

# Evaluation of headaches

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## Abstract

This article aims to provide a practical guide to the common causes of headache and their assessment in children. Contrary to popular belief, headaches are very common in children. The primary headache disorders, which include migraine and tension-type headache, account for the majority of headaches, while secondary headache, that is those with underlying pathology, are much less common. A thorough history and examination is the key to determining the cause and should be the most important means of reassuring the child and family that there is no serious cause for the headaches. To manage childhood headache you need to be able to distinguish the painful from the harmful, and therefore must recognize the common headache patterns and the signs and symptoms that may indicate serious intracranial disease. Most non-acute headaches do not need further investigation. Neuroimaging is rarely necessary. Recurrent headaches, of whatever cause, are a cause of considerable morbidity especially in terms of school loss.

**Keywords** diagnostic imaging; headache disorders, primary; migraine disorders; tension-type headache

## Introduction

Headaches are common in children and the prevalence increases with increasing age. In paediatric neurology practice almost half of referrals from primary care are because of headache. Unfortunately most parents think that headache is an uncommon symptom in children, hence their understandable concern. As well as hoping to relieve the pain, parents are often seeking reassurance that their child's headache is not a sign of serious intracranial disease, such as a brain tumour. Understanding this need for reassurance is key to managing headache effectively.

Migraine and tension-type headache are by far the commonest causes of headache. Other rarer causes include hemicrania continua, cluster headaches, idiopathic intracranial hypertension and, of course, the headache associated with raised intracranial pressure secondary to a tumour.

A good history will provide a diagnosis in the vast majority of children. This, and a careful examination, will ensure that serious secondary causes are unlikely to be missed.

A recent systematic review of population based studies of headache and migraine in children and adolescents reported an estimated prevalence for headache of 58.4% and 7.7% for migraine in the under 20s. They confirmed that headache is more common in girls and that the prevalence of migraine increases in

## Learning objectives

After reading this article, you should change for recognise:

- the history is the key to diagnosis
- neuroimaging is rarely necessary unless the history or examination suggests a structural aetiology
- headache due to a space occupying lesion is very rarely an isolated symptom and there are invariably accompanying neurological signs

children over the age of 14. Migraine affects males and females equally before this age.

Secondary headaches are rare, and brain tumour as a cause of headache even rarer. For every child with a brain tumour there are around 5000 children with recurrent headaches, including 2000 children with migraine.

Headaches have a significant impact on the lives of children and adolescents, resulting in school absence, decreased extra-curricular activities, and poor academic achievement.

## Classifying paediatric headaches

In 1988 The International Headache Society published a classification scheme for headaches including complex diagnostic criteria. In essence, it divided headache into two categories – primary and secondary. Primary headache disorders i.e. those that have no other underlying cause, include migraine, tension-type headache, cluster headache and the other trigeminal autonomic cephalalgias. Secondary headaches are associated with underlying CNS or other pathology. More recently, it has been recognized that this classification needed fine tuning, especially in relation to the classification of headaches in children and adolescents and the revised classification was published in 2004. This also separates out the cranial neuralgias which are almost exclusively adult diagnoses.

Although standard teaching is to consider migraine and tension headache as completely different entities, it is much more likely that they lie on a continuum. This theory fits better with clinical practice.

Clinically it can be more helpful initially to divide headache into one of four broad types depending on the temporal pattern.

- Isolated acute
- Acute recurrent (episodic)
- Chronic progressive
- Chronic non-progressive

**Acute** headache is defined as a recent onset headache with no prior history of similar episodes. In children this pattern is most commonly due to febrile illness related to upper respiratory tract infection, but severe acute headache may also be the presenting symptom of a variety of serious intracranial pathologies such as meningitis, raised intracranial pressure or haemorrhage (see Table 1).

Attacks of head pain separated by symptom free intervals are classified as **acute recurrent** headache. Primary headache syndromes, such as migraine or tension-type headache, usually cause this pattern.

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### Important causes of acute headache

- Migraine
- Tension headache
- Infection
  - Local
    - Eyes
    - Ears
    - Teeth
    - Sinuses
    - Skin
    - Lymph nodes
  - Systemic
    - Viraemia
    - Bacteraemia
    - Meningitis
    - Encephalitis
    - Septicaemia
- Arterial hypertension
- Inflammatory disease
  - Local
    - Cervical
    - Musculoskeletal
  - Systemic
    - Kawasaki disease
    - Lupus
    - Other collagen vascular disease
- Intracranial
  - Hydrocephalus
  - Intracranial haemorrhage
  - Brain tumour
  - Vascular anomaly
  - Idiopathic intracranial hypertension
  - Post traumatic

**Table 1**

In **chronic progressive** headache the frequency and severity of the headaches gradually increases with time. This is the most ominous of the temporal patterns and is commonly correlated with increasing intracranial pressure. Causes include idiopathic intracranial hypertension, tumour, hydrocephalus and subdural collections.

**Chronic non-progressive** headaches differ from acute recurrent headaches by their greater frequency and persistence. They may last for years with no associated neurological symptoms or change in headache severity. A common headache in this category is chronic tension-type headache. An important newly recognized entity that also occurs with this temporal pattern is chronic daily headache (CDH).

### Clinical assessment of headache in children

The cornerstone of headache management remains good history taking and careful physical and neurological examination; as they invariably allow a diagnosis to be made, identify those

children who have a secondary cause for their headache and recognize the few who require further investigation.

### History

The history is the key to diagnosing the cause of the headache and to identifying those children with symptomatic (secondary) headache. Asking both the child and his/her parents about the headache is important but unfortunately children under 10 years are not good at describing pain, its frequency, severity or distribution. This does not mean that they should not be asked or listened to. Rothner has created a checklist to aid clinicians in eliciting the important features of any headache (see Table 2). Whilst more applicable to the outpatient setting it is still a useful aide memoir in the acute situation. Asking the child to draw their headache can be a very effective way of enhancing the history.

In addition questions need to be specifically asked about other symptoms suggesting raised intracranial pressure or progressive neurological disease such as unsteadiness, seizures or visual disturbances. Subtle behavioural disturbances or school difficulties can be important early warning symptoms of a structural aetiology, but may also occur when the pain becomes chronic. A past history of head injury or other neurological problems may be relevant. School loss can be a useful proxy measure for the severity of the problem. A family member with headaches may give a clue to the cause but may also be acting as a role model for the headache behaviour.

Symptoms that suggest a secondary cause for the headaches are given in Table 3.

### Examination

The focus of the examination will be determined by the history and clinical context. It is helpful to divide the child presenting

### Things to ask about headache

- Do you have more than one type of headache?
- How did the headache begin?
- Was there associated trauma or infection?
- How long has the headache been present?
- Are the symptoms getting better, worse or staying the same?
- How often do the symptoms occur?
- How long do they last?
- Do the headaches occur at any particular time or circumstance?
- Is the headache preceded by a warning?
- Where does it hurt?
- What is sort of pain is it? Is it pounding or sharp?
- Do you have any associated symptoms during the headache?
- Is there any nausea or vomiting?
- Do you stop what you are doing during the headache?
- Are there activities that make the headache worse?
- Does anything make the headache better?
- Do you have any other medical problems?
- Are you taking any medication?
- Does any one in your family have headaches?
- What do you think is causing your headache?

**Table 2**

### Symptoms suggestive of a secondary cause

#### Headache history

- Short history
  - 'First or worst' headache
  - Recurrent severe headache(s) for a few weeks
- Accelerated course
  - Increasing frequency
  - Worsening usual headache
- Headache timing and posture
  - Mainly from sleep
  - In the morning before getting up
  - Mainly or worse when lying down, relieved when upright (suggests raised pressure)
  - Worse with bending, coughing etc
  - Mainly upright, relieved when lying down (suggests low pressure headache)

#### Associated symptoms

- Vomiting from sleep or before getting up
- Confusion, impaired consciousness
- Altered personality
- Focal weakness
- Diplopia
- Fever, rigors
- Seizures

**Table 3**

with an acute severe headache as an emergency from the child with other temporal patterns of headache as the causes are somewhat different (see [Tables 1 and 4](#)). Lewis and Qureshi found that children presenting to the emergency department with an acute headache most commonly had a febrile illness related to an upper respiratory tract infection. A serious underlying neurological diagnosis was uncommon, and all these patients had clear objective neurological signs. Signs of an infective aetiology, both intra- and extra-cranial, must therefore be specifically sought; as well as signs of acutely raised pressure and intracranial haemorrhage.

In the outpatient setting most children will have acute recurrent or chronic non-progressive headaches, but it is the rare child with chronic progressive headaches that we need to identify. [Table 4](#) lists the major causes of headache in the clinic population.

Given this list it is not surprising that the clinical examination in this situation is invariably normal. Important aspects of the general physical examination are height, weight and blood pressure. Specific features of the neurological examination that may indicate a secondary cause are given in [Table 5](#).

### Investigation

Careful history taking and examination should allow identification of the few children who require further investigation. As the diagnosis of a primary headache is clinical diagnostic testing is only necessary when a secondary cause of the headache is suspected.

It is again helpful to divide the investigation of the child with an acute severe headache from the child with other temporal

### Major causes of headache in the clinic population

Diagnosis	Percentage
Migraine without aura	24.3
Migraine with aura	6.0
Complicated migraine	2.4
Episodic tension-type headache	15.0
Chronic tension-type headache	23.9
Mixed common migraine and episodic tension headache	4.2
Mixed common migraine and chronic tension headache	6.2
Non-specific headache	12.3
Other specific diagnoses or combinations	6.0

**Table 4**

patterns of headache as the investigations that need to be considered are different.

### Acute severe headache

In acute severe headache, routine laboratory investigations may be helpful given that intercurrent infection is the commonest cause. Lumbar puncture, with measurement of the opening pressure, may be needed if subarachnoid haemorrhage, meningitis or idiopathic intracranial hypertension are diagnostic possibilities. Skull X-ray and EEG are of extremely limited value. An urgent initial CT scan may be required if acute hydrocephalus, haemorrhage or a structural lesion are suspected. A CT brain scan with contrast will demonstrate nearly all structural lesions; one done without contrast is somewhat more limited in its sensitivity, although it can define hydrocephalus and haemorrhage easily. MRI scanning is less readily available; less good at demonstrating acute blood and makes monitoring the ill patient more difficult so is not the initial method of choice in this situation.

[Table 6](#) lists the features in the history and examination that indicate imaging should be strongly considered.

### Signs suggestive of secondary headache

- Signs of raised intracranial pressure
  - Large or accelerating head circumference
  - Cracked pot sign
  - Papilloedema
  - IV nerve palsy
- Other signs of CNS disease
  - Other cranial nerve palsies
  - Brainstem signs
  - Other focal neurological signs e.g. hemiplegia
  - Cerebellar signs e.g. ataxia, nystagmus
- Signs of other systemic disease

**Table 5**

### Indications for neuroimaging in patients with acute headache

Signs and symptoms of elevated intracranial pressure  
 Meningeal signs + focal neurological findings or altered mental status  
 Progressive or new neurological signs  
 Significant head trauma  
 Severe ('worst headache of life') headaches of increasing frequency and duration  
 Presence of VP shunt

**Table 6**

### Other temporal patterns of headache

In the outpatient setting the cause for the child's headache is usually clear from the history and examination. Neuroimaging is rarely necessary, and of little value, unless the history or examination suggests a structural aetiology. The concept of red flag symptoms or signs as indicators of secondary headache, and therefore of the need for imaging, is well established in adult neurology but is not directly applicable to children.

The Quality Standards Subcommittee of the American Academy of Neurology and the Practice Committee of the Child Neurology Society reviewed the literature on the evaluation of the child with recurrent headaches and concluded that routine laboratory investigations, lumbar puncture and EEG are not necessary. They also concluded neuroimaging is not indicated in children with a normal neurological examination. In the studies they reviewed all the children with CNS lesions that required surgical treatment had definite abnormalities on examination. They recommended neuroimaging be considered in children with

- Recent onset of headache (less than 1 month duration)
- Features in history suggestive of neurological dysfunction
- Abnormal neurological findings on examination
- Occurrence of seizures

Variables that predicted a space occupying lesion included the above plus gait abnormalities and the absence of family history of migraine.

Repeated studies looking at the yield of neuroimaging in children with uncomplicated migraine or tension-type headaches and a normal neurological examination have found small but significant numbers of abnormalities none of which have influenced the diagnosis, management, or outcome for the patient.

Raised intracranial pressure due to a tumour is the major concern for the family and the referring clinician, however the symptoms and signs should rarely be mistaken for other benign causes of headache and brain tumours account for less than 0.1% of the lifetime prevalence of headaches.

All patients who present with symptoms and/or signs suggestive of a secondary intracranial cause (see Tables 3 and 5) for their headaches should undergo high-quality imaging. Magnetic resonance imaging (MRI) is generally more costly, takes longer, and may require sedation but its superior imaging capabilities offer detailed structural definition not available from CT scanning even with contrast. Neuroimaging should also be

considered in those with a significant change in headache symptomatology or who are less than 3 years of age.

It is sometimes suggested that scanning is reassuring to the patient and his/her family but a randomized control trial of imaging in adults with chronic daily headache showed that MRI scanning only temporarily reduced their anxiety about the cause of their headaches. At 1 year there was no difference between the scanned and the non-imaged groups and having a scan did not improve most other measures of health anxiety, illness perceptions or quality of life. There is no reason to suspect that children or their parents are any different. Given the potential risks of neuroimaging; which include incidental findings that increase the concern of the patient or parents, false reassurance from an inadequate study, the risks of an allergic reaction to iodine contrast media with CT scanning, and the risk of sedation in young children or claustrophobic patients having MRI scans; we should continue to try to avoid imaging for reassurance.

### Specific headache syndromes

As the history is so important in making the diagnosis this section details the features and diagnostic criteria for the two common causes of headache — migraine and tension-type headache. It is important to recognize that a mixed pattern of migraine and tension-type headache is common.

#### Migraine headaches

Paediatric migraine is now distinctly recognized among the primary headache disorders. The diagnostic criteria for migraine are broader in children than they are in adults and allow for a wider range of duration and localization of the pain. In practice, paediatric migraines are often bilateral, and clear localization of the pain can be difficult to obtain from children. In general, attacks in children last for a shorter time than in adults. They are frequently preceded by a behavioural prodrome with mood changes or withdrawal from activity. The classical history obtained in adults of unilateral throbbing/pounding pain lasting over 4 h becomes commoner with age. Migraine with aura is seen in 14–30% of children with migraine. Typical auras are spots, colours, image distortions, or visual scotoma. Common triggering factors include stress, sleep deprivation, missing meals and hormonal changes.

Migraine commonly 'runs in families' with approximately 70% of children having an affected first degree relative. Earlier attempts to define migraine used this strong familial occurrence as one of the diagnostic features of migraine.

The new diagnostic criteria set by the International Headache Society are as follows:

#### Migraine without aura

- A. At least five attacks fulfilling B–D
- B. Duration between 1 and 48 h
- C. At least two of the following:
  - Bilateral or unilateral
  - Pulsating
  - Moderate to severe in intensity
  - Aggravation by routine physical activity
- D. During the headache at least one of the following:
  - Nausea or vomiting
  - Photophobia or phonophobia
- E. Not attributable to another disorder

### Migraine with aura

- A. In addition to above criteria, at least two attacks fulfilling B
- B. At least three of the following:
  - One or more fully reversible aura symptoms indicating focal cortical or brainstem dysfunction
  - Aura developing gradually over minutes, or two or more symptoms occurring in succession
  - Aura lasts no more than 1 h
  - Pain follows aura after less than 1 h.

Complicated migraines are headaches that are accompanied or manifested by transient neurological symptoms. These symptoms may occur immediately before, during, or after the headache. In some situations, the headache may be mild or nonexistent. Hemiplegic migraine, ophthalmoplegic migraine, and basilar artery migraine are typical examples of complicated migraine. Hemiplegic migraine, while unusual, is seen more commonly in children than in adults. It is characterized by abrupt onset of hemiparesis, which usually is followed by a headache. Hemi-anaesthesia may also precede the headache. Ophthalmoplegic migraine may occur at any age, and usually is associated with orbital or periorbital pain as well as third, fourth or sixth cranial nerve involvement. The headache resolves in hours, but the ophthalmoplegia may last for days. Basilar artery migraines are characterized by dizziness, weakness, ataxia, and severe occipital headache (with vomiting).

### Tension-type headache

Tension-type headaches are more common in adults than children, but are commoner than migraine at all ages. They are less likely to present to secondary care for a variety of reasons including their less severe nature and lack of associated symptoms. The revised IHS classification distinguishes three subtypes depending on frequency – infrequent episodic, frequent episodic and chronic. The headache is usually bilateral and described as pressing or band-like. They can last for days and are not aggravated by physical activity. Nausea, vomiting, photophobia and phonophobia are not typical accompaniments.

The International Headache Society criteria for the diagnosis of infrequent tension-type headache are:

- A. At least 10 episodes occurring on less than 1 day per month average (less than 12 days per year) and fulfilling criteria B–D
- B. Headache lasting from 30 min to 7 days
- C. Headache has at least two of the following characteristics
  - bilateral location
  - pressing/tightening (non-pulsating) quality
  - mild or moderate intensity
  - not aggravated by routine physical activity such walking or climbing stairs
- D. Both of the following:
  - no nausea or vomiting (anorexia may occur)
  - no more than one of photophobia or phonophobia
- E. Not attributed to another disorder

Frequent episodic tension-type headache has occurred on more than one but less than fifteen days a month for at least 3 months.

Chronic tension-type headache has occurred for more than fifteen days per month for at least 3 months. This headache has the same physical characteristics as the episodic types but the pain may be continuous and mild nausea may occur. The picture may be complicated and perpetuated by inappropriate and excessive analgesia use.

Chronic daily headache (CDH) was first described in adults who reported daily or nearly daily headaches. It was soon recognized that, although patients were similar in the number of headaches experienced, the characteristics of their headaches fell on a continuum between migraine and tension-type headache. Recent work has demonstrated a similar spectrum in children. The most common CDH pattern is superimposition of migraines on a background pattern of frequent tension headaches, but other categories are recognized based on the specific clinical features and the pattern of evolution. ◆

### FURTHER READING

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