Epilepsy and migraine: are the two connected? And how can migraines be managed to ease their sometimes crippling daily-to-day impact?

If you’ve ever had a migraine, you’ll know how the pain and heightened sensitivity to light and sound affects your ability to function. The similarities between epilepsy and migraines are well established, and in individuals prompting research into common causes and therapies. Everyone has experienced a headache at some time in their lives, and like migraines, headaches vary in intensity, frequency, duration, and response to treatment. Generalised headaches can be effectively treated with over-the-counter medication. However, some people experience a more severe and debilitating form of headache called migraine.

The International Headache Society, an organisation that tracks headache disorders, as well as various health professionals as well as researchers, has published an internationally accepted classification of headache disorders. They define a headache as a migraine when:

- the pain can be classified as at least one of the following:
  - moderate to severe
  - throbbing
  - aggravated by movement

- it occurs with at least one of these symptoms: nausea, vomiting, photophobia sensitivity to light, phonophobia sensitivity to noise

- the headache lasts between 4 and 72 hours. Other symptoms can include:
  - oedema (swelling) sensitivity to smell
  - visual (مارس) disturbances such as bright zigzag lines, flashing lights, or visual focal spots, or blocking or blurring of vision
  - difficulty concentrating, confusion
difficulty falling asleep or unable to wake up

Migraine symptoms can sometimes be mistaken for another. People having a classical migraine (migraine with aura) may wake up at the time when the aura ends or until headache pain subsides, and afterwards they fully recover. One epilepsy symptom in particular shares similarities with most characteristics of a classical migraine. Benign epilepsy of childhood with occipital paroxysms causes partial seizures sometimes preceded by visual symptoms. The pain is commonly reported at 40% of people who suffer from migraine-like headaches. In neurological disorders such as mitochondrial encephalomyopathy – changes in cells resulting in muscle and nerve dysfunction – patients present with both seizures and migraine.

The similarities mean epilepsy and migraines can sometimes be mistaken for another, but some types of migraines can begin with loss of consciousness and other symptoms, followed by a headache. Meanwhile seizures that occur in the brain of the related vision, the occipital lobe, can be confused with migraine visual aura. Although there are differences that clinicians should be able to determine, such as shimmering or zigzag uncoloured lines for migraine auras, and coloured visual hallucinations for epilepsy.

Further, migraines and epilepsy often exist together. Migraine is common in people with epilepsy, whereas epilepsy is rare in migraine patients. Between 9-10% of the general population suffers from epilepsy compared to the population of people with epilepsy, up to 20% of whom reportedly experience migraine. Another hospital-based study published last year reports that 25.6% of participants with epilepsy had headaches compared to 15.2% of the control group who did not have epilepsy.

Although headache often develops after an epileptic seizure, it is extremely rare for a migraine attack to trigger a seizure. A phenomenon taken its course. Afterwards people can feel drained for about 24 hours, or they can feel energetic – even euphoric.

Migraine and epilepsy seizures are thought to result from an excessive excretion to stimuli, migraines from a type of chronic pain syndrome fundamentally neurovascular in nature – that is, relating to nerves supplying veins and arteries transporting blood to the brain. The pain and sensitivity headaches have traditionally been considered separate disorders although a variety of antiepileptic drugs are now frequently prescribed for severe migraine.

Migraine-specific medications may be prescribed for more severe migraine. Many are based on serotonin, which is a hormone that acts both as a chemical messenger transmitting signals between nerve cells and causes blood vessels to narrow. Sometimes stronger non-steroidal anti-inflammatory drugs are required.

The latest medications target specific areas not believed to cause the pain. Although the exact mechanism for pain generation is still not known, the “trigeminal vascular system” has been targeted. A paper published in Pain 2008 reports that the trigeminal sensory system is hyperactive in people with headaches.

Other acute therapies include non-steroidal anti-inflammatory drugs, as well as anti-emetic medications that reduce the nausea common with migraine. The presence of nausea means the patient has impaired absorption of oral medications leading to reduced effectiveness.

Preventive treatment

Preventive medication is taken daily, whether or not a headache is present, to reduce the number and severity of headaches. These include medications that block the beta-receptors, which affect the blood vessels and levels of adrenaline in the nervous system; or antiepileptic drugs including vigabatrin, levetiracetam and gabapentin, which affect the brain activity and reduce the intensity of migraine. Calcium-channel blockers constrict blood vessels, and some other medications, including beta-blockers, can prevent a headache independently of their antipressor action. While effective, these all have side-effects and need to be prescribed by a medical practitioner.
Epilepsy & Migraine - More than just a headache

Epilepsy and migraine: are the two connected? And how can migraines be managed to ease their sometimes crippling day-to-day impact?

If you’ve ever had a migraine, you’ll know how the pain and heightened sensitivity to light and sound affects your ability to function. The similarities between epilepsy and migraines exist together in many individuals, prompting research into common causes and therapies.

We explore the kinship of these two conditions, the discoveries made so far, and consider ways to manage migraines and reduce the level of disruption they cause in daily life.

Migraine or headache?

Everyone has experienced a headache at some time in their lives, for a variety of reasons and to varying degrees. Generally headaches can be effectively treated with over-the-counter medication, however some people will experience a more severe and debilitating form of headache called migraine.

The International Headache Society, an organization comprised of headache specialists and allied health professionals as well as researchers, has published an internationally accepted classification of headache diagnoses. They define a headache as a migraine when:

1. the pain can be classified by at least two of the following:
   - severe
   - moderate to severe
   - throbbing
   - aggravated by movement

2. It occurs with at least one of these symptoms:
   - nausea or vomiting
   - photophobia (sensitivity to light)
   - phonophobia (sensitivity to noise)

3. The headache lasts between 4 and 72 hours.

Migraine stages

Like epilepsy, migraines occur in the following distinct phases:

1. Early warning symptoms (prodrome): Up to 24 hours beforehand, people may experience:
   - mood changes, from elation to irritability
   - lack of appetite, constipation, diarrhoea
   - mood changes, from elation to irritability
   - aches and pains
   - fluid balance changes, thirst, passing more or less fluid

2. Aura: Accompanies migraine attacks in about 20-30% of people. It temporarily affects the visual field of both eyes and lasts 5-60 minutes. Less commonly, aura affects sensation or speech. Several aura symptoms may follow in succession.

3. Headache phase: Depending on the type of migraine, people may have a classical migraine (migraine with aura) or a migraine without aura.

4. Resolution and recovery (postdrome): Attacks vary differently. Sleep can restore some, or be sicking others. Find effective medication improves attacks. For a few, nothing has worked so far but the headache takes its course. Afterward, people can feel drained for about 24 hours, or can feel energetic – even euphoric.

Similarities between migraine and epilepsy

Seizures are thought to result from an excessive excitation to stimuli, migraines from a type of chronic pain syndrome fundamentally neurovascular in nature – that is, relating to nerves supplying veins and arteries transporting blood to the brain. Both conditions may be precipitated by a stimulus that tips the balance of the autonomic nervous system.

Common pathophysiological pathways – is there a biological link?

Recent discoveries into the basis of migraine have revealed the involvement of the theories of epilepsy and migraine pathophysiology – the changes in function associated with a disease or syndrome – and the possibility one day of new treatment breakthroughs. It is well recognized that whole families can share a tendency to suffer migraine headaches. These kinds of syndromes are far more common in relatives of people with migraine than among relatives of people without migraine.

Further research into the commonalities revealed genetic abnormalities related to dysfunction in the ion channels – valves that let ions such as sodium, potassium and calcium in and out of the cell. This dysfunction could alter the brain’s response to internal and external triggers, causing aura and pain. Meanwhile, some epileptic seizures are preceded by an ion channel dysfunction and dubbed “champeurabilities.”

In 2003, the realization of the role of ion channel dysfunction in migraine and epilepsy may lead to this new being a target for effective prophylactic (preventive) drugs for both conditions, says Dr Alexander Zagami, Senior Staff Specialist at the Prince of Wales Hospital’s Institute of Neurological Sciences.

Migraine pain can be excruciating and can incapacitate sufferers for days or weeks. Prevalence peaks during the prime work and child rearing ages of 25 to 55. Many (53%) say their headaches hinder activities or force bed rest, while 31% report work or school in a given three-month period.

Most people (52% to 75%) report that migraines affect their mood adversely, with some experiencing blood vessel.

Further, it overrules the headache cure system a recent US survey estimated an $11.7 billion annual cost of medical care, including prescription drugs, for sufferers.

A better way

Migraines and epilepsy can be very challenging on their own, but people who suffer migraines experience the combined impacts of the two. In this instance, effective migraine management is particularly important.

In the case of rare patients with familial hemiplegic migraine where paralysis occurs with migraine attacks, scientists have identified “mutations in genes encoding for components of sodium, potassium or calcium ion channels,” says Zagami. “Some of these mutations also cause epilepsy in the same patients.”

It has even been suggested that some headaches could be epileptic seizures – and in some people, these might be the only sign of epilepsy. This could result from the interplay between the source of the epileptic activity and its spread, which in turn, acts as a trigger for the headache.

In this instance, exploring the potential links between migraine and epilepsy, there is hope of treatment breakthroughs that will in future improve quality of life for people affected by either condition.

Treatments and strategies

Treatment and self-management strategies can help prevent and ease the impact of migraine. Treatment is not just about taking a tablet but involves a person developing an individual migraine management plan consisting of lifestyle modifications, medication and complementary therapies.

Preventive treatment

Prescription migraine is taken daily, whether or not a headache is present, to reduce the number of headaches. These include medications that block the beta receptors, which affect the blood vessels and levels of adrenaline in the nervous system; or anti-epileptic drugs, including valproic acid, topiramate and gabapentin. Some people with severe migraines may need to have migraine medication that affects the blood vessels.

Other acute therapies include non-steroidal anti-inflammatory drugs and ergot preparations. Ergot drugs were originally derived from a fungus that grows on rye. They interact with receptors for the brain chemical serotonin, which regulates pain awareness and blood vessel tone. These drugs reduce inflammation and cause the blood vessels to constrict, which helps relieve the throbbing nature of the pain of migraine.

Anti-emetic medications are important to relieve the nausea often seen with migraine. The presence of nausea means the patient has impaired absorption of oral medications leading to reduced effectiveness.

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Special Report

Enhancing seizure control

Better quality of life with epilepsy is possible by understanding the condition and a management regimen that involves not only the individual, but their family, friends and healthcare team.

Having a seizure for the first time is frequently a frightening, confronting and potentially harmful event for the person and also for witnesses.

There are many steps in the process leading up to a diagnosis of epilepsy – a detailed history of the event, including that of any witnesses, clinical examination, investigations including blood tests, EEG and neuro-imaging. Then a definitive diagnosis may be made by your doctor.

Being given the diagnosis of epilepsy is a big challenge. At that point, the reality of “having epilepsy” needs to be “owned” by the patient and the person’s family and friends.

1) Establishing a therapeutic partnership: steps on the journey

1. Receiving and accepting the diagnosis of epilepsy
2. Educating: Understanding your type of epilepsy
3. Understanding anti-epileptic medications and appropriate therapeutic strategies
4. Facilitating the best possible control of epilepsy
5. Continuing to work with your epilepsy management team for optimum quality of life

Why do seizures occur?

Given sufficient biological or environmental circumstances, every person on earth has the potential to have an epileptic seizure, for example with head injury or hypoxia (lack of oxygen). There is a point at which the normal electrical discharges of brain cells (neurons) escape the normal control mechanisms and a widespread electrical discharge occurs resulting in a seizure. The type of nature or seizure will depend on the area in the brain where the abnormal electrical discharges arise.

What is the concept of seizure threshold?

Seizure threshold is the balance between excitatory and inhibitory mechanisms in the brain. However this is not uniform for all people.

Because of genetic and environmental variations, some people have a lower seizure threshold than others. By understanding your particular type of epilepsy and anything that may trigger it, you may be able to enhance seizure control.

What can I do to help control my epileptic seizures?

Some of these suggestions below will refer to everyone, some are specific to certain epilepsy syndromes. Discuss any implications for you with your doctor.

1) Enhance seizure threshold
   a) Take the prescribed anti-epileptic medications consistently and reliably.
   b) Avoid situations and events that may lower seizure threshold
      i) Sleep issues
         i. Inadequate duration.
            (1) Try to get eight hours per night and more if necessary.
         ii) Poor sleep routine.
            (1) Establish a routine and avoid very late nights. If a late night is unavoidable, allow “sleep-in” time the next morning
         iii) Shift work
            (1) In some epilepsy syndromes, it is necessary to avoid variable shift work because of the sleep disruption that inevitably occurs.
      b) Jetlag
         (1) Space out medications at the same time intervals as at home. Leave a day on arrival to catch up on sleep.
      c) Drugs
         i) Caffeine – use in moderation. Beware of reduced sleep effects
         ii) Prescribed medications – discuss these with your doctor. Sometimes, the benefit/risk ratio may necessitate taking a medication that may minimally lower seizure threshold.
      iii) Alcohol – if used, it is recommended you consume only small amounts. Excessive and binge drinking should always be avoided.
      iv) Illicit drugs – avoid all of these. Some are particularly dangerous, for example amphetamines, ecstasy and PCP
      v) Photostimulation – dim lighting and patterns (especially at frequencies between 10Hz to 25Hz) may trigger seizures in a small subset of genetically susceptible epilepsy patients. Modern televisions with LCD and plasma screens and most computer screens with high refresh rates are rarely problematic. Older-style television screens, fast frequency strobe lights and occasionally computer games may be of concern in a few people.
   c) Hormonal factors – for women with epilepsy, relevant issues should be discussed in detail with your doctor.
      i) Menstrual seizures
      ii) Pregnancy, labour and the puerperium may all have various effects on seizure control.
   d) Other circumstances and intercurrent illness
      i) Diarrhoea and vomiting – discuss with your doctor whether you should increase your antiepileptic medication at this time
      ii) Surgery – discuss with your doctor about how to take your medications immediately before and after surgery.
   e) Take positive steps towards a psychologically healthy outlook. The diagnosis of epilepsy has many implications for your life. However, it does not need to “take over” your life.
      a) Emotional/psychological stress – it is impossible to avoid some stress in life but take positive steps to keep a reasonable balance. Acknowledging the stressors and seeking appropriate counsel can be helpful.
      b) Do not over-identify with epilepsy. Controlled or not, it is not you!
      c) Epilepsy is a symptom. It is biological. It is not your fault (for anyone else’s).

(1) Find a practice to support psychological and spiritual wellness.
(2) Maintain good self-esteem. Work on it.
(3) If symptoms of anxiety or depression arise, talk to your doctor.

These practical steps will help to facilitate optimum seizure control which is the shared goal of the therapeutic partnership involving the patient and the epilepsy management professional team.

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Definitions of headache types, migraine stages, triggers, symptoms and treatments adapted with permission from the Headache Australia website – an excellent source of information about headache and migraine.

Headache types

- Location and symptoms
- Precipitating factors
- Treatment/prevention

**Allergy**
- Generalised; often occurs with runny nose and sore eyes.
- Seasonal; allergies such as pollens trigger hay fever and sinusitis.
- May include anti-histamine medication and decongestant nasal sprays.

**Cluster Headache**
- Episodic or chronic; severe pain centred around one eye. May cause drooping eyelid, watering eye and nasal congestion. Most common in males.
- None known.
- Treatment of acute attacks may include oxygen inhalation and medications that constrict the blood vessels and reduce transmission of pain signals.
- Preventive medications may include calcium channel blockers and corticosteroids.
- Treat with liquids like broth. Consume fructose (e.g. honey, tomato juice) to help burn alcohol. Drink alcohol in moderation.

**Hangover**
- Migraine-like symptoms of throbbing pain and nausea, not localised to one side.
- Alcohol, the breakdown products of which dilate and irritate blood vessels of the brain and surrounding tissue.
- Avoid ice-cream or icy drinks.

**Ice-cream Headache**
- Sharp pain in the front of the head – the middle of forehead or in one temple – straight after swallowing ice cream or an ice cold drink. Can cause pain behind the ear.
- Pain in the palate or throat from swallowing very cold food or liquids may refer pain to the head through the trigeminal nerve endings or the glossopharyngeal nerve. Migraine sufferers are prone to ice-cream headaches.
- Avoid ice-cream or icy drinks.

**Tension-type Headache**
- A dull, non-throbbing pain, often bilateral, with tightness of scalp or neck. Severity remains constant.
- Emotional stress, hidden depression.
- Avoid stress. Use biofeedback, relaxation techniques, psychotherapy, and treatment with tricyclic antidepressant medication. Treat with rest, aspirin, diethylpropion, naproxen sodium, ice packs, and muscle relaxants.

**Migraine**
- Severe, one-sided throbbing pain, often with nausea, vomiting, cold hands, sensitivity to sound, light and smells. May occur with aura i.e. visual disturbances, numbness in arm or leg. Can last up to four days. Begins in children and may last beyond the 60s.
- Many triggers, including food intake, food cravings, centres of insufficient food, hormones, environmental such as sudden changes in weather, over sleeping or too little sleep, physical factors such as eye, dental problems, over-exertion or strenuous exercise, certain medications.
- Eating can help, especially with starch food, chemist or prescription medications; bed rest, and complementary therapies including massage, aromatherapy, yoga, physiotherapy, acupuncture and Alexander technique.
- May include anti-histamine medication and decongestant nasal sprays.

**Neurol 2009**

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**Excessive and binge drinking should always be avoided.**