artery, the proximal carotid "stump" or, in the iatrogenic circumstances of this patient, the aorta. Periortic directional Doppler, however, demonstrated normal flow in the ophthalmic artery. Secondly, embolisation through extracranial-intracranial anastomosis could be responsible but it is unlikely as these are considered too narrow to allow an embolus responsible for such a large left hemispheric infarction to pass. A third possibility is embolisation of thrombotic material breaking off from the distal soft "white tail" of the thrombus located in the left internal carotid artery. This hypothesis is lacking support: there was arteriographic evidence of internal carotid artery occlusion for at least six years and a "soft white tail" has little chance of persisting for six years after occlusion of the internal carotid artery. Fourthly, infarctions might result from haemodynamic alterations in blood flow, but at onset there was no evidence of haemodynamic attacks with a low flow state during the transcranial angioplasty. Furthermore, the two ischaemic areas were not similar to those described in watershed infarcts. Therefore evidence for cortical low flow infarcts in this patient is lacking.

We believe that the most likely cause of the left hemispheric infarction is an embolism across the circle of Willis, in this case embolisation through the anterior communicating artery caused by thrombotic material broken away from thrombi located either in the aorta or the contralateral, stenosed right internal carotid artery where thrombotic material was floating in the lumen. This hypothesis is strongly supported by the presence of left and right hemispheric infarcts of the same age. Embolism across the circle of Willis seems the only plausible mechanism for left hemispheric infarction in our patient.

KIM WEGENER
SERGE TIMSIT
DOMINIQUE LAAENNCH-MASSONI
RACHID MANAI
GÉRALD RANCUREL

Arterial CT with injection of contrast, showing two recent areas of hypodensity in the right frontal and left frontoparietal regions corresponding to pial vessel infarcts in the territory of the right and left middle cerebral artery.

MATTERS ARISING

Elementary visual hallucinations in migraine and epilepsy

We would like to add a cautionary note to the highly interesting study by Panayiotopoulos' on the different elementary visual hallucinations in migraine and epilepsy. The paper concludes that visual hallucinations in occipital epileptic seizures are predominantly multicoloured as opposed to predominantly black and white patterns in migraine.

To be able to reach this conclusion, there needs to be certainty that the diagnosis was correct. This is most likely the case for the patients with epilepsy as in all there was either evidence of spike and slow wave activity or a structural occipital lobe lesion. The group of patients assigned to the migraine group are, however, not clearly defined. The appreciable difficulty in being able to differentiate between migraine and epilepsy is stated but too little is said about the possibility of false diagnosis in the migraine group. So it is possible that some of the patients diagnosed as having migraine actually have occipital epilepsy. This would in turn falsify the conclusion of the study.

To illustrate the difficulty of ascribing a diagnosis of migraine to patients without evidence of spike and slow wave activity or a structural occipital lobe lesion we refer to a patient we described earlier who experienced visual hallucinations (distorted vision and false colours). She was repeatedly diagnosed as having migraine. Doppler sonography of the posterior cerebral arteries during symptoms showed increased blood flow velocity typical of an occlusive hyperperfusion due to increased neuronal activity. This enabled the diagnosis of migraine to be excluded and a diagnosis of occipital epilepsy to be established. Ictal EEG was non-specifically slowed.

As we do not know how many of the migraine group in Panayiotopoulos' study really had migraine, we urge caution in the interpretation and application of the proposed conclusion.

E WILDER-SMITH
Department of Neurology, University of Bern, Insalpital Bern, 3010 Bern, Switzerland
Matters arising

Certainly, none of my patients with migraine had any clinical similarity with such a patient. I hope that Wilder-Smith is not suggesting that these patients with migraine had the cranial Doppler sonography to verify the diagnosis.

Further experience and more confidence in clinical diagnosis, obtained through meticulous evaluation of symptoms in classic migraine and oculo-vascular epilepsy, may be needed. This is the main message of my report.

C P PANAYIOTOPoulos
Department of Clinical Neurophysiology and Epilepsy, St Thomas' Hospital, London SE1 7EH, UK


Antiganglioside antibodies in the CSF of patients with motor neuron disease and Guillain-Barré syndrome

In a recent report in this Journal Stevens et al described increased titres of antiganglioside antibodies (AGAs) in the CSF of patients with amyotrophic lateral sclerosis.1 They concluded that patients with amyotrophic lateral sclerosis have raised CSF IgM antibodies to all gangliosides except asialo-GM1 (A-GM1), due to a chronic intrathecal immune response. The authors did not, however, evaluate other motor neuron disorders related to amyotrophic lateral sclerosis and with sometimes borderline diagnosis.2 We have studied AGA reactivity in the CSF of 23 patients whose diagnosis included (a) four strictly defined patients with amyotrophic lateral sclerosis; (b) 13 patients with lower motor neuron signs, from which six had a syndrome of multifocal motor neuropathy with conduction block and two had overtactive tendon reflexes in limbs, with weak, wasted, twitching muscles, fasciculation, and Babinski signs; and (c) three patients with Guillain-Barré syndrome and three patients with chronic inflammatory demyelinating neuropathy. Thirty three subjects were tested as controls, including 28 patients with other neurological disease and 10 people whose CSF was normal and in whom irrelevant diseases, such as migraine or tensional headache, were found after later studies (normal controls).

Serum and CSF were assayed for antibodies to gangliosides GM1, GD1b, GD1a, and A-GM1 by enzyme linked immunosorbent assay (ELISA) according to the method described by Noble-Orcasio et al.3 Results were expressed as the mean absorbance obtained from the well coated with ganglioside minus the absorbance obtained from a bovine serum albumin coated well. Results were considered positive when this difference exceeded 0.1. Concentrations of AGA were considered to be increased if this titre was higher than 3 SD from the mean of the results obtained by Noble-Orcasio et al.4 Results were expressed as the mean absorbance obtained from the well coated with ganglioside minus the absorbance obtained from a bovine serum albumin coated well. Results were considered positive when this difference exceeded 0.1. Concentrations of AGA were considered to be increased if this titre was higher than 3 SD from the mean of the results obtained by Noble-Orcasio et al.4

Serum and CSF were assayed for antibodies to gangliosides GM1, GD1b, GD1a, and A-GM1 by enzyme linked immunosorbent assay (ELISA) according to the method described by Noble-Orcasio et al.3 Results were expressed as the mean absorbance obtained from the well coated with ganglioside minus the absorbance obtained from a bovine serum albumin coated well. Results were considered positive when this difference exceeded 0.1. Concentrations of AGA were considered to be increased if this titre was higher than 3 SD from the mean of the results obtained by Noble-Orcasio et al.4 Results were expressed as the mean absorbance obtained from the well coated with ganglioside minus the absorbance obtained from a bovine serum albumin coated well. Results were considered positive when this difference exceeded 0.1. Concentrations of AGA were considered to be increased if this titre was higher than 3 SD from the mean of the results obtained by Noble-Orcasio et al.4

Four patients with Guillain-Barré syndrome and one with chronic inflammatory demyelinating neuropathy were studied. Three of the four Guillain-Barré syndrome patients had raised AGA titres, one patient with the syndrome has typical clinical features of Guillain-Barré syndrome and three patients with chronic inflammatory demyelinating neuropathy. Thirty three subjects were tested as controls, including 28 patients with other neurological disease and 10 people whose CSF was normal and in whom irrelevant diseases, such as migraine or tensional headache, were found after later studies (normal controls).

Serum and CSF were assayed for antibodies to gangliosides GM1, GD1b, GD1a, and A-GM1 by enzyme linked immunosorbent assay (ELISA) according to the method described by Noble-Orcasio et al.3 Results were expressed as the mean absorbance obtained from the well coated with ganglioside minus the absorbance obtained from a bovine serum albumin coated well. Results were considered positive when this difference exceeded 0.1. Concentrations of AGA were considered to be increased if this titre was higher than 3 SD from the mean of the results obtained by Noble-Orcasio et al.4 Results were expressed as the mean absorbance obtained from the well coated with ganglioside minus the absorbance obtained from a bovine serum albumin coated well. Results were considered positive when this difference exceeded 0.1. Concentrations of AGA were considered to be increased if this titre was higher than 3 SD from the mean of the results obtained by Noble-Orcasio et al.4

Stevens et al reply:

The authors report significantly increased antibody titres and evidence of intrathecal antibody production of anti-AGMI (A-GM1), GD1b, and GM1 in the CSF of patients with amyotrophic lateral sclerosis and lower motor neuron disease, as well as from Guillain-Barré syndrome. They conclude that CSF immunoreactivity to AGMI, GD1b, and GM1 is specific for these disorders. Although they interpret their data as affirmative for an intrathecal immunological process that is typically raised in this disease,1 they report antibody spectra differing from those in our sample of patients with amyotrophic lateral sclerosis. On closer scrutiny, this seems not to be the case, as anti-AGMI IgM antibodies are also found in the CSF of nine of 35 patients of our previously reported sample. Anti-AGMI antibodies are not, however, part of the panel of antibodies that are typically raised in this disease.

Although the comparative approach of Iniguez et al is up to date, due to the small sample size the results are difficult to interpret in terms of specificity and sensitivity—for example, the CSF-IGM and the IGG index of their patients are raised (which was not the case in our study) but are not reported as significant due to large within-group variation. The results within the three

<p>| Mean (SD) blood and CSF variables measured in patients and control groups |
|-----------------|-----------------|-----------------|-----------------|
|                  |                |                |                |</p>
<table>
<thead>
<tr>
<th>Normal control group</th>
<th>Other neurological disease group</th>
<th>Patient group</th>
<th>P value*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Albumin index</td>
<td>1.80 (0.50)</td>
<td>2.40 (3.40)</td>
<td>1.50 (0.90)</td>
</tr>
<tr>
<td>IgG index</td>
<td>0.35 (0.18)</td>
<td>0.34 (0.16)</td>
<td>0.68 (0.65)</td>
</tr>
<tr>
<td>IgM index</td>
<td>0.67 (0.02)</td>
<td>0.05 (0.02)</td>
<td>0.33 (0.61)</td>
</tr>
<tr>
<td>CSF: serum ratio (GM1)</td>
<td>0.49 (0.08)</td>
<td>0.44 (0.26)</td>
<td>5.40 (13.03)</td>
</tr>
<tr>
<td>CSF: serum ratio (GD1b)</td>
<td>0.58 (0.33)</td>
<td>0.36 (0.19)</td>
<td>1.80 (3.20)</td>
</tr>
<tr>
<td>CSF: serum ratio (A-GM1)</td>
<td>0.58 (0.33)</td>
<td>0.46 (0.28)</td>
<td>1.60 (7.20)</td>
</tr>
</tbody>
</table>

*Analysis of variance.

Correspondence to: Dr A Jimenez-Brugar, Servicio de Neurologia, Hospital Ramon y Cajal, Carret de Colmenar Km 9, 28034 Madrid, Spain.