

Brief Note

Incidental MRI Lesions in the Periventricular White Matter of the Elderly : Correlation of Postmortem MRI and Neuropathologic Findings

Accepted for publication on October 9, 1990

Key words : MRI — periventricular white matter lesion — ischemic lesion

Magnetic resonance imaging (MRI) is widely recognized to be far more sensitive than computed tomography (CT) scans. It may reveal periventricular white matter lesions which cannot be detected by a CT scan. In one third to one half of the healthy elderly individuals examined by MRI, white matter lesions are found.¹⁾ They appear as scattered patchy high intensity areas on T₂-weighted MRI and are considered to increase in incidence with advancing age. Their clinical significance and neuropathologic findings are controversial.²⁾

We selected three such examples among 31 consecutive cases examined by MRI after death and correlated the postmortem MRI findings and corresponding neuropathologic features.

The patients were an 89-year-old man with bronchopneumonia, a 77-year-old woman with an aortic aneurysm and a 70-year-old woman with gastric cancer. T₂-weighted MRI of 0.5 tesla obtained from the postmortem brains showed scattered and confluent abnormal hyperintense lesions in the periventricular white matter of the cerebral hemispheres (Fig. 1). The brains were fixed in 20% neutral buffered formalin for two to three weeks before MRI in the horizontal plane was performed. The following scan sequences were used ; spin echo (SE) acquisition was employed, with a repetition time (TR) of 2000 msec, an echo time (TE) of 92 msec, and a slice thickness of 8 mm. For histological examination, paraffin embedded sections in the horizontal and coronal planes were stained by hematoxylin and eosin, the Klüver-Barrera method for myelin and the Holzer method for gliosis, and then they were compared with the MRI findings.

Neuropathologic examination demonstrated incomplete gliotic softened lesions with occasional lacunar and cribriform states in the cerebral white matter (Figs. 2,3) as well as in the basal ganglia, thalamus, midbrain and pons. Occasional fresh and old red blood cell leakages were also seen. Arteries showed atherosclerotic and arteriolosclerotic changes. Periventricular, dilated veins with adventitial fibrosis were also observed. These findings were considered to be those of local ischemic lesions probably due to arteriosclerosis, hypertension and other vascular risk factors which are supposed to increase with advancing age.

Leifer and his colleagues³⁾ correlated such MRI observations and neuropathologic findings for seven cases and found that small periventricular T₂-weighted high intensity lesions corresponded with the periventricular cap which was created by the loss of myelin and axon, gliosis, and the disappearance of

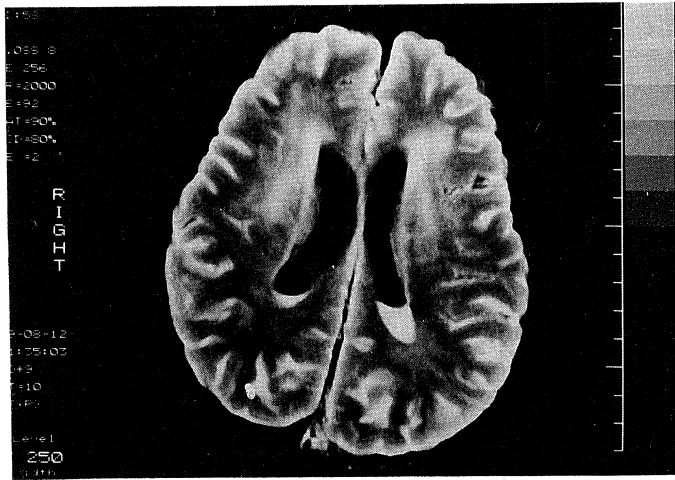


Fig. 1. T₂-weighted MRI of case 2 demonstrating scattered and confluent periventricular hyperintense lesions.

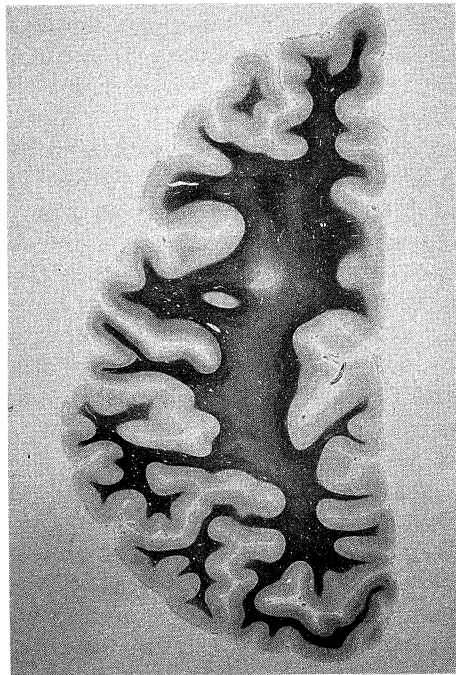


Fig. 2. Photomicrograph of the horizontal section of the left cerebral hemisphere of case 2 showing myelin pallor due to incomplete softening with a centrally situated lacuna in the deep cerebral white matter. Klüver-Barrera, $\times 0.77$.

the ependymal lining. They considered these to be normal findings of subcallosal fasciculus. These MRI findings, however, are never seen under 45 years of age. Therefore these histological observations should be considered meaningful findings specific to the elderly.

Braffman and his co-workers⁴⁾ performed a similar examination of seven

cases and found ischemic lesions and demyelinated plaques. Because incidental demyelinated plaques are rarely found clinically and pathologically in Japan, there is no need to consider the possibility that these may be demyelinated plaques.

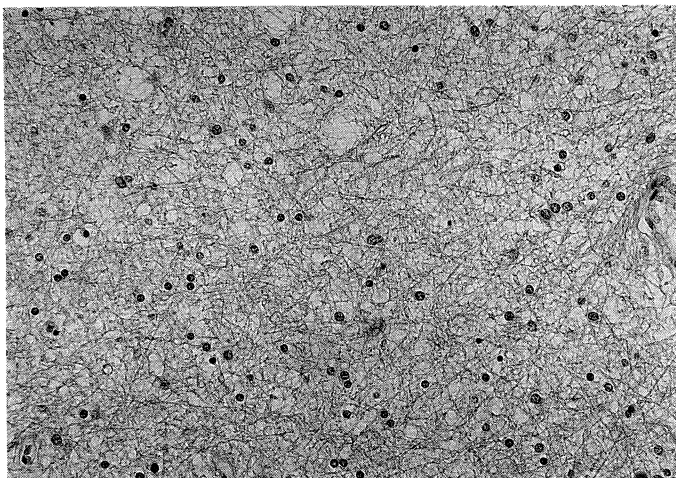


Fig. 3. Photomicrograph of the periventricular white matter showing incomplete gliotic softened lesion. Hematoxylin and eosin, $\times 200$.

In conclusion, most of the incidental MRI lesions in the periventricular white matter of healthy elderly individuals, which are difficult to detect on conventional CT scans, coincide with scattered ischemic lesions derived from arteriosclerosis, which increases with aging.

**Teruo SHIRABE, Yumi MORISADA
and Shimato ONO***

Department of Neuropathology,

**Department of Radiology,
Kawasaki Medical School,
Kurashiki 701-01, Japan*

REFERENCES

- 1) George, A.E., De Leon, M.J., Kalnin, A., Rosner, L., Goodgold, A. and Chase, N.: Leukoencephalopathy in normal and pathologic aging: 2. MRI of brain lucencies. *AJNR* **7**: 567-570, 1986
- 2) Hunt, A.L., Orrison, W.W., Yeo, R.A., Haaland, K.Y., Rhyne, R.L., Garry, P.J. and Rosenberg, G.A.: Clinical significance of MRI white matter lesions in the elderly. *Neurology* **39**: 1470-1474, 1989
- 3) Leifer, D., Buonanno, F.S. and Richardson, E.P., Jr.: Clinicopathologic correlations of cranial magnetic resonance imaging of periventricular white matter. *Neurology* **40**: 911-918, 1990
- 4) Braffman, B.H., Zimmerman, R.A., Trojanowski, J.Q., Gonatas, N.K., Hickey, W.F. and Schlaepfer, W.W.: Brain MR: Pathologic correlation with gross and histopathology. 2. Hyperintense white-matter foci in the elderly. *AJR* **151**: 559-566, 1988