

# Optic neuritis after mRNA COVID-19 vaccination; A case report

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## Optic neuritis after mRNA COVID-19 vaccination; A case report

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### A Key Clinical Message:

Our case reported a 22 years old male presented with headache, and sudden vision loss, ten days after receiving the first dose of COVID-19 vaccination. Counting fingers in both eyes was his visual acuity on examination and bilateral optic disc edema on funduscopy was found. Brain MRI was normal. After methylprednisolone pulse therapy, plasmapheresis, and IV cyclophosphamide courses, the optic disc edema disappeared, and his visual function did not improve. Reported cases of optic neuritis develop after mRNA COVID-19 vaccination are limited.

**Keywords:**

Case report, optic neuritis, COVID-19 vaccination, optic disc edema.

**Introduction:**

Although vaccination is an important and effective method to overcome the COVID-19 disease, flares or new onset of many auto-immune diseases have been described (1). Optic neuritis (ON) presented by sudden visual loss, and orbital pain. Many factors may play a role in its pathogenesis like trauma, demyelination, infection, autoimmunity, and granulomatous (2). Previous researches revealed that some vaccinations against influenza, polio, tetanus, and others, may cause ON (3).

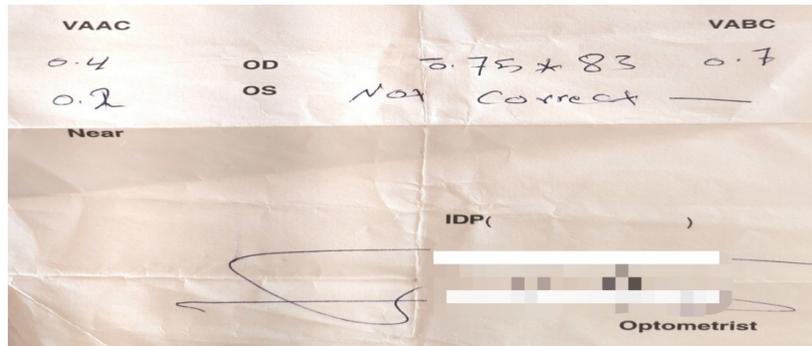
We present a case of bilateral ON, leading to blindness related to the mRNA COVID-19 vaccination.

**Case Presentation:**

A 22-year-old male, non-smoker, non-alcoholic, was seen due to headache and sudden loss of vision in both eyes and headache. Ten days before these symptoms, he received the first dose of mRNA COVID-19 vaccination, and at that time, he complained of malaise, low grade fever and arm pain, persisted for 3 days. COVID-19 polymerase chain reaction test was negative.

He had no previous medical history, or family history.

Ophthalmological examination revealed counting fingers in both eyes (Image-1).



The indirect light reflex was normal, but the afferent pupillary defect was positive. Bilateral optic disc edema was noted on funduscopy. Visual field imaging is shown (Figure 1,2).

**Figure-1:**

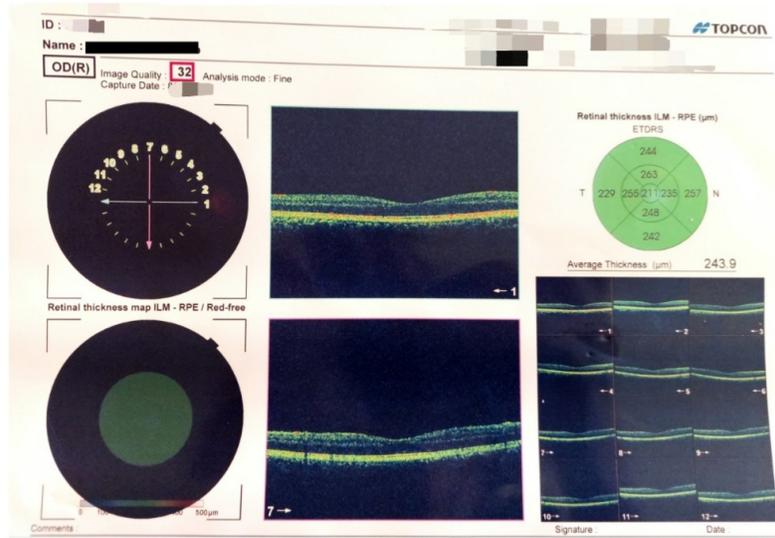
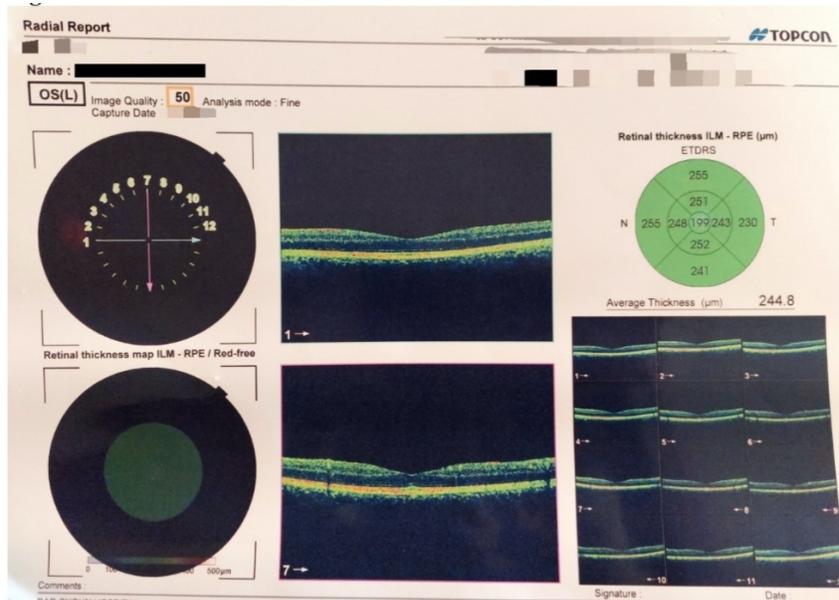


Figure-2:

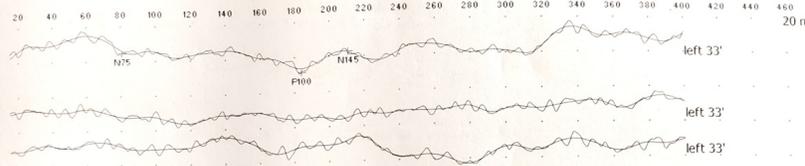


Visual evoked potentials (VEPs) revealed bilateral demyelinating optic neuritis, as shown in (Figure-3).

Figure-3:

**1. Visual pattern EP**

*Ich: Oz-Cz*



**Latencies**

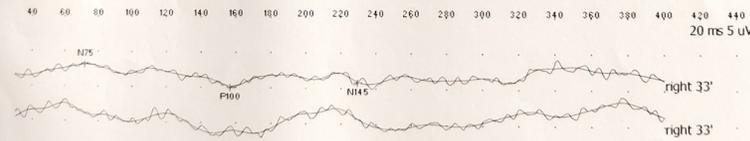
Stimulus	Chan-nel	Compo-nent	Lat., ms	Norm., ms	Dev., %
left eye 33'	I	N75	80.6	75	+7.47
		P100	184	100	+83.4
		N145	211	151	+39.8

**Amplitudes**

Stimulus	Chan-nel	Compo-nents	Ampl., uV(/)	Norm., uV	Dev., %
left eye 33'	I	N75-P100	3.33	9.8	-66
		P100-N145	2.76	8.4	-67.1

**2. Visual pattern EP**

*Ich: Oz-Cz*



**Latencies**

Stimulus	Chan-nel	Compo-nent	Lat., ms	Norm., ms	Dev., %
right eye 33'	I	N75	72	75	-4

		P100	157	100	+56.1
		N145	229	151	+52.3

**Amplitudes**

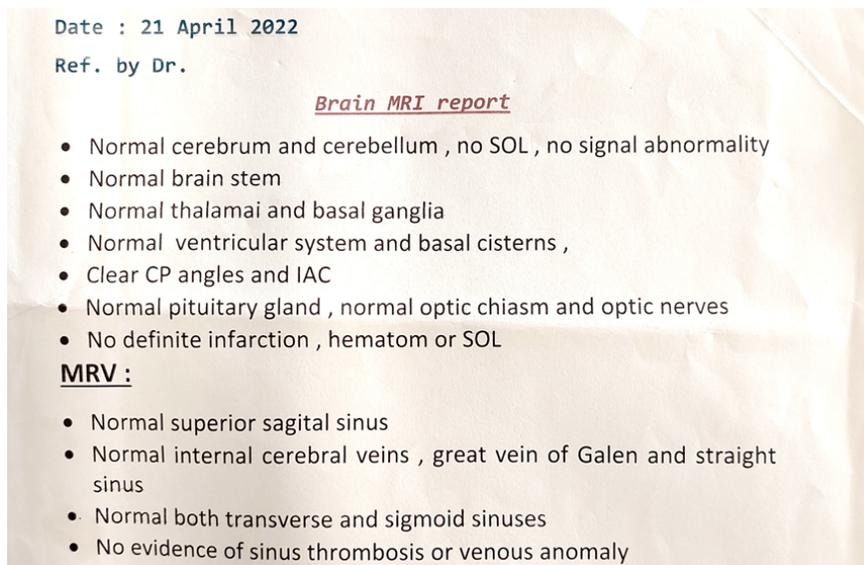
Stimulus	Chan-nel	Compo-nents	Ampl., uV(/)	Norm., uV	Dev., %
right eye 33'	I	N75-P100	3.26	9.8	-66.7
		P100-N145	0.86	8.4	-89.8

دراسة التماسك البصري المنهجي في سوداوات  
 العين P100 الخفيف من نتائجها دلالة لا  
 النتيجة: دراسة تقيس احتمال تمييز  
 ما درجته يسكو الحمار

Laboratory tests including WBC, CRP, ESR, urea, creatinine, Vit B12 and liver enzymes were within normal ranges. The infectious and virology profiles including HIV, hepatitis C, hepatitis B, syphilis, TB, and perlosy were negative. The immune profile including ANA, anti-phospholipid antibodies, C-ANCA, P-ANCA, and IgG4 were negative. Anti-aquaporin 4 antibody and anti-myelin oligodendrocyte glycoprotein antibody were also negatives. Cerebral spinal fluid analysis was normal.

Brain magnetic resonance imaging, and magnetic resonance vein were normal, and no findings suggestive of demyelinating disease or compressive lesions were found (Image-2).

### Image-2:



Optic nerve MRI was normal.

Neck, thoracic, abdominal, and pelvic CT scans were normal.

He was treated with 1000mg/IV/day methylprednisolone for 5 days followed by 70 mg/day oral prednisolone. Ophthalmological examination showed that disappearing of the bilateral optic disc swelling, without any improvement of visual capacity. The headache disappeared.

Another course of methylprednisolone pulse therapy for 5 days and 750 mg/IV/M2 cyclophosphamide every 15 days had been initiated, in addition to 5 courses of plasmapheresis. His visual function showed no improvement after the 6 doses of cyclophosphamide and 60 mg/day prednisone.

### Discussion:

Many complications following vaccination, including ocular manifestations had been seen. Uveitis, vision loss, papilledema, central serous retinopathy, central retinal vein occlusion, and others, have been reported (4,5). ON after vaccination against influenza, polio, hepatitis B, diphtheria, tetanus, and others, giving rise to permanent visual loss in some cases has also been mentioned (3,6).

Molecular mimicry, superantigen stimulation, and bystander activation, may play a role in the development of demyelinating lesions of the nervous systems (7). Immune complex may cause vascular damage, leading to perivascular inflammation, vascular permeability, and blood-brain barrier disruption, and the last event allows antibodies to enter the brain causing demyelination (8).

The mechanism of ON following mRNA vaccination is still unclear. Increased serum cortisol, free extracellular mRNA, and polyethylene glycol may be the cause (4,9).

Here, an autoimmune response leading to bilateral ON was triggered by mRNA COVID-19 vaccination, while it is difficult to prove the association with the causation of vaccines (2,3,6,7).

Critical visual loss occurs suddenly with pain, and Only 0.4% of patients develop symptoms in both eyes simultaneously (5,7,9), as in our case. VEP studied, the visual function, and Magnetic Resonance Imaging considered as a sensitive indicator of demyelination in ON (10,11), as in our patient.

A Cochrane review evaluating the beneficial effects of corticosteroids in terms of visual recovery, and visual field.

When these patients had poor response to steroids, immunotherapy, plasmapheresis or intravenous immunoglobulin should be initiated at the earliest (4,5,7).

The long-term visual outcome of ON is good, although one in three patients remains visually impaired, and this is usually accompanied by more extensive lesions on magnetic resonance imaging and lower levels of VEP (4,5,7). In our case, the prognosis was very poor ended with blindness even there were no extensive lesions on magnetic resonance imaging.

### **Conclusion :**

Optic neuritis following COVID-19 vaccination against rarely reported in the literature. Only a total of 8 reports on 9 patients have been published to date, 8 of 9 were females (5,7,9,11). Our case is the third case of post-COVID-19 vaccination optic neuropathy in a male. The cases affect young females more, with improvement with IV methylprednisolone therapy for most of them, after 6-14 days after the COVID-19 vaccination, meanwhile, our patient is a male who developed ON after 10 days of vaccination and did not respond to IV methylprednisolone therapy

In conclusion, several cases of optic neuropathy have been reported, with good prognoses with treatments. Additional studies are recommended.

### **Author Contributions:**

**Raghad Tarcha:** Conceptualization; data curation; investigation; writing – original draft; writing – review and editing; guarantor. **Afraa Ghazal:** Conceptualization; data curation; formal analysis; project administration; validation; writing – original draft. **Lama Al-Darwish:** Investigation; supervision; validation; writing – original draft. **Hoda Abdoh:** Writing – original draft; writing – review and editing. **Maysoun Kuds:** Project administration; supervision; writing – original draft; review and editing.

### **Funding Information:**

No funding.

### **Conflict of Interest Statement**

The authors have no conflicts of interest to declare.

### **Ethical Approval:**

This case report was according to the Declaration of Helsinki. The ethical approval for this report was not necessary.

### **Consent :**

Written informed consent was obtained from the patient to publish this report in accordance with the journal's patient consent policy.

### **References :**

1- Velikova T, Georgiev T. SARS-CoV-2 vaccines and autoimmune diseases amidst the COVID-19 crisis. *Rheumatol Int.* 2021 Mar;41(3):509-518. doi: 10.1007/s00296-021-04792-9. Epub 2021 Jan 30. PMID: 33515320; PMCID: PMC7846902.

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2- Ciapă MA, Șalaru DL, Stătescu C, Sascău RA, Bogdănici CM. Optic Neuritis in Multiple Sclerosis-A Review of Molecular Mechanisms Involved in the Degenerative Process. *Curr Issues Mol Biol.* 2022 Sep 2;44(9):3959-3979. doi: 10.3390/cimb44090272. PMID: 36135184; PMCID: PMC9497878.

3- Kawasaki A, Purvin VA, Tang R. Bilateral anterior ischemic optic neuropathy following influenza vaccination. *J Neuroophthalmol.* 1998 Mar;18(1):56-9. PMID: 9532544.

4- Elnahry AG, Asal ZB, Shaikh N, Dennett K, Abd Elmohsen MN, Elnahry GA, Shehab A, Vytopil M, Ghaffari L, Athappilly GK, Ramsey DJ. Optic neuropathy after COVID-19 vaccination: a report of two cases. *Int J Neurosci.* 2023 Dec;133(8):901-907. doi: 10.1080/00207454.2021.2015348. Epub 2021 Dec 14. PMID: 34906029.

5- García-Estrada C, Gómez-Figueroa E, Alban L, Arias-Cárdenas A. Optic neuritis after COVID-19 vaccine application. *Clin Exp Neuroimmunol.* 2022 May;13(2):72-74. doi: 10.1111/cen3.12682. Epub 2021 Nov 22. PMID: 34900001; PMCID: PMC8653244.

6- Stewart O, Chang B, Bradbury J. Simultaneous administration of hepatitis B and polio vaccines associated with bilateral optic neuritis. *Br J Ophthalmol.* 1999 Oct;83(10):1200-1. doi: 10.1136/bjo.83.10.1194g. PMID: 10636652; PMCID: PMC1722811.

7- Stübgen JP. A literature review on optic neuritis following vaccination against virus infections. *Autoimmun Rev.* 2013 Aug;12(10):990-7.

8- Stevenson VL, Acheson JF, Ball J, Plant GT. Optic neuritis following measles/rubella vaccination in two 13-year-old children. *Br J Ophthalmol.* 1996 Dec;80(12):1110-1. doi: 10.1136/bjo.80.12.1110. PMID: 9059281; PMCID: PMC505714.

9- AbidHaseeb, etal. Optic neuropathy after COVID-19 vaccination: Case report and systematic review. *Neuroimmunology Reports.* Volume 2, 2022, 100121. <https://doi.org/10.1016/j.nerep.2022.100121>.

10- Katayama H, Itoh K, Hashimoto M. Bilateral Optic Neuritis after COVID-19 mRNA Vaccination. *Case Rep Ophthalmol.* 2022 Aug 5;13(2):578-583. doi: 10.1159/000525938. PMID: 36160483; PMCID: PMC9459513.

11- Kantorová E, Ziak P, Kurča E, Koyšová M, Hladká M, Zeleňák K, Michalik J. Visual Evoked Potential and Magnetic Resonance Imaging are More Effective Markers of Multiple Sclerosis Progression than Laser Polarimetry with Variable Corneal Compensation. *Front Hum Neurosci.* 2014 Jan 22;8:10. doi: 10.3389/fnhum.2014.00010. PMID: 24478676; PMCID: PMC3898055.

### Figure legends:

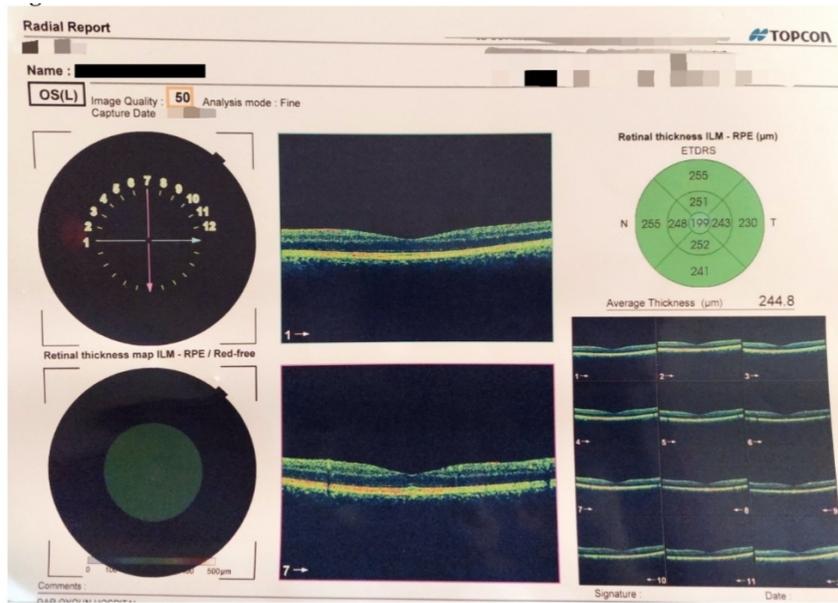
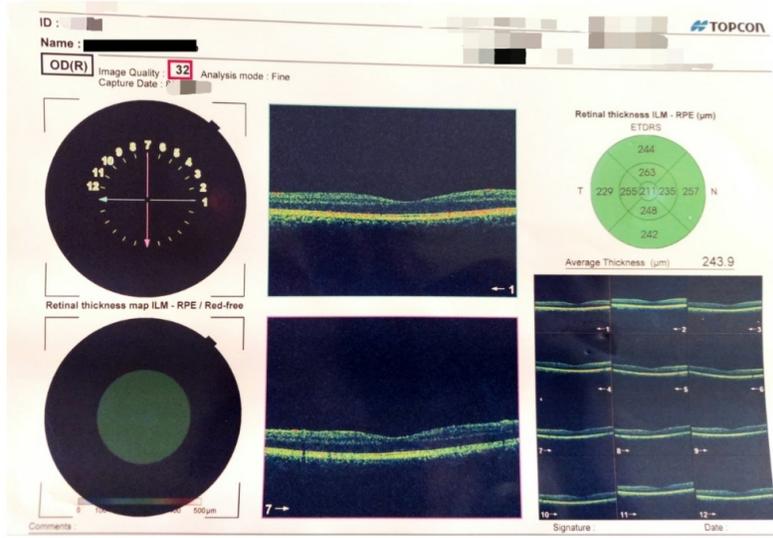
**Image-1:** Ophthalmological examination revealed counting fingers in both eyes.

**Image-2:** Brain MRI report.

**Figure-1:** Visual field imaging (Right eye).

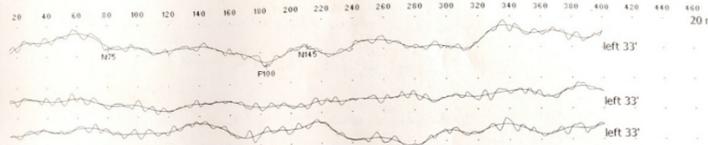
**Figure-2:** Visual field imaging (Left eye).

**Figure-3:** Visual evoked potentials (VEPs) revealed bilateral demyelinating optic neuritis.



**1. Visual pattern EP**

*lch: Oz-Cz*



**Latencies**

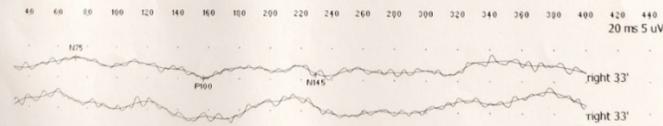
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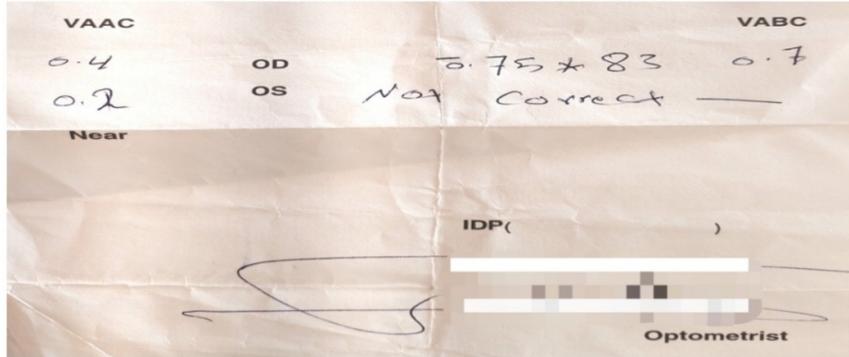
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دراسة العنصر الكهربائي المراد منه هو دوائر  
 المراد P100 الجواب هنا فترتيه دلالت لا.  
 النتيجة: دراسة توضح احتمال كسر  
 مدار في سلكو الحمار



Date : 21 April 2022

Ref. by Dr.

Brain MRI report

- Normal cerebrum and cerebellum , no SOL , no signal abnormality
- Normal brain stem
- Normal thalami and basal ganglia
- Normal ventricular system and basal cisterns ,
- Clear CP angles and IAC
- Normal pituitary gland , normal optic chiasm and optic nerves
- No definite infarction , hematoma or SOL

MRV :

- Normal superior sagittal sinus
- Normal internal cerebral veins , great vein of Galen and straight sinus
- Normal both transverse and sigmoid sinuses
- No evidence of sinus thrombosis or venous anomaly