



## Case report

# Acute disseminated encephalomyelitis after mumps infection in a vaccinated patient



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## ABSTRACT

Mumps is an infectious disease caused by a paramyxovirus. It can involve several organs in the acute stage of the infection, including central nervous system. (Rubin et al., 2015) [1] Neurological complications in the post-infectious period are also described, one of which is acute disseminated encephalomyelitis (ADEM). (Jonhson et al., 2004) [2] We present the case of an healthy young man previously vaccinated, who contracted ADEM after mumps.

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## Introduction

Mumps virus, one of the most neuroinvasive viruses, has seen its frequency greatly reduced since the inclusion of the MMR vaccine in the child and adolescent immunization program of many countries. Although rare since then, mumps can still occur, and benign meningitis is common in acute disease. ADEM after mumps infection has been described in the literature, usually without sequelae following adequate therapy.

## Case

A previously healthy 21-year-old adult male was brought by the mother to the emergency room with disorientation, weakness of the lower limbs and urinary retention of sudden onset. The mother related a period of fever, headache, myalgia, nausea and asthenia that had started 9 days before. No respiratory, genitourinary or gastrointestinal complaints and no other signs or symptoms. Upon physical examination, the patient was conscious but temporally and spatially disoriented, distractable, with myoclonus in the right hemiface, stiffness of the neck, generalized hyperalgesia without a clear sensory level, generalized hyperreflexia, grade 3 symmetrical paraparesis, and bilateral extensor responses. Patient was pyretic at entry, with blood pressure levels of 102/60 mmHg, bradycardia (heart rate of 40 beats per minute), normal pulmonary

auscultation, and with a distended and painful lower abdomen compatible with a bladder globe. He had no skin changes or palpable adenopathy. Arterial blood gas analysis was normal. ECG showed sinus bradycardia and chest X-ray was normal. Abdominal and renal ultrasound showed a bladder in repletion, with no changes in the walls or contents and no evident obstructive cause. Bladder catheter was placed with 1100 cc output of clear urine. Blood analyses and serum chemistry performed were normal, including C-reactive protein (1.37 mg/dl) and erythrocyte sedimentation rate (13 mm/h). Elevated urinary amylase (438 U/L - normal up to 321 U/L). Cranioencephalic and spine CT scan showed no lesions, and a lumbar puncture was subsequently performed. The analysis of the cerebrospinal fluid showed lymphocytic pleocytosis (134 leukocytes with predominance of mononuclear cells), high protein level (462 g/dl), erythrocytes 5/mm<sup>3</sup>, glucose 32 mg/dl (value in peripheral blood - 109 mg/dl).

Molecular biology studies were negative for the most common meningoencephalitis germs (Herpes simplex 1 and 2, Enterovirus, Varicella-zoster, Human Herpes Virus 6, Human Parechovirus, Cytomegalovirus, Neisseria meningitidis, Streptococcus pneumoniae, Haemophilus influenzae, E coli K1, Listeria monocytogenes and Cryptococcus neoformans). ELISA test for HIV was negative.

Cranioencephalic and spine magnetic resonance imaging (MRI) was performed and showed a lesion with hypersignal in T2 sequence and restriction to diffusion in the splenium of the corpus callosum, without signs of edema, and an additional lesion in the region of the anterior arm of the right inner internal capsule/head of the nucleus caudate. Due to the patient's lack of cooperation, it was not possible to view the spinal cord in detail, but no major

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changes were observed. A transthoracic echocardiogram with V-scan was also performed showing good bi-ventricular function, with no vegetation or myocardial involvement.

Given the patient's severe condition with suspected meningo-encephalitis, acyclovir and ceftriaxone were started in meningeal doses, and the patient was transferred to the Infectious Diseases department. An exhaustive serological study was carried out, suggesting old infections by CMV, EBV, HSV-1 and Parvovirus. There was acquired immunity to hepatitis B and hepatitis A viruses. *Toxoplasma gondii*, syphilis, hepatitis C virus, HIV, *Mycoplasma pneumoniae*, Adenovirus, Coxsackie virus, Enterovirus, Echovirus and *Bartonella henselae* serologies were negative. Interferon Gamma Release Assay was negative. Serology for mumps virus was positive, with both IgM and IgG positive. Despite the patient having taken no recent travels, Hantavirus, Schistosomiasis and cysticercosis were also excluded.

Despite antimicrobials use, on day 8th the patient worsened, showing decreased strength in the lower limbs. A lumbar puncture was performed. The antineural antibodies associated with autoimmune encephalitis were negative in CSF. Neuroaxis MRI study was repeated and now showed cervical and intracranial leptomeningeal enhancement, apart from the above-mentioned T2 lesions. In the meantime, the result of the admission's day microbiological tests (blood, urine and CSF) also came out negative.

The multifocal neurological involvement now evidenced led to the hypothesis of ADEM and high-dose steroid therapy (methylprednisolone 1 g/day) was started. After 2 days, the patient showed partial motor recovery, and at the end of the 5th day, he had grade 4 muscle strength in legs. Control mumps serology 2 weeks after admission showed a rise in IgG titer and disappearance of IgM, compatible with recent infection. Given this result, the patient was specifically asked about the presence of recent changes suggestive of orchidididymitis or enlarged parotids, which he denied. The patient was discharged and physical rehabilitation was continued. Six months after discharge, he still has residual paraparesis, which, however, did not interfere in his daily activities.

## Discussion

The main clinical feature of mumps is an increase in the volume of parotids or other salivary glands. It usually precedes the involvement of other organs, but it may not occur or be noticed by the patient [1]. Up to half of infections can be asymptomatic or evidence mild respiratory symptoms and fever [3–6]. In the patients with meningitis caused by this virus, around 50 % of cases do not noted parotids enlargement [3], and this percentage can be similar in post-infectious complications, which include ADEM. The latter condition affects the central nervous system and is characterized, in most cases, by an acute encephalopathy and variable multi-focal neurological dysfunction [7,8]. It is considered an autoimmune-based disorder, with most cases being triggered by an infection or vaccine [1,7,8]. The diagnosis is based on clinical and imaging changes, with MRI being the most important exam. Imaging findings are highly variable, most commonly with deep and subcortical white-matter lesions and/or gray-matter lesions involving the thalami and basal ganglia, measuring from 5 mm to more than 5 cm [8–10].

Signs and symptoms of ADEM usually appear 1–3 weeks after the onset of mumps virus infection [11]. Despite the frequent history of infectious disease in the previous weeks that can point to a post-infectious cause, it is important to consider treatment with antimicrobials until an actual infection can be ruled out. Pulse steroid therapy is the main treatment. If there is no response,

plasma exchange and, eventually, intravenous immunoglobulin are recommended [12].

The case presented here draws attention to the possible dissonance between clinical and imaging findings, and raises the question whether there was an active CNS infection, reinfection or post-infectious pathology. The fact that there was an initial worsening despite the antimicrobials, with improvement after corticosteroid therapy, leads us to believe that we were facing a post-infectious disease. Among the known agents, the mumps virus is recognized as a potential trigger of ADEM; and in the case described here the serological result was compatible with recent infection. Eventually the patient's vaccination would not have led to a sufficient production of antibodies, but would a more serious process have happened if he had not been vaccinated at all?

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## Consent

Written informed consent was obtained from the patient for publication of this case report and accompanying images. A copy of the written consent is available for review by the Editor-in-Chief of this journal on request.

## CRedit authorship contribution statement

**Raquel Gonçalves:** Conceptualization, Writing - original draft. **João Gomes:** Conceptualization, Writing - original draft. **André Martins:** Writing - original draft. **Vitor Duque:** Supervision, Writing - review & editing. **João Manuel Lemos:** Supervision, Writing - review & editing. **Luís Trindade:** Supervision, Writing - review & editing.

## Declaration of Competing Interest

The authors report no declarations of interest.

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