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Teaching NeuroImage: Rapid Identification of Infectious Optic Neuritis by Next-Generation Sequencing

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Yulu Liu: Major role in the acquisition of data

Yongguang Liu: Major role in the acquisition of data

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Xuejun Fu: Major role in the acquisition of data; Study concept or design

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A 52-year-old, HIV-negative female presented with one-year of bilateral painless central vision loss

that worsened over three months. A medical examination revealed Argyll-Robertson pupil (i.e., accommodates but does not react to light). Single-read next-generation sequencing (NGS) of the cerebrospinal fluid (CSF) identified 89 sequence reads corresponding to treponema, elevated CSF protein and pleocytosis, negative anti-aquaporin-4 and anti-myelin oligodendrocyte glycoprotein antibody levels, retinal nerve fiber layer (RNFL) thinning, and bilateral nerve sheath enhancement (Figure 1-2). The patient received penicillin and oral prednisolone, which improved her vision. Infectious causes of optic neuritis are complex (Table).^[1,2] NGS is an emerging method with the potential to rapidly identify atypical optic neuritis.

Teaching Slides -- <http://links.lww.com/WNL/B705>

References:

1. Eggenberger E R. Infectious Optic Neuropathies. *Continuum (Minneap Minn)*, 2019,25(5):1422-1437.
2. Abel A, McClelland C, Lee MS. Critical review: Typical and atypical optic neuritis. *Surv Ophthalmol*. 2019; 64(6): 770-779.

Figure 1. Ocular Images.

Legend: Optical coherence tomography of the retinal nerve fiber layer (RNFL) revealed bilateral thinning (A). Fundus angiography was unremarkable (B).

Figure2. Brain Magnetic Resonance Imaging (MRI) Images.

Legend: FLAIR (A) showed white matter lesions. T2-hyperintense lesions and atrophy in the bilateral optic nerve (arrowhead) were observed (B-C). T1-fat-saturation (D) and T1-gadolinium enhancement (E-F) demonstrated the entire optic nerve sheath (including chiasmal) (arrow).

Table Common pathogens of infectious optic neuropathies

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Viral	
Herpes simplex virus, Epstein-Barr virus, Chikungunya virus, Dengue virus, Influenza viruses, Mumps virus, Varicella-zoster virus, Cytomegalovirus, Human immunodeficiency virus, Measles virus, Rift valley fever virus, Rubella virus, Zika virus, West Nile virus	
Bacterial	
Treponema pallidum, Mycobacterium tuberculosis, Bartonella henselae bacteria, Rickettsii, Bacterium Borrelia burgdorferi, Leptospire, Tropheryma whipplei, Mycobacterium leprae, Brucella genus	
Fungi	
Cryptococcus neoformans, Mucorales	
Parasites	
Toxoplasma gondii, Toxocara canis, Toxocara cati, Plasmodium, Nematodes, Onchocerca	
Note: All pathogens listed in the table can be detected through next generation sequencing.	

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