Bilateral optic neuritis with branch retinal artery occlusion associated with vaccination

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Abstract. A case of a 40-year-old marine with bilateral optic neuritis and a branch retinal artery occlusion after vaccination is presented. Blood investigations showed no abnormalities. Cerebrospinal fluid studies revealed a lymphocytic pleocytosis and IgG antibodies against hepatitis A and rabies. Computed tomography and magnetic resonance imaging of the brain were negative. A diagnosis of vaccine-induced autoimmune demyelinating optic neuritis was made. The clinical picture improved after systemic corticosteroid treatment.

Introduction

The pathogenesis of optic neuritis is generally considered to be immune-mediated demyelination of the optic nerve. There are several possible causes of optic neuritis, but often a specific underlying cause cannot be discerned. The following case represents an extremely rare occurrence of bilateral optic neuritis with branch retinal artery occlusion after vaccination. The possible etiopathogenic mechanism is discussed.

Case report

A 40-year-old marine with a history of a febrile illness and an acute visual field loss was seen on 24 September 1992 in our hospital. On additional questioning he reported that he had undergone a course of vaccinations (Table 1) in the previous month. Several hours after the second and third series of vaccinations he had developed a fever with night sweats, headache and myalgias, which lasted approximately four days. On 20 September, ten days after the third series, he had noted an abrupt loss in the inferior visual field in the right eye. On presentation he felt well, except for complaints of a dull headache. The results of general physical and neurologic examination were unremarkable. On ophthalmologic examination visual acuity was RE 1.25 and LE 1.25. Pupils were normally reactive and there was no afferent pupillary defect. Colour vision with Ishihara plates was normal. Extraocular motility was full and not accompanied by pain. The anterior segments and the vitreous were normal. Fundoscopy disclosed an oedematous optic disc with occlusion of the
mg intravenous pulse methylprednisolone for 5 days was started, followed by prednisone 80 mg orally for eleven days, which was gradually tapered during the ensuing weeks. The optic neuritis reached a nadir one week after hospitalization, as evidenced by worsening of visual fields and the presence of pathological visual evoked potentials (Fig. 2).

Ten days after admission the patient was discharged and monitored on an outpatient basis. Over the next weeks both the papilledema and the retinal edema from the arteriolar occlusion resolved. A repeat fluorescein angiogram obtained on 8 January 1993, 5 months post-presentation, showed some residual optic disc hyperfluorescence and improvement of the flow in the superior temporal artery of the right eye. The visual fields had improved markedly, but with a persistent inferior defect in the right eye due to the segmental retinal infarction. The VEP’s were no longer pathological.
Table 1. Vaccination scheme

<table>
<thead>
<tr>
<th>Day</th>
<th>Vaccines</th>
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<tbody>
<tr>
<td>01st series</td>
<td>- Inactivated rabies virus vaccine, i.m.</td>
</tr>
<tr>
<td></td>
<td>- Recombinant hepatitis B vaccine, i.m.</td>
</tr>
<tr>
<td></td>
<td>- Inactivated Japanese B encephalitis virus vaccine, i.m.</td>
</tr>
<tr>
<td>2nd series</td>
<td>- Inactivated rabies virus vaccine, i.m.</td>
</tr>
<tr>
<td></td>
<td>- Hepatitis A virus vaccine, i.m.</td>
</tr>
<tr>
<td></td>
<td>- Meningitis vaccine (Meningovax A + C), s.c.</td>
</tr>
<tr>
<td></td>
<td>- Killed Salmonella typhi bacteria vaccine, s.c.</td>
</tr>
<tr>
<td>14</td>
<td>- D.T.P. (tetanus- and diphtheria toxoid, inactivated trivalent poliomyelitis virus vaccine, i.m.</td>
</tr>
<tr>
<td>3rd series</td>
<td>- Inactivated rabies virus vaccine, i.m.</td>
</tr>
<tr>
<td></td>
<td>- Hepatitis A virus vaccine, i.m.</td>
</tr>
<tr>
<td></td>
<td>- Recombinant hepatitis B virus vaccine, i.m.</td>
</tr>
<tr>
<td></td>
<td>- Inactivated Japanese B encephalitis virus vaccine, i.m.</td>
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superior temporal artery with geographic retinal oedema in the right eye. The left eye showed a nasally oedematous optic disc and a cotton wool exudate.

Visual fields demonstrated bilateral generalized constriction and an inferior or absolute arcuate scotoma on the right eye, corresponding to the segmental retinal oedema. The patient was admitted for diagnostic work-up.

Blood examination showed an ESR of 7 mm/hour and otherwise normal haematology and chemistry. The VDRL test was non-reactive. Borrelia, toxoplasmosis-, viral serologic studies (EBV, CMV, HSV and VZV) and IgG and IgM anticardiolipin antibodies were negative. Chest radiography, EEG and cranial computed tomography with contrast disclosed no abnormal findings.

Cerebrospinal fluid analysis revealed $78 \times 10^6$ leucocytes ($n$: 0–3 × 10⁶) with a percentage lymphocytes of 93% ($n$: 0–80%), total protein 0.70g/l ($n$: 0.15–0.45g/l) and a normal protein spectrum without oligoclonal IgG banding. The IgG-index was normal. Serologic studies of the cerebrospinal fluid showed IgG antibodies against hepatitis A and rabies, whereas they were negative for hepatitis B- and Japanese B encephalitis-antibodies. The pattern visual evoked potentials were within normal limits in both eyes. A fluorescein angiogram confirmed the fundoscopic findings (Fig. 1a, b). Brain magnetic resonance imaging disclosed no evidence of lesions or demyelinating plagues.

On the basis of the ocular manifestations and the temporal association with the vaccinations, a diagnosis of postvaccinal optic neuritis with branch retinal artery occlusion was made. Five days after admission a regimen of 500
Discussion

Bilateral optic neuritis is a relatively rare presentation among adults. In children, however, it is more commonly encountered and frequently associated with viral infections such as measles, mumps and chickenpox. The association with vaccination is very rare. Isolated or in combination with other neurological symptoms, bilateral optic neuritis has been described following administration of postexposure rabies vaccine [1], combined smallpox, tetanus and diphtheria vaccine [2], trivalent mumps, measles and rubella vaccine [3], rubella vaccine [4], influenza vaccine [5-7], tetanus toxoid booster [8], BCG vaccine [9], plasma-derived hepatitis B vaccine [10, 11] and Japanese B encephalitis vaccine [12].

The exact mechanism of postinfectious and postvaccinal neuritis has not been completely clarified. Autoimmune mediated demyelination of the central nervous system, including the optic nerves, has been described in experimental animals after immunization with nervous tissue [13, 14] and in man.
after administration of anti-rabies vaccine prepared from infected nervous tissue [15]. It is therefore believed that immunological cross-reactivity between viral and neural antigens plays a major role in their pathogenesis [16]. Our patient had received vaccines with diphtheria- and tetanus toxoid, inactivated viruses, inactivated *Salmonella typhi* bacteria and inactivated mouse-brain Japanese B encephalitis vaccine. The temporal relationship between the administration of these vaccines and the febrile illness and the lymphocytic pleocytosis and IgG antibodies against rabies and hepatitis A in the cerebrospinal fluid, strongly suggest a vaccine-induced auto-immune demyelination of the optic nerves.

To the best of our knowledge this is the first case of a branch retinal artery occlusion in an adult with optic neuritis. Central and branch retinal artery occlusion are reported in association with papilloedema due to pseudotumor cerebri [16, 17]. It is suggested that axonal swelling in papilloedema can cause retinal artery occlusion. The same mechanism may be responsible for the branch retinal artery occlusion in our patient.

Our case serves to remind the ophthalmologist that vaccination should be considered an etiological possibility in bilateral optic neuritis.
Acknowledgments

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References


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