QUESTION 68 MRI brain

A 57-year-old man with a long history of poorly controlled hypertension and smoking presents with sudden onset of right-sided sensory change and mild change of speech. On examination, his speech is slurred but content and comprehension are normal. He has a mild right hemisensory change to pin-prick, with normal power and symmetrical reflexes.

His magnetic resonance imaging (MRI) scans are shown below (T2 weighted axial image (A) and diffusion weighted image (B)).

The most likely cause of the stroke syndrome is:
A. left middle cerebral artery thrombosis.
B. left basal ganglia haemorrhage.
C. amyloid angiopathy.
D. left middle cerebral penetrating artery occlusion.
E. acute demyelination.

MRI

T1 weighted image

Water molecules in a sample are excited with the imposition of a strong magnetic field.
Causes millions of water molecules to precess simultaneously and it is this precession of protons which produces signals in MRI.

T2 weighted images

Constrast is produced by measuring the loss of coherence or synchrony between the water protons.
When water is in an environment where it can freely tumble, relaxation tends to take longer.

General rules

Prolonged T1 relaxation time gives hypointensity i.e more black.
Prolonged T2 relaxation time gives hyperintensity i.e. More white.

<table>
<thead>
<tr>
<th>T1 relaxation time</th>
<th>T2 relaxation time</th>
<th>Tissue / lesion</th>
</tr>
</thead>
<tbody>
<tr>
<td>↑↑ Intensity</td>
<td>↑ Intensity</td>
<td>CSF, cyst, hygroma, cerebromalacia</td>
</tr>
<tr>
<td>↓ Intensity</td>
<td>↑ Intensity</td>
<td>Ischemia, oedema, demyelination, most malignant tumours</td>
</tr>
<tr>
<td>↑ Intensity</td>
<td>Slight ↑ Intensity</td>
<td>Subacute/chronic haemorrhage</td>
</tr>
<tr>
<td>↑ Intensity</td>
<td>↑ Intensity</td>
<td>Fat</td>
</tr>
<tr>
<td>Isointense</td>
<td>↓ Intensity</td>
<td>Acute haemorrhage</td>
</tr>
<tr>
<td>Isointense</td>
<td>Isointense</td>
<td>Meningioma (usually identified from structural change or surrounding oedema)</td>
</tr>
</tbody>
</table>
Diffusion weighted imaging

Fast MRI to detect a signal related to the movement of water molecules between 2 closely spaced radiofrequency pulses (diffusion)
Can detect abnormalities due to ischemia within 3 to 30 mins of onset
Acute stroke → swelling of ischemic brain parenchymal cells follows failure of energy dependent Na/K ATPase pumps and is believed to increase the ratio of intracellular to extracellular volume fractions
DWI contains additional component of T2 effect
Increased T2 signal due to vasogenic edema can “shine through” on DWI images—making it difficult to distinguish vasogenic from cytotoxic edema on these images

Gadolinium
Induce strong local magnetic fields – particularly shortening the T1 component
After IV administration, leakage of gadolinium through regions of damaged blood brain barrier produces marked enhancement of MRI signal eg. Ischaemia, infection, tumours, and demyelination help differentiate tumour tissue from surrounding edema.

LEFT MIDDLE CEREBRAL ARTERY THROMBOSIS
Contralateral hemiplegia
Contralateral hemianaesthesia and hemianopia
Aphasia (dominant)
Neglect of contralateral limbs
Dressing difficulty

This is not the answer as the patient would have many more symptoms.

LEFT BASAL GANGLIA HAEMORRHAGE
In hypertensive patients, up to 70% occur in the basal ganglia/ thalamic region
Arteries in the brain damaged by exposure to chronic hypertension are the perforator arteries which serve the basal ganlia, thalamus and pons
The MRI T2 weighted one shows an increased intensity which occurs in ischemia and not haemorrhage. Therefore this is not a haemorrhage.

AMYLOID ANGIOPATHY
Usually asymptomatic
Most common cause of lobar hemorrhage in elderly
Deposition of congophilic material in small to medium sized blood vessels → cause breakdown of blood vessel wall with haemorrhage
Cause single and recurrent lobar hemorrhages

Biggest independent risk fact: AGE

Clinical features
Intracerebral hemorrhage
Spontaneous lobar hemorrhage
CAA-related hemorrhages have predilection to cluster in posterior brain regions and display an additional tendency to cluster in the same lobe within individual patients.

Diagnosis
Suspected clinically in pts over age of 60 who have multiple lobar hemorrhages in the absence of any obvious cuase
GOLD STANDARD: post mortem
Year 2005 Paper two: Questions supplied by Ilynn

**Treatment**
- Same as any other acute intracerebral hemorrhage
- Attention to ICP and bp control
- High recurrence rate, avoid anticoagulant and anti platelet agents

This is not the answer as it is not visible on imaging. It is a diagnosis of clinical suspicion.

**DEMYELINATION**

Difficult to distinguish edema of acute plaque from gliosis and demyelination of a chronic plaque with conventional MRI technology

It is unlikely to be this answer as the question mentions it is a 57 year old man who has hypertension and is a smoker. Having slurred speech is an unlikely presenting symptom of demyelination.

**Answer is D.**