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## Acute Transverse Myelitis After Influenza Vaccination: Magnetic Resonance Imaging Findings

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### ABSTRACT

Descriptions in the literature of magnetic resonance imaging (MRI) findings in postvaccination myelitis are scarce. Described here is a case of acute transverse myelitis that occurred after administration of an influenza vaccination. T1-weighted MRIs showed diffuse, fusiform spinal cord enlargement, extending from C-3 to rostral thoracic levels. Intramedullary lesions containing increased T2 signal were found in the areas of cord enlargement. The involvement on MRI was profound, extending far

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rostral to the level of the discrete clinical myelopathy. The lesions did not enhance after contrast administration. The patient had a complete long-term recovery of neurological function. This represents the first report of MRI findings in acute transverse myelitis after influenza vaccination.

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Acute transverse myelitis (ATM) is an inflammatory disorder of the spinal cord that is often associated with an antecedent or intercurrent factor, such as infection, collagen vascular disease, multiple sclerosis, or ionizing radiation. In addition, ATM has been reported following vaccinations, including for hepatitis B [1], rabies [2], smallpox [3], influenza [4], and rubella [5]. Only 1 patient demonstrating magnetic resonance imaging (MRI) findings in vaccination-associated ATM has been described in the literature to date, occurring after hepatitis vaccination [1].

### Case Report

A 36-year-old woman presented to UCLA Medical Center with a 1-week history of progressive leg weakness, numbness below the chest, and urinary retention. The symptoms began 4 weeks after a routine influenza vaccination (0.5 ml, inactivated, trivalent, split antigen). No antecedent illnesses were identified; the vaccination had been otherwise well tolerated. Neurological examination revealed mild to moderate weakness and hyperreflexia of the lower extremities, a discrete sensory deficit below the T-3 level, and a decrease in rectal tone.

Conventional spin-echo MRI of the cervical and rostral thoracic spine (General Electric 1.5-T Signa scanner) at admission revealed mild diffuse fusiform enlargement of the spinal cord extending from C-3 to the visualized upper thoracic levels, best appreciated on T1-weighted images (Fig 1). These same areas showed confluent intramedullary lesions containing increased T2 signal (Fig 2). After administration of intravenous contrast (gadopentetate dimeglumine), no abnormal enhancement was noted (not shown). In addition, MRI of the brain, both with and without contrast material, was unremarkable (not shown).

The cerebrospinal fluid contained 84 white blood cells (90% lymphocytes and 10% monocytes), 3 erythrocytes, a total protein concentration of 96 mg/dl, and a normal

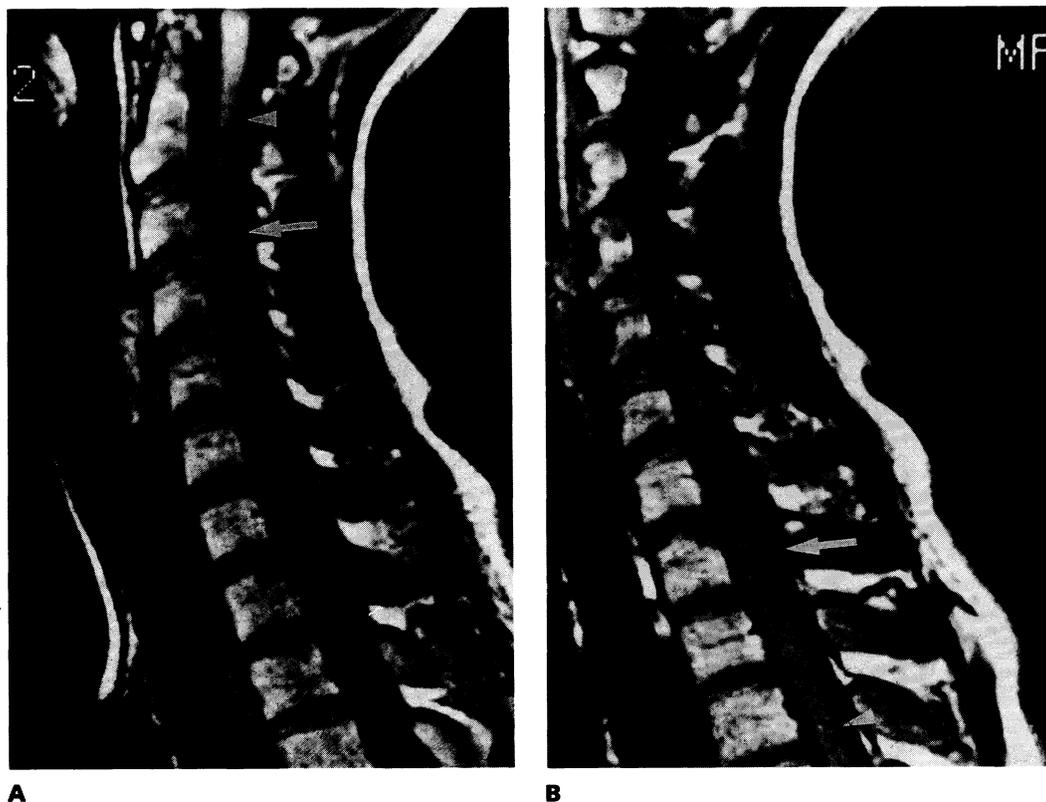
glucose level; myelin basic protein was elevated (6 ng/ml; normal, < 2). An extensive laboratory evaluation for an alternative underlying cause was unrevealing (Table). Intravenous methylprednisolone therapy (1 gm/day for 5 days) led to a marked recovery by 2 weeks.

At a routine outpatient visit 6 months later, she reported only minimal bowel incontinence and occasional exercise-induced leg paresthesias. Results of a neurological examination were normal except for trace weakness in the left quadriceps and pin-induced paresthesias of the lower extremities. One year later, she demonstrated a complete recovery with no incontinence or paresthesias; the neurological examination was completely normal. A repeat MRI examination was not performed.

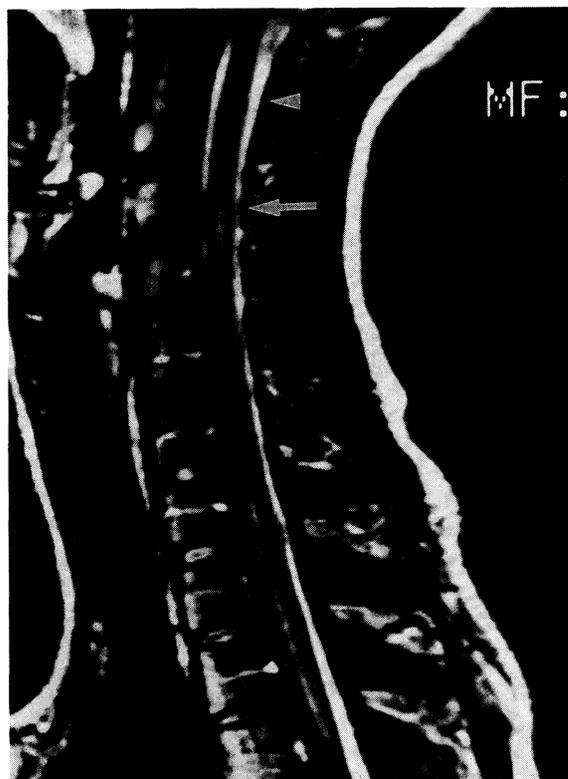
### Discussion

The MRI findings in various forms of ATM, both idiopathic [6] and those with identifiable causes such as infectious [7], postinfectious [8], and collagen vascular disease associated [9], are nonspecific. Such findings include spinal cord enlargement, intramedullary increased T2 signal lesions, and variable enhancement. However, the MRI findings in postvaccination ATM have not been well described. The only report presented to date in the literature, ATM after hepatitis B vaccination [1], described spinal cord expansion, hyperintense intramedullary T2 signal from C-3 to T-9, and enhancement from C-6 to T-8. In the present patient with ATM that followed a routine influenza vaccine, MRI showed an extensive, longitudinal myelitis. Diffuse, fusiform cord enlargement extending far rostral to the discrete clinical myelopathy was seen on T1-weighted images. Increased intramedullary T2 signal was noted in areas corresponding to cord enlargement. The lesions did not enhance after contrast administration. Although ATM often presents clinically as a discrete myelopathy, as it did in the current patient, MRI shows that the disease can be diffuse and extend over several spinal levels, both rostral and caudal to the clinical deficits. These MRI findings are nonspecific and are similar to those previously reported in other secondary forms of ATM.

Numerous neurological complications, including Guillain-Barré syndrome, brachial plexitis, cranial neuritis, dermatomyositis, and encephalopathy, have been associated with influenza vaccination [4, 10, 11]. In addition, a few cases of ATM have occurred following influenza vaccination [4, 12]. Neurological complications develop with a latency that ranges from 1 to 63 days (mean, 16.5 days) after influenza vaccination [4].



**Fig 1.** Spinal MRI (sagittal), 1 week after symptom onset. T1-weighted images (TR 600/TE 17) show mild fusiform cord enlargement of the cervical (A) and rostral thoracic (B) regions of the spinal cord. The enlargement is diffuse, extending over several levels, most prominent at C3-4 and T-1 (*arrows*). Compare to a normal cord diameter at C-2 and T-3 (*arrowheads*). On post-contrast-enhanced images, no abnormal enhancement was identified (not shown).



**Fig 2.** Spinal MRI (sagittal), 1 week after symptom onset. A T2-weighted image (TR 2400/TE 80) shows increased intramedullary signal extending over several levels, in areas corresponding to cord enlargement, beginning rostrally at C-3 (*arrow*) and extending caudal throughout the remaining spinal levels. Compare to a normal intramedullary cord signal at C-2 (*arrowhead*).

Postvaccination Acute Transverse Myelitis: Summary of Laboratory Evaluation

	Result
<b>Serum</b>	
VDRL	Nonreactive
Vitamin B <sub>12</sub>	Normal
Folate	Normal
Erythrocyte sedimentation rate	Normal
Antinuclear antibody	Negative
HIV-1, HIV-2 antibodies	Negative
HTLV-I antibody	Negative
<b>Cerebrospinal fluid</b>	
VDRL	Nonreactive
IgG index	Normal
Oligoclonal bands	Negative
Cryptococcal antigen	Negative
Coccidiomycosis antibody	Negative
Acid-fast bacillus culture	Negative
Fungal culture	Negative
Viral culture	Negative
<b>Other</b>	
Head MRI	Normal
Visual evoked responses	Normal

However, with the advent of the modern trivalent inactivated vaccine, the frequency of neurological adverse effects appears to be low; the benefit of vaccination for individuals at high risk for influenza significantly outweighs the risk of major adverse effects [12-15]. The present patient developed