strength and reflexes | Asymptomatic with normal strength and reflexes |

Abbreviations: MRC = Medical Research Council; NCS = nerve conduction studies; RT = reverse transcriptase; ZIKV = Zika virus.
[a] Normal values: median nerve 9–11 $mm^2$, superficial peroneal 2–3 $mm^2$.

7–10 days with associated unrevealing electrophysiologic and CSF testing (repeated weeks later) was noted.

Preliminary research using human neural progenitor cells have shown that ZIKV infection increases cell death and dysregulates cell cycle progression.[5] Other flaviviruses, such as West Nile virus, can lead to direct neurotropic injuries as well.

Though nerve conduction studies were normal, mild syndromes with clinical manifestations may manifest with minimal electrophysiologic abnormalities.[6,7] Since the syndrome we describe primarily involves distal nerves, normal electrophysiologic studies are not inconsistent with an acute neuropathy. Negative serum and CSF laboratory studies and normal gadolinium-enhanced MRI of the brain and spine diminish the likelihood of a brain, spinal cord, or muscular etiology for our patients' clinical presentations.

Our cases suggest a newly described ZIKV-associated acute transient polyneuritis. It will be important for practitioners to recognize this benign syndrome and differentiate it from other ZIKV-related complications.

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