

Optical coherence tomography of macular atrophy associated with microcephaly and presumed intrauterine Zika virus infection

Atrofia macular na tomografia de coerência óptica associada a microcefalia e infecção presumida por Zika vírus

ADRIANA GONDIM DE MOURA CAMPOS¹, RODRIGO PESSOA CAVALCANTI LIRA², TIAGO EUGENIO FARIA E ARANTES³

ABSTRACT

This case report describes the retinal optical coherence tomography (OCT) findings in a microcephalic infant with macular atrophy presumably caused by intrauterine Zika virus infection. OCT demonstrated atrophy of the outer retinal layers and choriocapillaris, including the outer nuclear layer and ellipsoid zone, associated with retinal pigment epithelium hyper-reflectivity and increased OCT penetration into deeper layers of the choroid and sclera. A major concern associated with this infection is the apparent increased incidence of microcephaly in fetuses born to mothers infected with the Zika virus. It is becoming increasingly difficult to ignore the upsurge in congenital microcephaly observed in Brazil. Recently, ocular findings in infants with microcephaly associated with intrauterine Zika virus infection have been described. This is the first report of OCT imaging of macular atrophy in a child with presumed Zika virus infection-associated microcephaly.

Keywords: Retina; Microcephaly; Zika virus; Tomography, optical coherence; Eye manifestations

RESUMO

Este relato de caso descreve os achados da tomografia de coerência óptica (TCO) da retina de uma criança com microcefalia e atrofia macular presumivelmente causada por infecção intra-uterina pelo vírus Zika. Tomografia de coerência óptica demonstrou camadas externas da retina e atrofia coriocapilar, incluindo a camada nuclear externa e zona de elipsóide, associada a hiperreflectividade do epitélio pigmentar da retina e aumento de penetração da tomografia de coerência óptica em camadas mais profundas da coróide e esclera. Uma grande preocupação associada com esta infecção é o aumento aparente da incidência de microcefalia em fetos nascidos de mães infectadas com o vírus Zika. É cada vez mais difícil ignorar o surto de microcefalia congênita observada no Brasil. Recentemente, foram descritos achados oculares em crianças com microcefalia associados à infecção pelo vírus Zika intra-uterino. Este é o primeiro relato de tomografia de coerência óptica com atrofia macular em uma criança com microcefalia associada a infecção presumida por vírus Zika.

Descritores: Retina; Microcefalia; Zika vírus; Tomografia de coerência óptica; Manifestações oculares

INTRODUCTION

Zika virus (ZIKV) is an emerging mosquito-borne pathogen of growing global public health importance. In Brazil, clusters of cases of an acute exanthematous illness have been reported from various regions since late 2014, and in April 2015, ZIKV was identified as the etiologic agent⁽¹⁾.

A dramatic increase in cases of microcephaly was also reported from 2014 to 2015. After preliminary clinical, epidemiological, and laboratory investigations, the Ministry of Health of Brazil recognized the potential relationship of this increase with the ongoing Zika outbreak. Detection of the ZIKV genome was reported in cases of congenital malformations as well as in the amniotic fluid of two pregnant women carrying fetuses with microcephaly⁽¹⁾.

Ocular findings in 17 eyes of 10 infants with microcephaly associated with intrauterine ZIKV infection were recently described. These consisted of focal pigment mottling of the retina and chorioretinal atrophy in 11 of the 17 eyes⁽²⁾.

Here we describe the retinal optical coherence tomography (OCT) findings in a microcephalic infant with macular atrophy presumably caused by intrauterine ZIKV infection.

CASE REPORT

A 1-month-old microcephalic infant (head circumference=28 cm) with a macular scar was referred for ophthalmologic evaluation. He

was born via spontaneous vaginal delivery at 38 weeks of gestation to a 31-year-old woman. At delivery, the mother was immune to rubella and had negative serologies for toxoplasmosis, cytomegalovirus, syphilis, herpes, HIV, and dengue virus. The pregnancy was uncomplicated except for a history of a self-limited exanthema at the 18th gestational week. There was no history of consumption of tobacco, alcohol, or illicit drugs during pregnancy. Family history was not significant for known medical or genetic conditions.

The child was clinically diagnosed with presumed intrauterine ZIKV infection. A computed tomography disclosed thinning of the cerebral parenchyma, enlargement of the ventricles and subdural space, and sparse foci of calcification in the cerebral cortex and periventricular regions.

The ophthalmological exam was normal except for the presence of a single area of well-defined chorioretinal atrophy in the macula of the left eye. OCT (Spectralis OCT, Heidelberg Engineering, Germany) of the lesion demonstrated atrophy of the outer retina, including the outer nuclear layer and ellipsoid zone, associated with retinal pigment epithelium (RPE) hyper-reflectivity and increased penetration of OCT into deeper layers of the choroid and sclera (Figure 1).

DISCUSSION

Currently, diagnosis of ZIKV-related microcephaly is based on history and clinical manifestations. Serological tests are not commercially

Submitted for publication: March 29, 2016
Accepted for publication: June 9, 2016

¹ Universidade Federal de Pernambuco (UFPE), Recife, PE, Brazil.

² Universidade Estadual de Campinas (UNICAMP), Campinas, SP, Brazil.

³ Universidade Federal de São Paulo (UNIFESP), São Paulo, SP, Brazil.

Funding: No specific financial support was available for this study.

Disclosure of potential conflicts of interest: None of the authors have any potential conflict of interest to disclose.

Corresponding author: Adriana Gondim de Moura Campos. Rua Neto Mendonça, 230/1.402 - Recife, PE - 52050100 - Brazil - E-mail: adri.gondim@gmail.com

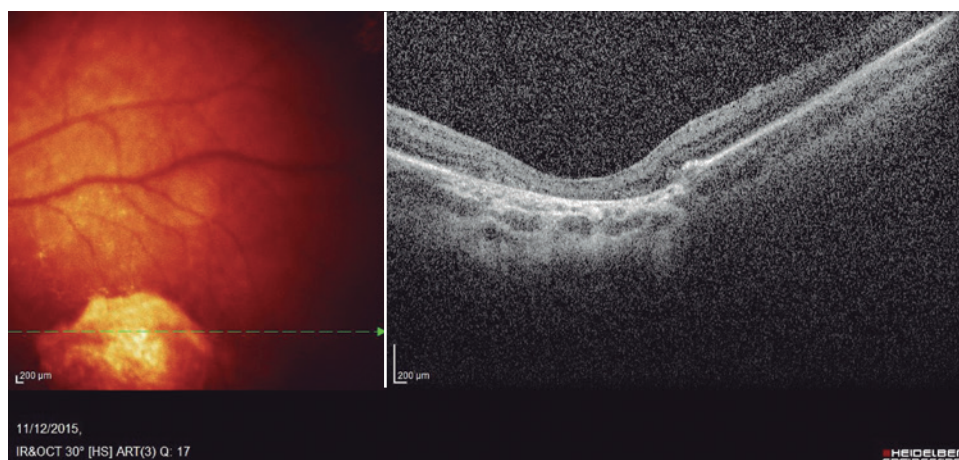


Figure 1. Spectral domain OCT of a macular lesion in an infant with presumed Zika virus-associated microcephaly, demonstrating retinal thinning with atrophy of the outer retina, including the outer nuclear layer and ellipsoid zone, associated with retinal pigment epithelium hyper-reflectivity and increased penetration of OCT into deeper layers of the choroid and sclera.

available. The definitive laboratory method to diagnose ZIKV infection is real time-PCR, which has limited utility after the acute stage⁽²⁾.

Chorioretinal disorders are associated with microcephaly of varying etiologies, including infections (STORCH complex)⁽³⁾ and genetic conditions⁽⁴⁾. Intrauterine infection with the West Nile Virus, another flavivirus, was also reported to cause chorioretinal scarring⁽³⁾.

Imaging of congenital toxoplasmosis scars with OCT reveals retinal thinning, RPE hyper-reflectivity, excavation, intraretinal cysts, and fibrosis⁽⁵⁾. Toxoplasmic retinochoroidal scars can be classified in four different patterns: atrophic retinochoroidal scar, elevated scar, combined scar, and deep scars⁽⁶⁾. Similarly to toxoplasmosis, our patient's OCT disclosed retinal thinning and RPE hyper-reflectivity with marked atrophy of the outer retinal layer; however, minimal distortion of the inner layers was observed.

CONCLUSIONS

Zika virus is an emerging mosquito-borne pathogen of growing global public health importance which possibly caused an unusual increase in the number of children born with microcephaly in 2015 in Brazil.

We could only document OCT findings in one patient with macular atrophy. It may well be that different types of lesions will show other OCT patterns.

To our knowledge, this is the first report of OCT imaging of macular atrophy in a child with presumed ZIKV-associated microcephaly. Further studies are needed to establish a definitive association between ZIKV infection and congenital malformations and to evaluate the spectrum of ocular manifestations and the natural history of the disease.

REFERENCES

1. Brasil. Ministério da Saúde. Secretaria de Vigilância em Saúde. Departamento de Vigilância das Doenças Transmissíveis. Protocolo de vigilância e resposta à ocorrência de microcefalia relacionada à infecção pelo vírus Zika [Internet]. [citado 2016 Jan 18]. Disponível em: <http://portalsaude.saude.gov.br/images/pdf/2015/dezembro/09/Microcefalia---Protocolo-de-vigilancia-e-resposta---versao-1---09dez2015-8h.pdf>
2. de Paula Freitas B, de Oliveira Dias JR, Prazeres J, Sacramento GA, Ko AI, Maia M, et al. Ocular findings in infants with microcephaly associated with presumed Zika virus congenital infection in Salvador, Brazil. *JAMA Ophthalmol*. 2016.Epub ahead of print.
3. Mets MB, Chhabra MS. Eye manifestations of intrauterine infections and their impact on childhood blindness. *Surv Ophthalmol*. 2008;53(2):95-111.
4. Jones GE, Ostergaard P, Moore AT, Connell DC, Williams D, Quarrell O, Brady AF, et al. Microcephaly with or without chorioretinopathy, lymphoedema, or mental retardation (MCLMR): review of phenotype associated with KIF11 mutations. *Eur J Hum Genet*. 2013;22(7):881-7.
5. Garg S, Mets MB, Bearely S, Mets R. Imaging of congenital toxoplasmosis macular scars with optical coherence tomography. *Retina*. 2009;29(5):631-7.
6. Goldenberg D, Goldstein M, Loewenstein A, Hahot-Wilner Z. Vitreal, retinal, and chorioid findings in active and scarred toxoplasmosis lesions: a prospective study by spectral-domain optical coherence tomography. *Graefes Arch Clin Exp Ophthalmol*. 2013;251(8):2037-45.