The Ovoid Lesion: A New MR Observation in Patients with Multiple Sclerosis

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We investigated the frequency of oval-shaped, high-signal-intensity lesions oriented perpendicular to the anteroposterior axis of the brain on abnormal, axial T2-weighted MR brain scans in 59 patients with clinically documented multiple sclerosis. This finding, not heretofore described in patients with multiple sclerosis, was observed in 86% of patients, and correlates with the neuropathologic description of demyelination in multiple sclerosis.

The superiority of MR imaging in detecting the intracranial lesions of multiple sclerosis (MS) is well documented in the literature [1–3]. In fact, it is this application that has been so instrumental in establishing the reputation of MR as the most sensitive technique for imaging the CNS.

This article describes a new observation on MR, which appears to be associated with MS: the ovoid lesion. The frequency of this finding among MS patients with positive intracranial MR scans is documented, and the anatomic basis of this finding is supported in the pathology literature [4].

Materials and Methods

All patients with a diagnosis of MS and an abnormal cranial MR at three institutions over a period of 1 year were retrospectively reviewed. The diagnosis of MS was established if any three of the following four criteria were met: (1) history of intermittent CNS dysfunction; (2) positive neurologic examination for lesions in scattered CNS areas; (3) positive evoked potentials; and (4) demyelinating spinal fluid profile [5]. The patients ranged in age from 18 to 75 years (mean age 37). Since it was our intent to document the frequency of an observed MR finding among positive MR scans, we thought there would be no loss of objectivity in selecting only those MS patients who had abnormal MR brain scans.

The MR examinations were obtained on either a 0.3-T permanent magnet* or a 1.5-T unit.† Relatively T2-weighted axial images were obtained in all instances, with TR (repetition time) varying between 1800 and 2000 msec, and Te varying between 56 and 80 msec. Imaging parameters on the Fonar scanner included 8-mm slices with two excitations and an average acquisition time of 18 min. On the GE unit, 5-mm slices were obtained with one excitation and an average acquisition time of 8 min. All images were reconstructed by using conventional 2DFT techniques with a resulting matrix of either 256 × 256 or 256 × 128 pixels.

Results

In 51 (86%) of 59 patients, MR demonstrated one or more oval or elliptically shaped high-signal-intensity lesions on T2-weighted images whose major axes were perpendicular to the anteroposterior axis of the head.

Figure 1 demonstrates the major and minor axes of an ellipse, and Figure 2 is a diagram illustrating our observation. This drawing shows elliptically shaped lesions

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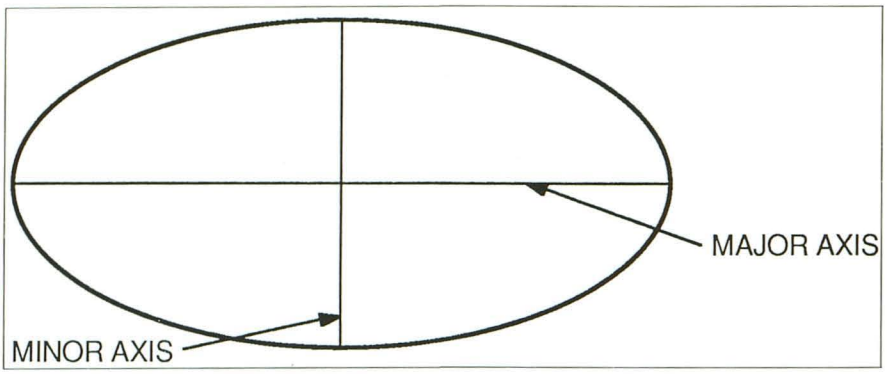

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Fig. 1.—The ellipse and its two axes. Note that the longer of the two is termed the "major axis."

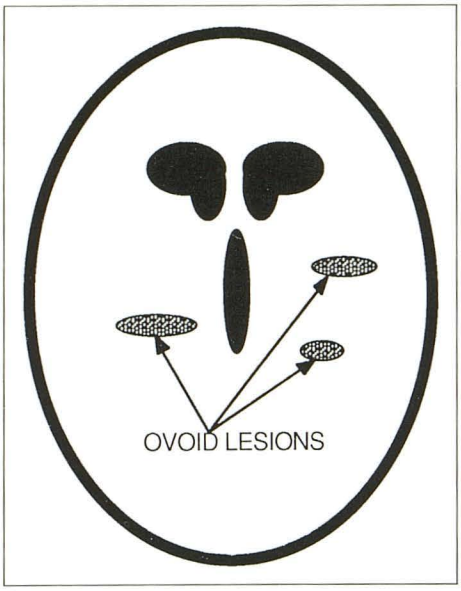

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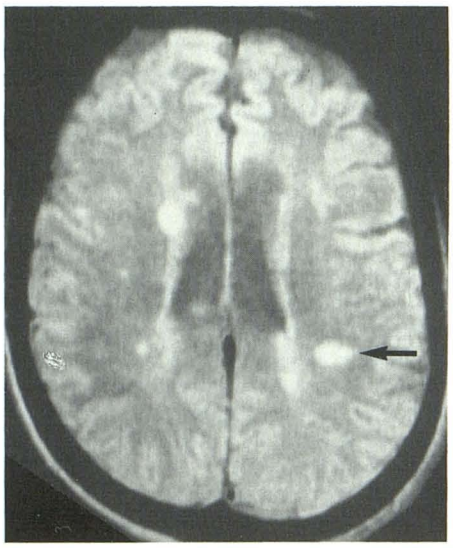
Fig. 2.—The ovoid lesions are diagrammed as elliptical, speckled densities whose major axes are perpendicular to anteroposterior axis of head.



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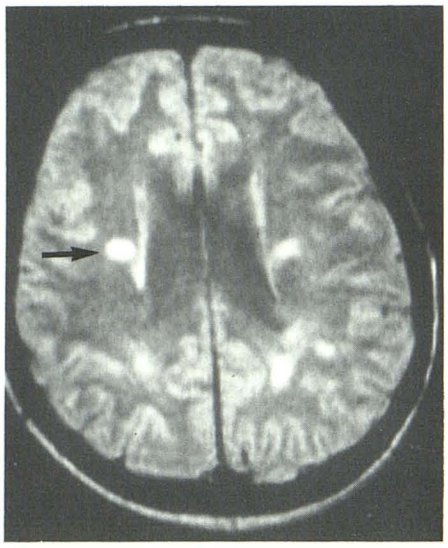

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Fig. 3.—Axial moderately T2-weighted SE image (1800/56) at level of lateral ventricles in a patient with MS. *Arrow* indicates typical ovoid in left posterior periventricular white matter. Note that its major axis is perpendicular to anteroposterior axis of head.

Fig. 4.—Axial moderately T2-weighted SE image (1800/56) at level of lateral ventricles in a second patient with MS. *Arrow* indicates another typical ovoid in periventricular white matter.

in the periventricular white matter with their major axes pointing perpendicular to the anteroposterior axis of the head. Figures 3–5 show three typical examples from the series of 59 cases studied.

The configuration of the ovoid lesion varied considerably from case to case. This was manifested by different ratios of the major to minor axes of the ovoids, or stated more simply, some ovoid lesions were skinnier than others. In fact, the ovoids at times were so thin that the lesions became linear (Fig. 6). This was observed in five (8.5%) of 59 cases.

Discussion

Of the 59 patients with clinically documented MS and positive MR examinations, a vast majority (86%) demonstrated at least one ovoid lesion as described. The neuropathologic basis for the ovoid lesion derives from the fact that the demyelination in MS is perivascular. Since the vessels in the periventricular white matter course perpendicular to the ventricular wall, and the larger percentage of these extend straight laterally, one would expect to find the high-signal foci

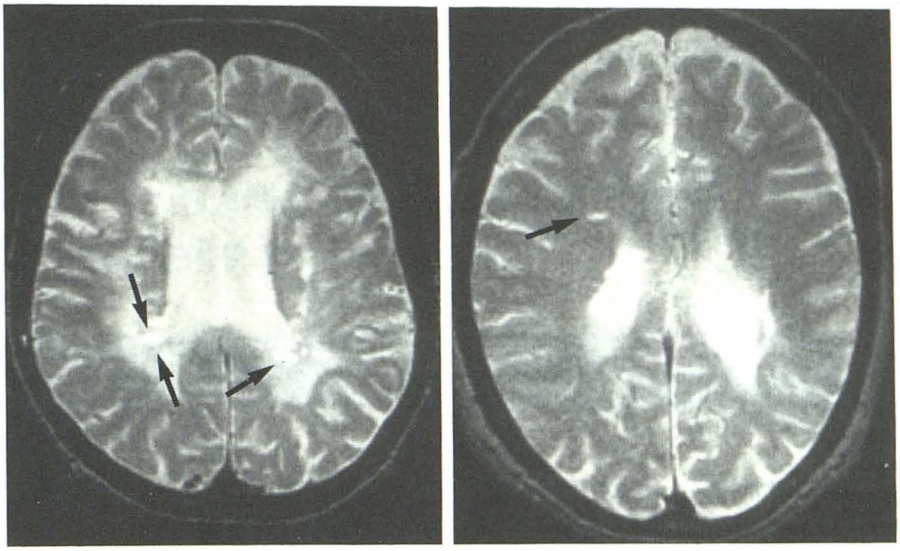

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Fig. 5.—Axial T2-weighted SE image (2000/80) at level of lateral ventricles in a third patient with MS. Several ovoids (*arrows*) are seen bilaterally adjacent to trigone areas. Note "lumpy-bumpy" white-matter changes.

Fig. 6.—Axial T2-weighted SE image (2000/80) at level of lateral ventricles in a fourth patient with MS. *Arrow* indicates linear lesion in anterior right periventricular white matter—a "skinny" ovoid.

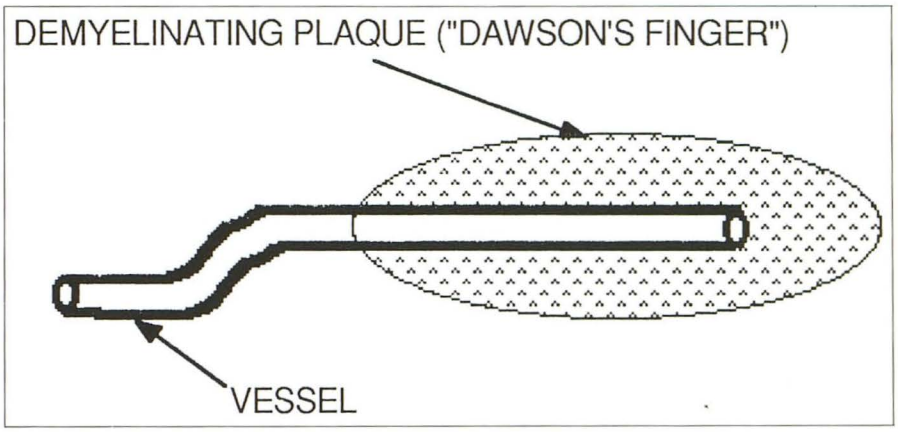

Fig. 7.—Diagram of "Dawson's finger." *Shaded area* represents an advancing "front" of perivascular demyelination—Dawson's finger. This corresponds to the "ovoid lesion" described in the text.

of demyelination oriented in the direction of the ovoid lesions, as depicted in Figure 2.

The pathology literature refers to a specific eponym to describe this process: "Dawson's fingers" [4]. Figure 7 shows the pattern of demyelination around vascular structures. This pattern suggests a "finger" pointing along the direction of the vessel and correlates with the morphology of the ovoid lesion described in this paper. Hence, we believe the ovoid lesion is the MR correlate of "Dawson's fingers."

Heretofore, the lesions of MS on intracranial MR have been described as "lumpy-bumpy" periventricular high-signal-intensity foci [6]. To this well known descriptor we add a new observation: the ovoid lesion. As is the case with the lumpy-bumpy pattern, the ovoid lesion must be considered in conjunction with clinical parameters, since neither is specific for MS.

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