CASE REPORT

3D-FLAIR magnetic resonance imaging in the evaluation of mumps deafness

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1. Introduction

Mumps is still one of the most frequent causes of sensorineural hearing loss in children in the world [1], although incidence of mumps has tremendously decreased in countries that has instituted widespread administration of mumps vaccine. Bilateral deafness was reported in 22 patients before 1957, and in 2 patients after that date [2—4]. The reported incidence of unilateral sensorineural hearing loss is 1/2000—1/30,000 [2]. Hearing loss may occur before, during or after parotitis, and in subclinical cases [1].

The fluid-attenuated inversion recovery (FLAIR) sequence is part of the routine protocol for brain magnetic resonance imaging (MRI). Many studies have noted subtle findings on FLAIR images. The three-dimensional fluid-attenuated inversion recovery (3D-FLAIR) procedure applied to magnetic resonance imaging (MRI) showed high signals in the right cochlea and vestibule. This indicated hemorrhage or a high concentration of protein in the right inner ear. This is the first case demonstrating a high 3D-FLAIR MRI signal of the inner ear in a patient with mumps deafness. Our findings suggest that 3D-FLAIR MRI may help to identify and define labyrinthitis in mumps deafness.

2. Case report

A 6-year-old boy who noticed right hearing loss on 30 January 2006, was referred to our university hospital...
on 13 February 2006. Both eardrums were normal.
Pure tone audiometry revealed total deafness on the
right but normal hearing on the left. Distortion pro-
duct otoacoustic emissions were absent on the right
but normal on the left. The boy felt dizzy around the
time of onset of hearing loss, but did not complain of
dizziness or vertigo when he came to our hospital.
The medical interview established that two class-
mates had developed mumps in January 2006. Our
patient’s salivary glands had not been swollen and
palpation of the salivary glands (at interview) was
normal. Blood examination on 13 February 2006,
revealed that mumps IgM was 3.1 U/ml (normal
range: 1.0 >) and mumps IgG was 12.0 U/ml (normal
range: 2.0 >). 3D-FLAIR MRI taken at 3-tesla (T) with-
out gadolinium enhancement on 1 March 2006,
revealed high signals in the right cochlea and vesti-
bule (Fig. 1A). MRI scans were performed with a 3 T
MR (Trio, Siemens, Erlangen, Germany) using a
receive-only 8-channel phased-array coil. The MRI
protocols and the film settings have been described in
detail in a previous report [5]. The high signal areas in
3D-FLAIR were not detected by T1- and T2-weighted
MRI in this patient. These results indicated right
labyrinthitis due to mumps infection (Fig. 1B and C).

3. Discussion

Mumps deafness is suspected in patients with sudden
hearing loss, and with high levels of mumps IgM
antibody, even if the salivary glands are not swollen
[6–9]. Mumps IgM antibody rises after viral infections
in 1 or 2 days and becomes a peak in 4 or 5 days and
gradually falls afterwards while mumps IgG antibody
rises after viral infections since about 1 week and
maintains afterwards a long term. Patients without
evident clinical signs of mumps, but have a significant
rise in mumps IgM antibody within 3 months after the
onset of acute hearing loss are regarded as almost
definite cases of mumps deafness [6].

The hearing loss may be due to direct viral inva-
sion of the cochlea, affecting the stria vascularis,
the organ of Corti, the tectorial membrane and/or
the myelin sheath of the eighth nerve [1]. In
humans, the path of labyrinthine infection has not
been established, but it is thought to be secondary
to a viremia or to reflect viral spread from infected
cerebrospinal fluid through the labyrinth [10].

Comacchio et al. [10] reported a case of mumps
deafness in which an abnormal T2-weighted MRI was
found from the inner ear. Gadolinium enhancement
was not observed in the inner ear, although gadoli-
nium enhancement was recognized in the eighth-
nerve bundle. Our case revealed that the 3D-FLAIR
MRI is superior to T1- and T2-weighted MRI in visualiz-
ing abnormality of the inner ear in mumps deafness.
The abnormally high signal we observed may be due
to high protein concentration in the inner ear fluid. This
MR imaging is not specific for mumps [11]. But 3D-
FLAIR MRI, even without enhancement, can detect
the minor abnormality of the inner ear because of its
high sensitivity. We assume that all acoustic tumors
can be detected by MRI without enhancement [12].
Moreover, 3D-FLAIR MRI may possibly clarify the
pathophysiological mechanisms in patients with sen-
sorineural hearing loss including mumps deafness.

In conclusion, 3D-FLAIR MRI will help, to demon-
strate and define labyrinthitis in mumps deafness, in
the future. 

Fig. 1 (A) Axial magnetic resonance imaging using 3D-FLAIR. Bright signals are noted in the right cochlea and vestibular
apparatus. High signal areas on 3D-FLAIR MRI were not detected by unenhanced T1-weighted (B) or T2-weighted and (C)
MRI. CO: cochlea.
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References