CASE THREE

Short case number: 3_12_03
Category: Children & Young People
Discipline: Paediatrics Medicine
Setting: General Practice
Topic: Headache in children_migraine.

Case

Elena Helsham is 14 years old she presents with a 2 day history of headache. She has tried paracetamol, which seems to ease it, but the headache *"just won't go away, I'm pretty sure it just all the school work...but mum was worried and said I should see the doctor just to be sure"*

Questions

1. What are the key features of history and examination that assist in differentiating tension headache, from migraine and headache due to raised intracranial pressure?
2. Elena has a family history of migraine and her headache has migranous features; what is the pathophysiology of migraine headache?
3. You explain to Elena, that her headache is consistent with migraine; she asks if she should continue to use paracetamol or does she need something stronger. Outline the use of analgesics in the management of migraine in children.
4. You review Elena in follow-up several months later; she has continued to experience migraines on a regular basis and asks if there is any other treatment that would help. Would you refer Elena for further assessment and management and why? Outline the indications for the use of prophylactic medication in the management of migraine in children.

Suggested reading:

- South M, Isaacs D editors. Practical Paediatrics. 7th edition. Edinburgh: Churchill Livingstone;2012.
- Helme R. Australian Doctor. How to treat. Migraine. 19 June 2009. pg 21 – 28

  http://search.ebscohost.com.ipacez.nd.edu.au/login.aspx?direct=true&db=anh&AN=43801497&site=ehost-live&scope=site

ANSWERS

1. **Migraine:** Childhood migraines result from the same biological process as those in adults but clinical manifestations may be quite different. Some of these differences relate to the difficulty a child has in describing or explaining the features, nevertheless, there are some features, such as dizziness and vomiting that are clearly more common in children.

   'Classical' migraine (relatively uncommon even in adults) includes an aura which often precedes the onset of headache and then disappears as the headache commences. The aura may be a visual disturbance described in unsophisticated terms, such as 'flashing lights', ' seeing things double' or 'blurry, like looking through a curtain'. Some hallucinations include the appearance that objects are too big or too small, or that things moving in the environment are going too fast or too slow. Auditory hallucinations may manifest as things sounding too loud or someone speaking too fast.

   Other variations from adult migraine involve the location of the pain. Young children may simply point to their forehead (without lateralization) as being the location. As the child grows older a description of pain that is unilateral and sometimes located in one or other temple becomes more common. The pain is more often in the frontal half of the head and pain that is only located posteriorly raises the possibility of more sinister causes of headache.

   A description of the quality of the pain in migraine in children is often difficult for them. The pain tends to more of an aching type 'like a tummy ache'. Throbbing pain may not be able to be described as such, although, as the child becomes older, he or she may describe it as 'beating like a drum' or 'like a hammer'.

   In children there can be a great range in the severity of migraine events, from the situation where the child is able to continue in school or at play, to the level where all activity must cease and the child retreats to bed in misery. Adults with migraine attacks may not change in external appearance but children are often extremely pale.

   During the migraine (abdominal migraine variant) attack, abdominal pain, nausea and vomiting are extremely common in children but the sequence may be that a single vomit, often followed by a sleep, seems to terminate the attack.

   In childhood migraine the onset is more commonly later in the day, perhaps approaching midday or during the afternoon or evening. Migraine variants occur in childhood, e.g. hemiplegic migraine may present with unilateral weakness, or unilateral sensory disturbance and this often precedes the actual headache.

   Expressive or receptive language difficulties also may be a presenting feature of some attacks with the headache occurring an hour or so later. In acute confusional migraine the patient is quite disoriented and distressed, with short-term memory loss. Again, the headache may not become apparent until later

   In practice, children with headaches with some of the previously mentioned features, occurring intermittently and with symptom-free periods, who are normal to neurological examination, may be considered to suffer from migraine.

   Stress and tension headaches: There is a broad spectrum of headache types in some way associated with emotional factors, perhaps more frequently seen in older children and adolescents. At one end is a small group where the symptoms of headaches may be used in a conscious and malingering way to avoid a situation'

   Further along the spectrum is the situation where the child is being exposed to a great deal of stress, often multifactorial, and this apparently constitutes the sole underlying aetiological basis for headaches.

The nature of this headache may differ from that of migraine. In migraine the headache does not usually occur daily, and indeed daily headaches by many definitions are not migraine. In addition, the quality of the headache may differ,
e.g., they
• may occur at all times and throughout the day
• cannot be localized or described in other than vague terms
• lack an association with pallor, nausea, vomiting, or disturbance of vision or Balance

Somewhere along this spectrum is the child who has a primary psychiatric disorder and in whom the symptom of headache may be part of a conversion reaction or a major psychosis.
The sequence whereby individual stress events provoke a severe migraine attack is perhaps less frequently seen in children than in adults, but can still occur.
Sometimes it is the 'let down' phenomenon following a period of stress that provokes a headache.
In childhood headaches associated with emotional aetiologies there is usually no abnormality on neurological examination. The facial appearance can range from complete indifference through to intense anxiety.

Headaches due to raised intracranial pressure: Only a very small number of childhood headaches are due to raised pressure. Even when there is pressure, the ability of the child's skull to expand may mitigate some of the effects.
Although headaches due to raised intracranial pressure have classically been described as worse in the morning upon awakening, or causing the patient to awaken, and associated with vomiting, this is not always the case
Raised intracranial pressure can be a result of abnormal fluid collections, solid masses or vascular malformations. Interference with fluid dynamics without discrete collections can result in the condition of benign intracranial hypertension.
Fluid can collect abnormally either within ventricles (hydrocephalus), within the substance of the brain (intracranial abscesses) or over the surfaces. Fluid, including blood, can collect in the subdural and extradural spaces, often as a result of trauma.
Accompanying headaches are often crescendo in frequency and severity, and may be associated with focal signs.
Headaches due to tumours are most often due to mass effect, or obstruction of cerebrospinal fluid pathways, and are less likely to be due to direct local involvement of pain-sensitive structures. Intracranial tumours in children are usually primary and are most frequently found in the posterior fossa, where they readily obstruct fluid pathways.
Aneurysms are uncommon in children but arteriovenous malformations or cavernous angiomas are found at this age. These may produce headache due to their size or obstruction of fluid pathways.
The signs associated with raised intracranial pressure often involve the eyes.
Papilloedema may take days to develop, even in the presence of grossly elevated pressure. Abnormalities of ocular movements, particularly failure of abduction with resultant paralytic convergent strabismus, or failure of upward gaze, can occur.
Sluggish papillary light reflexes may be found. Deep tendon reflexes are often brisk. There may be neck stiffness. Bradycardia and systemic hypertension are later effects.
Benign intracranial hypertension also known as 'pseudotumour cerebri' results from a build-up in intracranial pressure, without a space occupying lesion, probably due to an imbalance between production and resorption of cerebrospinal fluid. It is potentially serious as it can eventually result in visual loss. There is often an association with

adolescent females, who may be overweight but otherwise apparently healthy. Other proposed causes:- recurrent middle ear infections, head trauma, oral contraceptives, use or withdrawal of corticosteroids, tetracyclines, idiopathic

2. The pathogenesis of migraine is not yet fully understood. The two major central mechanisms include initiation of activity in the brainstem reticular formation, and spreading cortical depression, in which spontaneous synchronous neuronal depolarization associated with massive potassium and glutamate release spreads from a point injury at a rate of 3-5mm a minute.

   Spreading cortical depression is associated with altered vascular reactivity in the arterial circulation, firstly a small brief reduction in central blood flow, then an increase for several minutes before a final reduction.

   A peripheral mechanism for migraine involves the release of neuromodulators from trigeminal primary afferents that innervate arterioles and venules in the intracranial circulation. This has been more closely associated with the pain of migraine. These effects can be blocked by ergots and triptans.

   It is likely that all these mechanisms interact to cause the symptoms we closely associate with migraine. However , none of them accounts for the intermittent heightened sensitivity of migraineurs, as seen in the premonitory headache phase or in chronic migraine. This is thought to possibility represent intermittent dyshabituation rather than hyperexcitability, and is of central origin.

   Once initiated, brain systems involved in all somatic pain are activated, including facilitatory and inhibitory pathways in the brainstem reticular system, particularly those relaying through the peri-aqueductal grey matter of the midbrain, where high iron levels have been found in patients who develop chronic migraine.

   The genetic mechanisms that underlie all these manifestations of migraine remain obscure. Three monogenic subtypes have been identified:
   - familial hemiplegic migraine (three genes)
   - some cases of sporadic hemiplegic migraine
   - cerebral autosomal dominant arteriopathy with subcortical infarcts and leucoencephalopathy (CADASIL)

   There is continuing controversy over the role of precipitant factors such as trauma, stress, diet, weather change and other environmental factors. Provoking factors are thought to include the following:-
   - intercurrent systemic infections, particularly with fever
   - strenuous physical exercise
   - hot weather
   - dehydration
   - worry and stress, either domestic, social or educational in origin.
   - foodstuffs, controversial with evidence for and against. Citrus fruit, cheese, chocolate and processed meat have been implicated.
   - food additives, such as monosodium glutamate, sodium nitrite, benzoic acid, tartrazine

   There are advocates for intense management of all these factors.

3. The use of non-specific analgesics in attacks is the simplest means of treatment.
   The most commonly used is paracetamol in a dose of 15mg/kg. Unfortunately, children may not seek medication, or as a result of being at school may not be able to access medication, until the attack is advanced. The paracetamol may not be effective at this

time, or may be vomited. There may be a role for rectal paracetamol in this latter situation.

Ibuprofen is usually drug of choice in initial therapy, in randomized trials it is one of the only agents with proven efficacy in paediatric migraine. For children < 12 years the dose 100 – 200mg orally, starting dose for pain is 4 – 10mg/kg every 6 hours as required , >12 years 400 – 600mgs orally. Other non-steroidal anti-inflammatory drugs may also be helpful, e.g. naproxen.

Aspirin has been avoided in childhood because of concerns about its relationship with Reye syndrome, a rare but severe acute encephalopathy with potentially fatal outcome. Nevertheless, aspirin in doses of 15mg/kg may be employed in older children with recurrent headaches.

The use of codeine and powerful narcotics in childhood headache is not usually necessary and is potentially hazardous, although restricted infrequent use of combinations of paracetamol and codeine in older children may be necessary and effective.

Ergotamine preparations (alone or in combination with caffeine) are direct vasoconstrictors of smooth muscle in cranial blood vessels. Their activity depends on the CNS vascular tone at administration. Their use is not established in children < 12 years of age while >12 years the dose is 1 – 2mg orally with or without 100 – 200mg caffeine, however they have had limited use because children often delay seeking treatment and also they may produce side effects such as vomiting and abdominal discomfort.

Triptans are new-generation antimigraine agents that directly affect serotonin receptors. Selective agonists for receptors in cranial arteries suppresses inflammation associated with migraine headaches. The nasal form of sumatriptan succinate has been demonstrated to have some efficacy in adolescents with migraine.

4. If the history is consistent with migraine, the frequency and characteristics of the headaches has not changed in the last several months and a thorough examination is unremarkable then there is still no indication for referral. If however there is doubt as to the diagnosis then other causes need to be excluded with assessment by an optometrist and possibly imaging of the sinuses if indicated on history or examination. Any concern in regard to an underlying vascular malformation such as a hemiplegic migraine with apparent incomplete recovery should be referred to a Neurologist for appropriate imaging.

   Prophylactic medications may be considered for frequent disabling attacks. What constitutes 'frequent' is arbitrary but more than two severe attacks per month may justify treatment. Controlled trials of prophylaxis in childhood migraine are confounded by the cyclical nature of the condition and the tendency to remit spontaneously, as well as the high placebo response rate.

   Some of the prophylactic medications that are effective in some patients with migraine include:-

   - daily low dose aspirin , depending on age, stop during febrile illnesses
   - beta-blockers, also blocks release of serotonin from platelets, contraindicated in asthma
   - low dose tricyclic antidepressants, may be useful where there are stress and depressive symptoms, may provoke cardiac arrhythmias
   - cyproheptadine, an antihistamine with serotonin-blocking and calcium-channel-blocking properties, side effects include drowsiness
   - calcium-channel blockers
   - low dose anticonvulsants, including sodium valproate or topiramate