



Adie's tonic pupil and Zika virus

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Abstract

A 57-year-old patient presented with blurred near vision, and on examination, with a constricted right pupil with intact pupillary accommodation, consistent with Adie's tonic pupil. Two weeks prior to presentation, the patient had a serologically confirmed Zika virus infection, where the patient developed pain and swelling affecting the right orbit. The close temporal relationship of Zika virus infection and Adie's tonic pupil suggests ciliary ganglionitis, secondary to Zika virus infection. Ciliary ganglionitis and Adie's tonic pupil have not previously been described as sequelae of Zika virus infection, but are plausible, as Zika virus has already been linked to neurological conditions in adults, such as Guillain-Barre syndrome. This case highlights the possibility of lasting neurological changes in some adults following Zika virus infection.

Introduction

We report a patient presenting with Adie's tonic pupil in the context of recent serology-confirmed Zika virus infection, affecting the orbit.

Adie's tonic pupil is a condition characterised by anisocoria, with the affected pupil having poor or absent reaction to light, segmental palsy of the iris sphincter, cholinergic super-sensitivity of the iris, and a normal near response.¹ Although most cases of Adie's pupil are idiopathic, it has also been related to infection and inflammation of the ciliary ganglion, ocular or orbital lesions, neuropathies, oculomotor nerve palsy, and trauma; Adie's pupil has also been more specifically linked to neurotropic viral infections, which cause inflammation and damage to the neurons of the ciliary ganglion.¹ Although there are reports of neurotropic viral causes such as varicella,³ this report is the first to describe a link between Adie's pupil and Zika virus infection.

Case report

A 57-year-old Brazilian male presented to the Dunedin Hospital Eye Department, Dunedin, New Zealand on referral from optometry – he initially described blurry vision during near work and a mid-dilated tonic right pupil was noted by the optometrist at the time of referral, within a

week of the onset of symptoms. He had not been seen by ophthalmology in the past and denied any long-standing eye problems. Examination by ophthalmology four months after symptom onset discovered anisocoria, with the right pupil appearing smaller than the left; this was confirmed upon measurement in a dark room, with the right pupil measuring 4.0 mm and the left 4.7 mm. The right pupil had minimal response to light exposure via infrared video pupillometry (4.0–3.9 mm) and a normal response on the left (4.7–3.3 mm), using a NeurOptics PLR-2000 pupillometer.¹ There was a normal near response in both pupils with neither ptosis nor ocular motility disturbance, but delayed dilation of the right eye when transitioning from near to far focus. Visual acuity was 4/8 on the right, 4/3 on the left. Visual fields were not assessed. Upon administration of dilute (0.125%) pilocarpine eye drops, there was a reduction in the size of the tonic pupil to 3.7 mm in dark conditions and no response in the left eye (pupil size remained 5.1 mm in a darkened room).

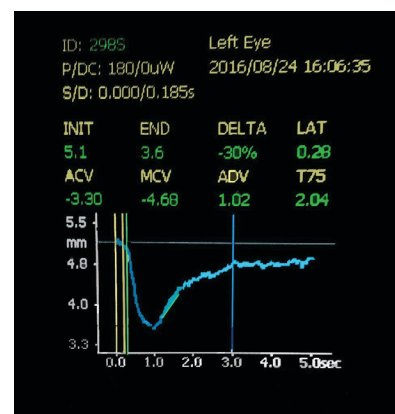


Figure 1 Photograph of the pupillometer output for the patient's left eye, showing normal pupillary response to light exposure.

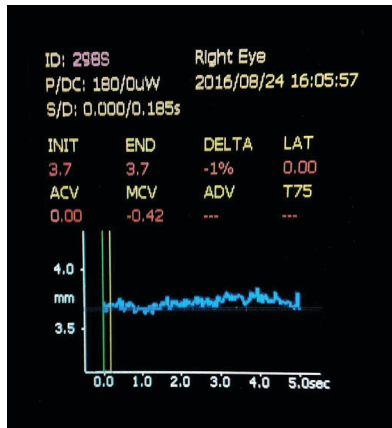


Figure 2 Photograph of the pupillometer output for the patient's right eye, showing minimal pupillary response to light exposure.

Pupillometry was repeated with results consistent with a tonic pupil (Figures 1 and 2). Intraocular pressures were normal (13 mmHg in the left eye and 15 mmHg in the right, normal range 12–20 mmHg) and no abnormalities were found on dilated fundoscopy.

Upon targeted questioning of recent illnesses, he reported that he had experienced an illness while in Brazil two weeks before the onset of blurred vision, with right orbital pain and swelling being described along with nausea, fever, and malaise. Serology in Brazil at the time confirmed Zika virus infection. There was no history of ocular medication or trauma. His medical history included medicated hypertension and hyperlipidaemia, notably, no history of diabetes, and denied any other recent illnesses.

Discussion

The disease course of Adie's tonic pupil closely mirrors the history of this patient: an enlarged tonic pupil following a viral illness and that responds to dilute pilocarpine solution, then shrinking to a small tonic pupil over time. Adie's pupil is caused by a paresis of parasympathetic pupillary fibres, thought to be due to inflammation of the ciliary ganglion lying just behind the globe of the eye, within the intraconal space of the orbit.¹ As this has no definitive treatment, management is limited to glare reduction during the mydriasis phase, which disappears as the pupil becomes miotic.¹ This condition is related to Holmes-Adie syndrome, which includes the same ocular signs with additional loss of deep tendon reflexes.²

Adie's tonic pupil of viral cause is most commonly associated with neurotropic viruses (those that affect the nervous system) such as herpes zoster and syphilis.¹ As this patient denied any recent illnesses aside from Zika infection, specifically including those causing skin changes and ulceration, the aforementioned viral causes become less likely.

Zika virus is known to cause nervous system pathology, including microcephaly and other brain changes in fetuses. Ocular manifestations can occur in these fetuses, with abnormalities affecting the optic nerve, macula, and peri-macular areas.⁴ These pathologies have been most apparent in Brazil, which was the location of the 2015–2016 Zika virus epidemic, and the home country of this patient. Guillain-Barre syndrome has also been found to occur as a result of Zika infection in adults.⁵ The temporal relationship in this case, combined with a lack of other recent illness, suggests a Zika-induced ciliary ganglionitis resulting in tonic pupil, although a causal relationship has not been proven. An indirect mechanism may be ciliary ganglion trauma from orbital inflammation and soft-tissue swelling during active Zika infection.

Conclusion

This case is the first description in the literature, to the best of our knowledge, of an association between Zika virus and Adie's tonic pupil. Zika virus should be considered a possible cause of Adie's tonic pupil and further cases described. Confirmation of a causal relationship may lead to improved virological understanding of Zika.

Verbal and written consent was gained from the patient to write and publish this case report.

Pupillometer key (for Figure 1 and Figure 2)

INIT = Initial pupil diameter (mm), END = Maximal pupil constriction (mm), DELTA = Percentage change between INIT + END, LAT = Latency between flash and onset of pupil constriction (s), ACV = Average pupil constriction velocity (mm/s), MCV = Maximal pupil constriction velocity (mm/s), ADV = Average dilation velocity (mm/s), T75 = Time to 75% redilation (s)

References

1. Somlai J. The most important disorders of the pupillomotor pathway in the clinical practice. In: Somlai J, Kovács T, editors. Neuro-ophthalmology. Switzerland: Springer; 2016. P. 463-70.
2. National Organization for Rare Disorders (NORD) [Internet]. Danbury; c2016. Wilhelm H. Adie Syndrome; 2016 [cited 28 Feb 2018]. Available from: <https://rarediseases.org/rare-diseases/adie-syndrome/>
3. Heger T, Kolling GH, Dithmar S. [Atypical tonic pupil as a complication of chickenpox infection]. Ophthalmologe. 2003 Apr;100(4):330-3. German.
4. De Paula Freitas B, de Oliveira Dias JR, Prazeres J, et al. Ocular Findings in Infants With Microcephaly Associated With Presumed Zika Virus Congenital Infection in Salvador, Brazil. JAMA Ophthalmol. 2016;134(5):529-35.
5. World Health Organisation [Internet]. Geneva: World Health Organisation; 2016. Zika virus, microcephaly and Guillain-Barre syndrome. [cited Aug 2016]. Available from: <http://www.who.int/emergencies/zika-virus/situation-report/7-april-2016/en/>

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