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Potential Association Between COVID-19 Vaccination and Facial Palsy: Three Cases With Neuroimaging Findings

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Abstract

Acute onset Facial palsy was reported in four vaccinated participants in the BNT162b2 (Pfizer-BioNTech) vaccine clinical trials published on December 10, 2020. So far, few cases of Facial palsy among the mRNA vaccine groups have been previously documented in the literature. Facial palsy is cited as medically attended adverse event following immunization on April 12, 2021, after the first dose of the approved Pfizer-BioNTech COVID-19 vaccines for preventive immunization for SARS-CoV-2 is administrated to the population in Turkey. This study is aimed to describe clinical and magnetic resonance imaging features of three patients, who developed acute onset peripheral facial paralysis after administration of the BNT162b2 vaccine, without any previous medical condition. The first patient presented with right sided facial palsy within the same day following the vaccine was administrated, while the second patient presented with left sided facial palsy 2 months after vaccination. The third patient, on the other hand, presented with right sided facial palsy and abducens nerve (CN VI) paralysis two days after vaccine was administrated.

Keywords

facial palsy, COVID-19, facial nerve, COVID-19 vaccines

Introduction

Following the outbreak of a series of cases with pneumonia reported in mid-December in Wuhan (Hubei province),[1-4] COVID-19 has spread rapidly all over the world since the beginning of 2020, and it was declared as a pandemic by the World Health Organization on March 11, 2020.[5] Since the beginning of the pandemic, preventive immunization via vaccines has been vigorously aimed. US Food and Drug Administration (FDA) issued emergency use authorization for the BNT162b2 (Pfizer-BioNTech) vaccine in December 2020. Acute facial nerve palsy is listed as a rare adverse event of Pfizer-BioNTech COVID-19 Vaccines within the post-marketing phase.[6]

This study is aimed to describe clinical and magnetic resonance imaging (MRI) features of 3 young patients (ages ranging between 20 and 30), who developed acute onset peripheral facial paralysis after administration of the BNT162b2 vaccine, without history of known previous medical condition.

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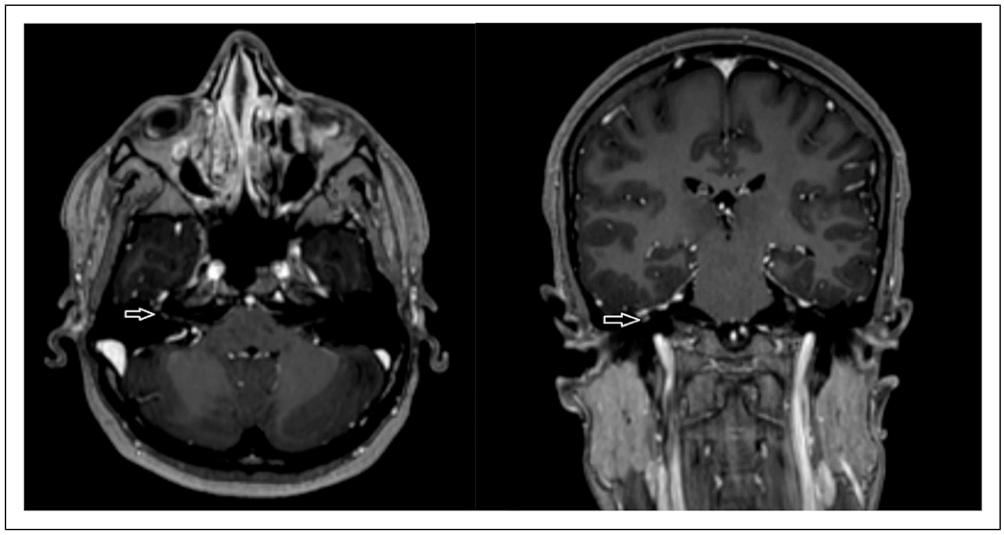

Figure 1. Post-contrast fat saturated T1-weighted axial (left) and coronal MR images of the patient demonstrated diffuse contrast enhancement in the labyrinthine segment of the facial nerve and the geniculate ganglion (black arrows). The imaging findings of the contralateral facial nerve were unremarkable.

Description of Cases

Case 1

A 23-year-old man, without any past medical history, presented with weakness of right facial muscles, lagophthalmos, and headache compatible with facial palsy. At the same day he was administrated the first dose of BNT162b2 (Pfizer-BioNTech) vaccine. The patient had no history of upper respiratory tract infection, trauma, or any other trigger within last 6 months. Cranial MRI, which was performed 2 months after the onset of symptoms, showed prominent diffuse contrast enhancement in the labyrinthine, tympanic, and mastoid portions of the right facial nerve and also in the right geniculate ganglion. (Figure 1). The MRI findings of cerebral parenchyma was unremarkable for any other pathology. The laboratory features including complete blood count were within the normal range. Prednisolone was started promptly.

Case 2

A 27-year-old man, without any underlying disease including varicella-zoster, herpes simplex virus-1 or Lyme infection, experienced rapid-onset left sided facial droop, drooping of the mouth to left, a left-sided cervicogenic headache. Physical examination revealed a left-sided hemifacial paralysis. The patient did not report fever, nausea, vomiting, any other systemic symptoms, or trauma within the last 6 months. He was administrated the first dose of BNT162b2 (Pfizer-BioNTech) vaccine 2 months ago. Laboratory features including thyroid hormone panel were within normal levels. Cerebrospinal fluid (CSF) basic parameters (protein, cellularity, viral pathogen PCR panel, and glucose levels) were normal, and CSF culture was negative. Cranial MRI, which performed 18 days after the patient admitted with acute onset facial palsy, revealed linear and non–mass-like gadolinium enhancement in the internal auditory canal portion of the left facial nerve (Figure 2). The patient partially responded to the oral prednisone treatment and did not totally return to the baseline.

Case 3

A 20-year-old woman without any significant past medical history, developed a sudden onset dizziness after she had been administrated the second dose BNT162b2 (Pfizer-BioNTech) vaccine 2 days ago. Three days later, the patient developed limitation of his right eye movement in lateral gaze, binocular diplopia, headache, and right facial muscle weakness. Physical examination revealed both right sided facial palsy and right lateral rectus palsy. Patient had no history of neck stiffness, photophobia, phonophobia, upper respiratory tract infection, trauma, or any other trigger within last 6 months. Cerebrospinal fluid basic parameters (protein, cellularity, and glucose levels) were normal. Both CSF viral pathogen PCR panel and culture were negative. Cranial MRI, which was performed 10 days after the vaccination, demonstrated vivid and non-nodular gadolinium enhancement in the labyrinth portion of the right facial nerve, extending into the right geniculate ganglion (Figure 3). Laboratory studies including complete blood count displayed no abnormality. High-dose intravenous methylprednisolone (1gr/day for 10 days) was started promptly. The patient showed excellent response to the IV treatment and full symptomatic recovery was achieved.

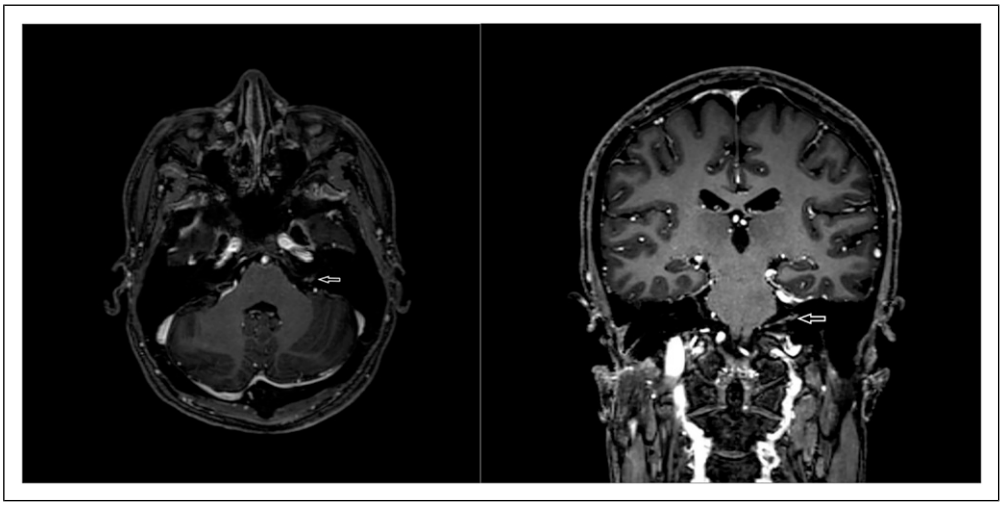

Figure 2. In the axial (left) and coronal (right) views of post-contrast fat saturated T1-weighted images, linear and non–mass-like enhancement of the left facial nerve was detected in the internal auditory canal (black arrows). The imaging findings of the contralateral facial nerve were normal.

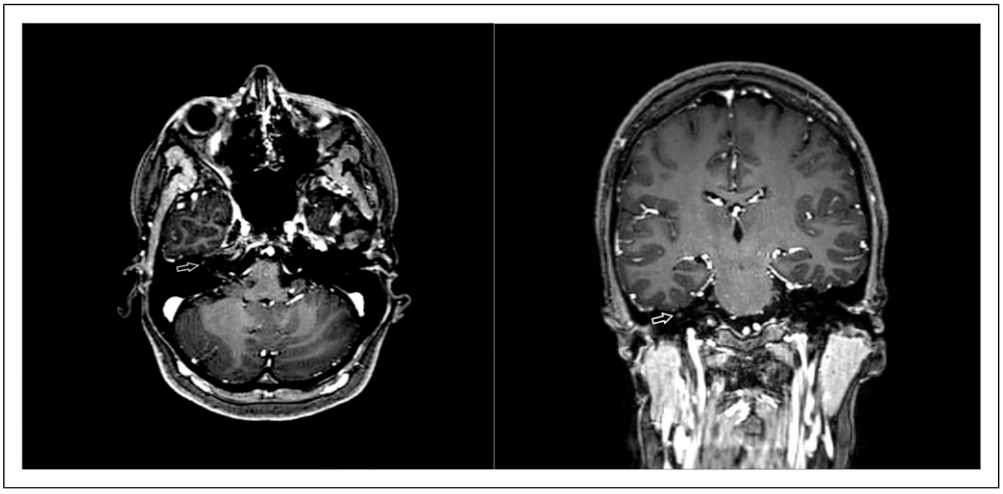

Figure 3. Axial (left) and coronal (right) post-contrast fat saturated T1-weighted images. The right geniculate ganglion shows vivid enhancement in the post-contrast images (black arrows).

Discussion

Since the beginning of COVID-19 pandemic, mass immunity is aimed to be established in population through native or preventive immunization of the population. Thus far, three novel COVID-19 vaccines have been approved by the US FDA. The BNT162b2 (Pfizer-BioNTech) vaccine was the first vaccine to achieve this authorization and millions of people worldwide have been vaccinated with it.[7]

Pathophysiologic mechanism of vaccine related facial palsy is unknown. The main hypothetical approach emphasizes that mechanisms such as activation of silent autoreactive T cells, innate immune activation due to interferon stimulation, cross-reactivity of host and viral antigens due to immune-mediated segmental demyelination or molecular mimicry may be associated with facial palsy and autoimmune reactions. Other specific potential pathophysiologic pathway links facial palsy and reactivation of latent herpes simplex virus in the geniculate ganglia.[8]

The highest incidence of idiopathic facial neuropathy is seen in individuals between 15 and 45 years old without any gender predomination.[9] In this case report, we reported three patients with acute onset facial palsy symptoms in correlation with relevant neuroimaging findings. The ages of the admitted patients range between 20 and 30 years. Among the three patients (2 males, 1 female), one patient also presented with both abducens and facial palsy. The detailed medical history of the patients have not indicated any history of viral etiology, systemic symptoms, trauma, or any other trigger within 6 months. Diagnostic studies; blood count and

biochemistry studies and CSF studies (cell count, protein, glucose, viral PCR panel, oligoclonal bands, and anti-MOG and anti-NMO antibody) were negative for any definitive etiopathogenesis. Cell culture panels were negative for any viral pathogen.

Magnetic resonance imaging is not necessary for the diagnosis of idiopathic facial neuropathy (facial palsy). However, MRI imaging of facial nerve usually rules out other etiopathologies such as neoplasia, congenital diseases, or infectious processes. Magnetic resonance imaging may demonstrate gadolinium contrast enhancement especially in the cisternal, intracanalicular, labyrinthine, and parotid segments.[10] Cisternal, intracanalicular, labyrinthine, and parotid segments are not expected to enhance typically within the healthy subjects.[11] Due to venous plexus surrounding the facial nerve as normal facial nerve faintly enhances in the geniculate ganglion, tympanic, and mastoid segments. At our institution, standard MRI imaging for evaluation of the facial nerve includes an internal acustic canal (IAC) protocol with the following special sequences for facial nerve; an axial 3 mm, T1-weighted sequence of the IAC angled perpendicular to dorsal aspect of the brainstem; an axial constructive interference in the steady-state (CISS) sequence (.6 mm) from the occipital bone to superior petrous ridge.

The MRI findings of all presented patients indicated that facial nerve dysfunction was not related with neoplastic or congenital etiologies as enhancement pattern is linear and not mass-like. MRI demonstrated vivid enhancement of ipsilateral labyrinth segment without any thickening relative to contralateral side following gadolinium administration in 2 of 3 patients with facial nerve dysfunction. Intense enhancement of the labyrinth segment is common in facial palsy and this finding has been stated to associate with the narrow calibration of the labyrinth segment and its vulnerability to ischemic injury.[12] Magnetic resonance imaging findings of a patient revealed vivid enhancement of geniculate ganglion which is expected to enhance faintly within the normal subjects.

Although there is currently insufficient evidence to support any causal relationship between COVID-19 vaccines and facial palsy, the temporal relationship between vaccination and facial palsy in our patient and the cases reported in the literature raises suspicion. The healthcare professionals should be vigilant for detecting individuals who develop facial palsy following COVID-19 immunization. More research is needed to assess the causal relationship and uncover potential pathophysiological mechanisms.

Limitations

This case series has some limitations. First, a limited number of outpatients who applied to Istanbul University-Cerrahpaşa Medical Faculty were examined, and the number of cases is very limited. Second, the immune status and antibody levels of the 3 patients presented are not available.

Declaration of conflicting interests

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Ethical approval

All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

Contributors

All the authors have made substantial contributions to conception and design, or analysis and interpretation of data.

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References

1. Polack FP, Thomas SJ, Kitchin N, et al. Safety and efficacy of the BNT162b2 mRNA COVID-19 vaccine. *N Engl J Med*. 2020;383(27):2603-2615. doi:10.1056/NEJMoa2034577.
2. Obermann M, Krasniqi M, Ewers N, Fayad J, Haeberle U. Bell's palsy following COVID-19 vaccination with high CSF antibody response. *Neurol Sci*. 2021;42:4397-4399. DOI: 10.1007/s10072-021-05496-5.
3. Repajic M, Lai XL, Xu P, Liu A. Bell's Palsy after second dose of Pfizer COVID-19 vaccination in a patient with history of recurrent Bell's palsy. *Brain Behav Immun Health*. 2021;13:100217. doi:10.1016/j.bbih.2021.100217.
4. Shemer A, Pras E, Einan-Lifshitz A, Dubinsky-Pertzov B, Hecht I. Association of COVID-19 vaccination and facial nerve palsy: a case-control study. *JAMA Otolaryngol Head Neck Surg*. 2021;147(8):739-743. doi:10.1001/jamaoto.2021.1259.
5. Zhu N, Zhang D, Wang W, et al. A novel coronavirus from patients with pneumonia in China, 2019. *N Engl J Med*. 2020;382(8):727-733. doi:10.1056/NEJMoa2001017.
6. Renoud L, Khouri C, Revol B, et al. Association of facial paralysis with mRNA COVID-19 vaccines: a disproportionality analysis using the world health organization pharmacovigilance database. *JAMA Intern Med*. 2021;181(9):1243-1245. doi:10.1001/jamainternmed.2021.2219.
7. Thomas SJ, Moreira ED Jr, Kitchin N, et al. Safety and efficacy of the BNT162b2 mRNA Covid-19 vaccine through 6 Months. *N Engl J Med*. 2021;385(19):1761-1773. doi:10.1056/NEJMoa2110345.
8. Eviston TJ, Croxson GR, Kennedy PG, Hadlock T, Krishnan AV. Bell's palsy: aetiology, clinical features and

multidisciplinary care. *J Neurol Neurosurg Psychiatry*. 2015; 86(12):1356-1361. doi:10.1136/jnnp-2014-309563.

9. Holland NJ, Bernstein JM. Bell's palsy. *BMJ Clin Evid*. 2014; 2014:1204.
10. Corrêa DG, Cañete LAQ, Dos Santos GAC, de Oliveira RV, Brandão CO, da Cruz LCH Jr. Neurological symptoms and neuroimaging alterations related with COVID-19 vaccine: Cause or coincidence? *Clin Imaging*. 2021;80:348-352. doi:10.1016/j.clinimag.2021.08.021.
11. Gupta S, Mends F, Hagiwara M, Fatterpekar G, Roehm PC. Imaging the facial nerve: a contemporary review. *Radiol Res Pract*. 2013;2013:248039. doi:10.1155/2013/248039.
12. Hong HS, Yi BH, Cha JG, et al. Enhancement pattern of the normal facial nerve at 3.0 T temporal MRI. *Br J Radiol*. 2010; 83(986):118-121. doi:10.1259/bjr/70067143.