US GUIDELINES ON NEUROIMAGING IN PATIENTS WITH NON-ACUTE HEADACHE: A COMMENTARY

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The US Headache Consortium is a group of 14 US doctors (mainly academic neurologists) who aim to “develop scientifically sound, clinically relevant practice guidelines on chronic headache in the primary care setting.” The consortium has produced several sets of guidelines, endorsed by the American Academy of Neurology and several other relevant US medical academic societies. These include the guidelines on neuroimaging of non-acute headache patients. As far as I am aware, these are the only available guidelines addressing this issue. Non-acute (or chronic) headache is defined as all headache syndromes lasting for at least four weeks, and the “primary care setting” in the USA refers to patients seen in an outpatient setting by a family doctor, a general physician or a specialist.

WHAT THE GUIDELINES SAY

The guidelines begin by pointing out that headache is very common and that the majority of headaches (tension type and migraine) are benign. There is, therefore, a very low probability of identifying a causative lesion on a brain scan of an unselected outpatient presenting with headache, so that neuroimaging is highly unlikely to be a sensible “routine” investigation among outpatients with headache. In practice, a brain scan may be requested for one or more of several different reasons:

1. the physician suspects a causative structural lesion whose identification would alter the clinical management of the patient
2. the scan is expected to be normal and so reassure the patient, their relatives and/or the doctor
3. the patient, relatives or referring doctor (if there is one) specifically request a scan
4. the physician wants to avoid any possibility of a lawsuit based on failure to diagnose a lesion, even if it is an incidental finding and unrelated to the headache.

Neuroimaging to identify a suspected structural lesion

The guidelines focus mainly on the use of neuroimaging to identify a suspected structural lesion. Reasonably comprehensive search methods were used to identify all studies of computed tomographic (CT) or structural magnetic resonance (MR) scans among patients presenting with non-acute headache, and these form the basis of the recommendations made. The section summarising the methods and results of these studies is rather long and tortuous, and the tables presenting the data could be clearer. I read all of the papers referenced to see if I could make better sense of it all, and found a few errors and inconsistencies in the text and the data presented.

Rather late on in the document, the guidelines suggest that testing should be avoided if it will not lead to a change in management and if the individual is not significantly more likely than anyone else in the general population to have a clinically important abnormality. These principles should be mentioned earlier, since they could then better inform the way the data are presented and interpreted.

Included studies

The guidelines acknowledge that the available studies can offer only limited guidance because of methodological flaws (generally small size and/or serious biases). All of them involved series of patients with headache who were referred for a CT or MR brain scan, and generally provided no or very little clinical detail about the patients studied (clinical details were often only those available on the imaging request form) or why they were scanned. Most of the studies were retrospective, and only one reported that the radiologists interpreting the scans were unaware of the patients’ clinical details. In addition, although not mentioned in the guidelines document, about one third of the studies included were published before 1985 and used early (mainly first) generation CT scanners that were less sensitive than those now in widespread use.

Results of the studies and recommendations

Patients with no abnormal neurological signs

Overall, the studies found that imaging detected a serious abnormality (one requiring definite action and so altering the patient’s management) in only a very small proportion (< 0.5%) of
patients without abnormal neurological signs who presented with migraine or tension type headache, or with “chronic headache” (not further defined), and were referred for a scan (table 1). This is no greater than the proportion of completely asymptomatic individuals in whom a serious abnormality was detected on an MR brain scan (not included in the guidelines but shown in table 1).19

In the guidelines (but not in table 1), the data from studies that probably included patients with acute (as well as chronic) headache are presented together with those from studies that clearly included only chronic headache patients. This is rather misleading, since the latter types of studies are likely to have included mainly tension type headache patients, while the former are likely to have included patients with a higher frequency of abnormal scans (for example, those caused by subarachnoid haemorrhage).

The guidelines recommend that neuroimaging is not usually warranted for patients with migraine and normal neurological examination, but state that the “data were insufficient to make a recommendation regarding the use of neuroimaging for tension-type headache”. My own view is that the data from patients with chronic headache (not further defined) provide enough reassurance to suggest that, for migraine, imaging will almost always be unnecessary if the history is one of tension type headache and the neurological examination is normal (table 1).

**Patients with abnormal neurological signs**

The studies showed that abnormal neurological findings on examination increased the probability of finding significant intracranial pathology. The guidelines therefore recommend that “neuroimaging should be considered in patients with non-acute headache and an unexplained abnormal finding on neurological examination”.

**Features in the history**

The studies also suggested that certain features of the history (for example, headache worsened by Valsalva manoeuvre or causing waking from sleep, progressively worsening headache, or new headache in older people) were associated with an increased probability of finding a significant abnormality on scanning. However, since the data were not conclusive the guidelines recommend that “evidence is insufficient to make specific recommendations regarding neuroimaging in the presence or absence of [various headache-related] symptoms”.

**Imaging modality**

There were no data comparing enhanced with unenhanced CT scans. Limited data suggested that MR imaging was more sensitive than CT in finding white matter lesions of uncertain significance and developmental venous anomalies, but there was no evidence to suggest that this was of any clinical importance. Because of the limited data, the guidelines do not make any specific recommendations about imaging modality.

**Neuroimaging for other reasons**

The guidelines discuss the second to fourth reasons for requesting a brain scan (see previous page) only very briefly. They explain that, while reassurance and increased patient/relative satisfaction may be the result of a scan performed for one of these reasons, there are potential risks to be taken into account. These include the radiation exposure of a CT scan, the small risk of an allergic reaction to any ionic contrast used, and the risk of oversedation of claustrophobic patients having MR scans. In addition, false negative studies may provide inappropriate reassurance, but are extremely unlikely to occur when the suspicion (that is, prior probability) of detecting a serious abnormality is low. The guidelines do not emphasise enough the important point that false positive findings are much more likely than true positive ones in this setting. Such findings may lead to unnecessary concerns, further investigation and procedures, any of which may be physically or psychologically harmful. (Consider, for example, a patient with tension type headache whose MR scan shows an unrelated asymptomatic aneurysm that might never have ruptured. Having discovered the lesion, the patient and neuroradiologist decide that it should be treated endovascularly, but unfortunately the patient develops a permanent hemiparesis as a complication of the coiling procedure.) Some of these consequences might even themselves result in legal action, so that requesting a brain scan to avoid the possibility of a lawsuit may not be as straightforward as it seems! Furthermore, it remains unclear whether or not brain imaging that is expected to be normal plays any role in reassuring anxious patients.”22 An ongoing randomised trial is addressing this issue.

**CONCLUSIONS**

These guidelines provide a useful source of most available studies of the role of neuroimaging in non-acute headache patients. Unfortunately, the studies have serious methodological limitations, and fail to address several important issues. The guidelines are unlikely to impact much on clinical practice, since their recommendations reflect only the limited data from these studies. It is not uncommon for good quality evidence to be unavailable, and in these situations we must surely be guided by clinical common sense. When the next

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**Table 1** Proportion of individuals with a serious abnormality on brain imaging (CT or MRI)*

<table>
<thead>
<tr>
<th>Types of individuals included</th>
<th>Number with serious abnormality/number scanned</th>
<th>% (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Migraine†‡12</td>
<td>2/1086</td>
<td>0.2 (0.02 to 0.7)</td>
</tr>
<tr>
<td>Tension type headache†‡7</td>
<td>0/83</td>
<td>0 (0 to 4.4)</td>
</tr>
<tr>
<td>Chronic headache (not further defined)†‡15–27</td>
<td>7/1445</td>
<td>0.5 (0.2 to 1.0)</td>
</tr>
<tr>
<td>Asymptomatic volunteers¶19</td>
<td>4/1000</td>
<td>0.4 (0.1 to 0.8)</td>
</tr>
</tbody>
</table>

*To improve clarity, these results are summarised here in a simpler format than that used in the guidelines.
†No abnormal neurological findings on examination.
‡Only those studies which definitely excluded patients with acute headache are included here.
¶ A study of the incidental findings on brain MR scans of 1000 asymptomatic volunteers who participated as control subjects in various research projects and whose median age was similar to the individuals included in the studies of headache patients summarised in the guidelines.
CI, confidence interval.
patient with chronic headache walks into the consulting room, it might be more helpful simply to recall Packard’s warning: “The patient with a headache often finds himself a medical orphan. He is fortunate indeed if his headache is transient, for otherwise he may find himself on an excursion to the ophthalmologist, otolaryngologist, neurologist, dentist, psychiatrist, chiropractor, and the latest health spa. He is rayed, fitted with glasses, analysed, massaged, relieved of his turbinates and teeth and too often emerges with his headache intact.”

REFERENCES