

Primary care access to computed tomography for chronic headache

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ABSTRACT

Background

The diagnostic yield of neuroimaging in chronic headache is low, but can reduce the use of health services.

Aim

To determine whether primary care access to brain computed tomography (CT) referral for chronic headache reduces referral to secondary care.

Design of study

Prospective observational analysis of GP referrals to an open access CT brain scanning service.

Setting

Primary care, and outpatient radiology and neurology departments.

Method

GPs in Tayside and North East Fife, Scotland were given access to brain CT for patients with chronic headache. All referrals were analysed prospectively over 1 year, and questionnaires were sent to referrers to establish whether imaging had resulted in or stopped a referral to secondary care. The Tayside outpatient clinic database identified scanned patients referred to the neurology clinic for headache from the start of the study period to at least 1 year after their scan.

Results

There were 232 referrals (55.1/100 000/year, 95% confidence interval = 50.4 to 59.9) from GPs in 59 (82%) of 72 primary care practices. CT was performed on 215 patients. Significant abnormalities were noted in 3 (1.4%) patients; there were 22 (10.2%) non-significant findings, and 190 (88.4%) normal scans. Questionnaires of the referring GPs reported that 167 (88%) scans stopped a referral to secondary care. GPs referred 30 (14%) scanned patients to a neurologist because of headache. It is estimated that imaging reduced referrals to secondary care by 86% in the follow-up period.

Conclusion

An open access brain CT service for patients with chronic headache was used by most GP practices in Tayside, and reduced the number of referrals to secondary care.

Keywords

headache disorders; computed tomography; open access; primary health care.

INTRODUCTION

Headache is one of the most common symptoms encountered in general practice, with an annual consultation rate of 4.44 per 100 registered patients.¹ It is the single most common cause for neurology referral in the UK,² accounting for up to 22% of GP referrals to neurologists.³ Chronic tension-type headache and migraine are the two most common headache types encountered in the UK population, both in primary care⁴ and specialist clinics.⁵ It has been argued that most primary headache can be managed in primary care, and that investigations are rarely needed.⁶ However, healthcare professionals often find the diagnosis and classification of headache difficult,⁷ and both healthcare professionals and patients worry about serious causes such as brain tumours.⁸

The role of imaging in this situation has been extensively reviewed, and guidance has been published for risk which stratifies patients according to presentation.^{9,10} Although pathology may be excluded by neuroimaging, the diagnostic yield is low,^{9,11,12} and the duration of reassurance for patients is short.¹³ Moreover, there is a risk of finding coincidental abnormalities that may generate more anxiety.¹⁴ So, the US Headache

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Consortium Guidelines⁶ and the Scottish Intercollegiate Guidelines Network⁸ do not recommend neuroimaging for chronic headache in the absence of focal neurological signs. Nevertheless, observational studies indicate that brain scans are widely carried out on patients with normal neurological examinations.¹⁵⁻¹⁸

In a randomised trial to examine the effect of scanning of patients with chronic daily headache, referral rates to the neurology service were reduced from 17/74 (23%) in the control group to 1/76 (1.3%) in the scanned group.¹³ Although this study was restricted to selected patients referred to a trial, it raises the possibility that provision of an open access service might reduce chronic headache referral rates to secondary care for the entire population. Open access services have been shown to influence the management of patients in primary care by helping to avoid referrals to secondary care, ensuring referral to the appropriate specialty, and speeding up the time to diagnosis with a consultant opinion.¹⁹⁻²¹

The aim of this study was to estimate both the rate of referral of patients with chronic headache to an open access CT service, and the effect on referral rates to the neurology service in a defined population.

METHOD

The study was performed in Tayside and North East Fife, Scotland. The adult population of 421 207²² is cared for by 309 GPs in 72 GP practices, and four full-time consultant neurologists, working in the local university teaching hospital, with outreach clinics in two district hospitals. Care is free at the point of access and few patients seek care outside the area.

The number of consultations for headache was estimated by applying the UK rate¹ to the Tayside and North East Fife population, and the scan referral rate was the number of scan referrals as a proportion of this estimate.

All of the GPs were given access to refer patients directly to brain CT at three sites in the study area: Ninewells Hospital, Dundee; Perth Royal Infirmary, Perth; and Stracathro Hospital, Angus. Between these hospitals, approximately 7000 CT brain scans are carried out routinely each year. The referral protocol stated that patients should be aged 18 years or more, with a normal neurological examination, and symptoms consistent with chronic, unchanging headache, or of a non-acute nature such that secondary care referral for specialist opinion was not deemed necessary. The duration of headache was not specified.

All referrals were analysed prospectively for a 12-

How this fits in

In the absence of focal neurological signs, neuroimaging for chronic headache is not recommended by US and Scottish Intercollegiate Guidelines Network guidelines, but has been shown to reduce subsequent use of health services, especially in patients with high levels of morbidity. In this study, an open access brain CT service for patients with chronic headache was used by the majority of GPs, and reduced referrals to secondary care.

month period from 1 April 2005 to 31 March 2006, and data were collected on the referral and referring practitioner and radiological findings. A follow-up questionnaire was sent to the referring GP with the CT scan report to establish whether the CT service had resulted in or stopped a referral to neurologists. The Tayside outpatient clinic database was used to determine which of the scanned patients were referred to a neurology clinic between 1 April 2005 and 31 March 2007, giving a follow-up period of at least 1 year after each patient's scan. GP referral letters and hospital records were then assessed, so that only those patients who were referred because of headache were included.

RESULTS

Between 1 April 2005 and 31 March 2006 the GPs in the study area referred 232 patients for brain CT (55.1/100 000/year, 95% confidence interval [CI] = 50.4 to 59.9). There were an estimated 18 702 headache consultations, and the referral rate to the open access service was 1.24%. A scan was not performed for 17 (7.3%) of the patients because six appointments were cancelled, five patients did not attend, two request forms were incomplete, and four requests were declined because the radiologist did not think that the referrals complied with study criteria (one for memory loss, one for personality change, one for suspected stroke, and one for suspected transient ischaemic attack). So 215 (92.7%) of the referred patients were scanned (51.0/100 000/year, 95% CI = 46.3 to 55.8), and two patients were recalled for second scans. Table 1 gives details of the age and sex of the 215 scanned

Table 1. Patients grouped according to whether or not they were referred to a neurology clinic for chronic headache.

	Referred to neurology clinic	Not referred to neurology clinic	Total
Male, <i>n</i>	14	80	94
mean age in years (SD)	47 (16)	48 (15)	48 (15)
Female, <i>n</i>	16	105	121
mean age in years (SD)	41 (14)	47 (18)	47 (18)
Total, <i>n</i>	30	185	215
mean age in years (SD)	44 (15)	48 (17)	47 (17)

Table 2. Diagnoses in patients referred to neurologists.

Diagnosis	<i>n</i>
Tension-type headache	6 ^a
Tension-type headache and migraine	6 ^a
Migraine	4
Chronic daily headache not otherwise specified	3
Post-traumatic	2
Atypical facial pain	1
Trigeminal neuralgia	1
Thunderclap headache	1
Temporomandibular joint dysfunction	1
Not headache	3
Did not attend	2
Total	30

^aIncludes one medication overuse headache.

patients, grouped according to whether or not they were referred to neurology clinic for chronic headache. The age range of the study population was 20–85 years.

The CT scans of 215 patients identified three lesions which, in the opinion of the study neurologists, might have caused chronic headache. One patient had metastatic lung cancer, another patient had a meningioma, and a third patient had an arteriovenous malformation. It was concluded that 22 patients had non-significant findings including old infarcts ($n = 7$), other ischaemic changes ($n = 7$), arachnoid cysts ($n = 2$), sinusitis ($n = 2$), pineal cyst ($n = 1$), prominent deep cerebral vein ($n = 1$), probable artefact ($n = 1$), and other unspecified changes ($n = 1$), giving a 1.4% yield for significant pathological findings and 10.2% for non-significant findings; 190 (88.4%) CT scans were reported to be normal.

The open access service was used by 140 (45%) of 309 Tayside GPs from 59 (82%) of the 72 GP practices. The highest number of CT requests from a single GP was seven: most GPs referred one patient. Completed questionnaires were obtained from 189 (88%) of the referring GPs, and the

responders reported that, in 167 (88%) of 189 cases with completed questionnaires, the scan had stopped a referral to secondary care; in 10 (5%) cases the scan had caused a referral, and in 12 (6%) cases a referral had been made to neurology service at the same time as the scan request.

There were 288.9 patient years of follow-up in 215 patients, giving a mean follow-up period of 1.3 years per patient (standard deviation = 0.29 years). Assessment of the Tayside outpatient clinic log and GP referral letters showed that, of the 215 patients scanned in 1 year, 30 (14%) were referred to neurology clinics because of headache. Of these 30 patients, 12 (40%) were referred before, or at the same time as their CT scan request, and the remaining 18 (60%) were referred after their brain CT. The overall referral rate per 100 patient years was 10.4 (95% CI = 6.3 to 14.5). The diagnoses made by neurologists of the 30 patients referred to clinic are shown in Table 2, and the brain CT findings are shown in Table 3.

Five (2.3%) patients died in the follow-up period: one patient had meningeal deposits of metastatic lung cancer seen on the study brain CT; three other patients died of unrelated conditions including pneumonia ($n = 1$), pulmonary embolism ($n = 1$), and acute renal failure ($n = 1$). No information was available for one of the deceased patients.

DISCUSSION

Summary of main findings

The majority of GP practices in the study area used the open access service, and it is estimated that 1.24% of consultations for headache led to a referral to the open access service. Open access CT scans accounted for about 4% of the annual number of CT brain scans across Tayside. The yield of significant pathological findings in this study was 1.4%, and this is consistent with findings in other populations of patients with chronic headache.^{6,12,23}

Results of the questionnaire sent to GPs who had used the service show that it may have prevented a neurology referral in 88% of cases. As the CT scan was said to have caused a referral in 5% of cases, one could assume that the predicted reduction in clinic referrals would be 83%. This finding seems to have been borne out in the follow-up study, which showed that only 14% of the scanned patients were referred to neurology because of headache in the mean 1.3 years of follow-up per patient. Hypothetically, CT prevented a referral in 86% of cases. The 14% referral rate in scanned patients is higher than the rate observed in other much larger groups of patients with chronic headache.^{1,13} This may result from referral filter bias, as presumably these patients were referred because the GP was

Table 3. Computed tomography results in patients referred to neurologists.

Findings	<i>n</i>
Normal	17
Dural/falcine calcification	2
Arachnoid/pineal cysts	2
Old lacunar infarct	1
Mild asymmetry	1
Small vessel disease	1
Incidental meningioma	1
Total	25 ^a

^aExcludes two 'did not attend' and three 'without headache'.

not certain of the diagnosis, or required advice about management. This is supported by the observation that in 12 (6%) cases, the GPs referred their patients to neurologists at the same time as requesting CT. The neurologists' diagnoses of tension-type headache, migraine, or chronic daily headache in 19 out of 30 cases reflects the prevalence of these headache types in the general population.⁴

Is scanning a patient's brain for reassurance sufficient to render referral to secondary care unnecessary? Some patients will find reassurance in being given a diagnosis or an explanation of the problem,²⁴ whether this comes from a primary or secondary care provider, and others will not. However, it could be argued that the GP is best placed to identify those patients most likely to be reassured by a negative or normal scan, and the present study indicates that the majority of GPs were able to manage scanned patients in primary care during the follow-up period.

Strengths and limitations of the study

This prospective observational study puts into a population-based context the findings of Howard *et al*, who showed that patients with chronic daily headache who were randomised to brain scanning had lower rates of referral to neurological services.¹³ First, it shows the likely level of uptake of the service is quite low, at 1% of consultations. Secondly, a questionnaire sent to referring GPs was used to estimate that a referral to the neurology service was avoided for 88% of scanned patients during the study period. Thirdly, it was possible to measure actual referral rates in the follow-up period to confirm this.

The observational study design has some limitations. First, because one of the study aims was to observe the effect of CT on usual clinical practice, GPs were not asked to classify the type or chronicity of headaches using the International Classification of Headache Disorders.²⁵ Instead, the GPs were allowed to scan patients within the bounds of the referral protocol. Second, it was not possible to evaluate the GPs' management of patients with headache, before and after the scans, or to compare it to specialist care. This would require a randomised trial comparing GP and specialist practice, with and without access to imaging. Third, long-term studies have not been carried out to look for trends in rates of referral to the open access CT service. Nor did the study look at the effect on referrals to non-neurology clinics, such as general medicine, ophthalmology, and otorhinolaryngology. Lastly, it is important to consider the identification of significant

coincidental findings, together with the small risk associated with exposure to radiation. There may also have been benefits of the open access service if its availability changed the management of people with headache who were not scanned.

Comparison with existing literature

Howard *et al* carried out a randomised controlled trial of patients with chronic daily headache in which the intervention was the offer of a brain scan.¹³ They found that neuroimaging reassured patients about the cause of their headache when they were reassessed at 3 months, but this effect was not sustained at 1 year. Nevertheless, this study did demonstrate that scanned patients had a lower rate of referral to the neurology service. However, the study was a trial of selected patients with chronic daily headache. It did not provide an estimate of the likely referral rates for patients with chronic daily headache, nor did it show an actual effect of reduced referral rates at a population level. The present study allowed an estimate that 1% of consultations led to a referral for CT, and that referrals of scanned patients to the neurology service were reduced by 86%.

Implications for clinical practice

The primary reason for arranging neuroimaging must remain its clinical indication, but the results of this study suggest that open access scanning may give GPs more confidence in managing the small minority of patients for whom a normal scan will provide reassurance and prevent secondary referral.

Competing interests

The authors have stated that there are none.

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