Dizziness is a common symptom which affects about 30% of people over the age of 65. Older people often find it difficult to articulate the nature of their symptoms, but “dizziness” includes sensations such as giddiness, faintness, “light headedness”, vertigo, and imbalance. It is associated with depressive symptoms, poor self rated health, falls, and a reduction in social activities. We have previously shown that the most common clinical causes of dizziness in older people in the community are central vascular disease (defined as the most common clinical causes of dizziness in older people reduction in social activities.

“light headedness”, vertigo, and imbalance. It is associated with depressive symptoms, poor self rated health, falls, and a reduction in social activities. We have previously shown that the most common clinical causes of dizziness in older people in the community are central vascular disease (defined as the most common clinical causes of dizziness in older people reduction in social activities.

METHODS
Subjects over the age of 65 were invited to take part in the study through articles in the local press and through our local community survey of dizziness. We obtained signed consent and permission from each person’s general practitioner before formal recruitment. Only those who had never been dizzy were recruited to the control group. No other inclusion or exclusion criteria were applied, and the dizzy subjects were not matched for age and other clinical characteristics with the non-dizzy subjects. The definition of dizziness included unsteadiness, vertigo or “light headedness”, or a combination of these symptoms.

We recorded dizzy symptoms, medical history, current treatments, and functional ability. One of us (NC) performed all the clinical assessments, which included visual acuity testing. Posturography and vestibular testing were also performed, and these results were reported in a previous paper.

The assessments were done blind to the MRI.

MRI of the head and neck was done with a Siemens 1.5 Tesla scanner. Subjects with cardiac pacemakers, intraocular metallic foreign bodies, or intracranial ferromagnetic clips did not undergo scanning. Images were reported according to a
standardised format by a consultant neuroradiologist (RJS) who was blind to whether or not the scans were of a dizzy or non-dizzy subject. Cerebral atrophy was categorised subjectively as mild, moderate, or severe; white matter lesions were defined as an abnormal signal less than 3 mm in diameter (not perivascular); and cerebral infarcts were areas of high signal intensity on T2 images, typically involving the grey and white matter without mass effect. Cord compression was categorised subjectively as mild or severe; subluxation as none, 0–1 cm, or more than 1 cm; facet joint degeneration subjectively as none, mild, moderate, or severe; and vertebral artery compression subjectively as mild, moderate, or severe. Vertebral artery occlusion was identified by a flow void in the appropriate place.

Statistics
Statistical analysis was performed using the Statistical Package for the Social Sciences (SPSS). We used χ² tests, Fisher’s exact test, and the Mantel–Haenszel test as appropriate to compare MRI abnormalities in the dizzy and non-dizzy subjects.

RESULTS
We recruited 149 subjects with dizziness and 97 controls. The mean (SD) age of the dizzy subjects was 76 (6) years and 69 (49%) were men. The mean age of the controls was 76 (5) years and 39 (40%) were men. A history of smoking, ischaemic heart disease, stroke, ear disease, and eye disease was significantly more common in dizzy subjects than the controls. Dizzy subjects were more likely to be taking diuretics, calcium antagonists, and aspirin. One hundred and sixteen dizzy subjects (77%) described their symptoms as unsteadiness, 89 (60%) as light headedness, and 37 (32%) as vertigo, while 83 (56%) described more than one sensation. Based on standard diagnostic criteria, the most common diagnoses in the dizzy group were central vascular disease (105; 70%), cervical spondylosis (98; 66%), and anxiety or hyperventilation (48; 32%). There was considerable overlap of symptoms, with 126 (85%) having more than one diagnosis.

One hundred and twenty five dizzy subjects and 86 non-dizzy subjects underwent MRI. In the remainder, scanning was contraindicated, refused, or not tolerated.

The main findings were as follows. All dizzy subjects and all controls had at least one structural abnormality. Some degree of cerebral atrophy was found in more than three quarters of dizzy and non-dizzy subjects (table 1). Most subjects, both dizzy and non-dizzy, had at least one white matter lesion (table 2) and the proportions with more extensive hemispheric white matter lesions were very similar in the two groups. Midbrain white matter lesions (but not pons or brain stem lesions) were significantly more common in dizzy subjects (table 2). There was no significant difference in the prevalence of disease of the cervical cord and vertebrae in the dizzy and non-dizzy subjects (table 3), or in the presence of disease of the VIII nerve and semicircular canals (table 4).

DISCUSSION
To our knowledge, this is the largest case–control study of dizzy and non-dizzy people to undergo MRI of their brain and neck. We found no significant differences in the prevalence of cerebral atrophy, the number of white matter lesions, the number of cerebral infarcts, or disease of the semicircular canals or cerebellopontine angle in subjects with and without dizziness, though dizzy subjects were more likely to have cardiovascular risk factors and a history of previous stroke. This suggests that routine MRI in patients with dizziness is unlikely to be helpful, and does not support the view that “head CT and MRI are diagnostically useful when dizziness of a CNS aetiology is suspected,” as previously suggested. In older people, dizziness is often attributed to vertebrobasilar ischaemia, which is assumed to be caused by impaired blood flow through the vertebral arteries as a result of cervical spine disease. We found no difference in disease of the cervical cord and vertebrae in dizzy and non-dizzy subjects. Hence a diagnosis of ‘vertebrobasilar ischaemia’ in dizzy people is probably unhelpful, and the application of such a label may prevent physicians from considering other potential causes of dizziness.

The only difference in MRI between dizzy and non-dizzy subjects was that midbrain white matter lesions were more common in the dizzy subjects. There are several possible explanations for this finding. First, it may be a chance finding, but the p value of < 0.001 makes this highly unlikely. Second, it may be related to the higher prevalence of cardiovascular risk factors in the dizzy group, but if this were the case, one might expect dizzy subjects to have more white matter lesions in all sites (and not just in the midbrain). Third, it is possible that these lesions cause dizziness in some patients. Midbrain lesions such as infarcts typically cause eye movement problems. Although our subjects did not have eye movement problems, it is possible that these lesions cause dizziness in some patients.

---

### Table 1

<table>
<thead>
<tr>
<th>Cerebral hemispheres in dizzy and non-dizzy subjects</th>
<th>Dizzy subjects (n=125)</th>
<th>Non-dizzy subjects (n=86)</th>
<th>p Value</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Atrophy</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>None</td>
<td>17 (14)</td>
<td>12 (15)</td>
<td>0.47*</td>
</tr>
<tr>
<td>Mild</td>
<td>38 (31)</td>
<td>28 (34)</td>
<td></td>
</tr>
<tr>
<td>Moderate</td>
<td>51 (42)</td>
<td>35 (43)</td>
<td></td>
</tr>
<tr>
<td>Severe</td>
<td>16 (13)</td>
<td>7 (8)</td>
<td></td>
</tr>
<tr>
<td>No information</td>
<td>3</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td><strong>White matter lesion</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0</td>
<td>38 (31)</td>
<td>18 (22)</td>
<td>0.21†</td>
</tr>
<tr>
<td>1–5</td>
<td>40 (33)</td>
<td>32 (39)</td>
<td></td>
</tr>
<tr>
<td>6–10</td>
<td>21 (17)</td>
<td>15 (18)</td>
<td></td>
</tr>
<tr>
<td>&gt;10</td>
<td>24 (20)</td>
<td>17 (21)</td>
<td></td>
</tr>
<tr>
<td>No information</td>
<td>2</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td><strong>Infarct</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>None</td>
<td>118 (96)</td>
<td>80 (98)</td>
<td>0.70*</td>
</tr>
<tr>
<td>Occipital</td>
<td>0 (0)</td>
<td>2 (2)</td>
<td></td>
</tr>
<tr>
<td>Parietal</td>
<td>0 (0)</td>
<td>0 (0)</td>
<td></td>
</tr>
<tr>
<td>Middle cerebral artery territory</td>
<td>1 (1)</td>
<td>0 (0)</td>
<td></td>
</tr>
<tr>
<td>Lacunar</td>
<td>3 (2)</td>
<td>0 (0)</td>
<td></td>
</tr>
<tr>
<td>Occipital and parietal</td>
<td>1 (1)</td>
<td>0 (0)</td>
<td></td>
</tr>
<tr>
<td>No information</td>
<td>2</td>
<td>4</td>
<td></td>
</tr>
</tbody>
</table>

Values are n (%). The denominator used to calculate the percentage is the number of scans where information is available.

*Scans unclear or unreadable.

### Table 2

<table>
<thead>
<tr>
<th>Site of posterior fossa white matter lesions in dizzy and non-dizzy subjects</th>
<th>Dizzy subjects (n=125)</th>
<th>Non-dizzy subjects (n=86)</th>
<th>p Value (χ² test)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lesion in pons</td>
<td>16 (13)</td>
<td>10 (13)</td>
<td>1.00</td>
</tr>
<tr>
<td>No lesion in pons</td>
<td>103 (87)</td>
<td>69 (87)</td>
<td></td>
</tr>
<tr>
<td>Lesion in midbrain</td>
<td>26 (22)</td>
<td>3 (4)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>No lesion in midbrain</td>
<td>93 (78)</td>
<td>76 (96)</td>
<td></td>
</tr>
<tr>
<td>Lesion in medulla</td>
<td>8 (7)</td>
<td>5 (6)</td>
<td>1.00</td>
</tr>
<tr>
<td>No lesion in medulla</td>
<td>111 (93)</td>
<td>74 (94)</td>
<td></td>
</tr>
</tbody>
</table>
*No information                                                                | 6                      | 7                        |                  |

Values are n (%). The denominator used to calculate the percentage is the number of scans where information is available.

*Scans unclear or unreadable.
problems, it is plausible that the clinical effect of infarcts may be different from insidious white matter lesions. Hence the clinical significance of these midbrain lesions remains uncertain.

We identified our subjects and controls from articles in the local press. Hence, our subjects may have had milder dizziness than people who seek medical attention for this symptom. Had we performed MRI in patients who present to their doctor with dizziness or who were admitted to hospital with dizziness—that is, the more severe end of the dizzy spectrum—we may have found a higher prevalence of structural brain abnormalities in the dizzy subjects, although one would not necessarily be able to attribute a causative role to such abnormalities. Had we just recruited patients with poor balance or falls, as in two previous studies, we might have found a higher prevalence of structural abnormalities. However, we were interested in the complaint of dizziness in general rather than in more specific symptoms such as vertigo. Over half the patients with dizziness complained of more than one symptom, which meant that it was not possible to compare the MRI findings in patients with unsteadiness, vertigo, or light headedness.

Implications

These data suggest that routine MRI in the investigation of dizziness is unhelpful, because most abnormalities (for example, cerebral atrophy and white matter lesions) are equally common in people with and without dizziness. Obviously, if a specific diagnosis such as an acoustic neuroma is suspected, then MRI should be performed. The observation of more frequent white matter lesions in the midbrain in dizzy subjects requires further study to determine whether small vessel changes could cause dizziness in older people. Studies to determine the relation between falls, poor balance, and structural brain lesions would be interesting.

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Authors’ affiliations

N Colledge, Department of Geriatric Medicine, Liberton Hospital and Royal Infirmary, Edinburgh, UK
S Lewis, G Mead, Department of Clinical and Surgical Sciences, (Geriatric Medicine) University of Edinburgh
R Sellar, Department of Neuroradiology, Western General Hospital, Edinburgh
J Wardlaw, Department of Neuroradiology, University of Edinburgh
J Wilson, Department of Head and Neck Surgery, University of Newcastle, Newcastle upon Tyne, UK

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Magnetic resonance brain imaging in people with dizziness: a comparison with non-dizzy people

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