Migraine

Migraine remains a poorly understood disease, and with this the management traditionally is frequently unsatisfactory. Migraine headaches are characterized by a throbbing or pounding pain, and are classically located on one side of the head, although they can occur all over. The pain is usually severe, and is usually accompanied by sensitivity to bright lights, sounds as well as nausea and vomiting. The pain may last for hours or even days. Some migraines are preceded by an “aura” 10-30 minutes before the headache. Typically, auras can be flashing lights, cracked glass visual change, motor/ speech difficulty, weakness of an arm or leg, or it can be sensory such as with tingling of the face or hands.

The pain is thought to be caused by abnormal dilatation of the blood vessels. The preceding aura is thought to be vascular constriction of the vessels before they dilate. This constriction leads to a lower blood flow through the affected part of the brain, and that the transient ischaemia causes the aura.

Certain foods that are “vasoactive” such as red wine, chocolate and aged cheese are well-known triggers. In women, hormonal changes at the times of menstruation can be a trigger. Sometimes it can be weather changes, or glare while driving, and the triggers can be obvious, but sometimes they can be very difficult to determine.

Migraine is about inflammation. Successful management of migraine is really about “turning off” the processes that are driving the inflammation, while reducing the reliance on medication to manage symptoms. Genetic information points to the involvement of transient receptor potential (TRP) channels in pain mechanism. TRPA1, an ion channel on the trigeminal (and most other sensory) nerves is the major oxidative threat sensor. It is activated by various irritants and agents releasing the pro-migraine peptide, calcitonin gene-related peptide through this nerve pathway. TRPA1 agonists release chemicals that cause vascular dilation.

Among the genes implicated in the pathogenesis of this disease, including genes involved in regulating the vascular system. of particular importance is the methylenetetrahydrofolate reductase (MTHFR) gene and the role it plays in migraine with aura. Migraine with aura has previously been shown to have a significant comorbidity with stroke, making the vascular class of genes a priority for migraine studies. (1)

Most migraine appears to be driven by cervical nerve root sensitivity. Physio researcher from Sydney, Dean Watson, found “The cervical afferents of C1-3 are the reason we get increased sensitization of the brainstem. The common pathway with the Trigeminal nerve will present as the head pain or facial pain plus associated symptoms of dizziness and nausea etc (C2/3). The head pain is a representation of the input from the cervical afferent nerves C1-3. This constant input will reduce the latency period (ie someone will get symptoms earlier than the normal person). This constant input then causes the brainstem to become sensitized and effectively “ready to go” with small input. This is why small variations (small C2 rotation perhaps from bad posture) or triggers will bring on large changes so quickly. The changes of this C2 rotation can very subtle and hard to find unless therapists are experienced in assessing these.” (2)

Successful management of migraine is really about “turning off” the processes that are driving the inflammation. In most people I see they are driven by the neck, sometimes thoracic outlet, which in turn affects the C2/3 region (see Thoracic Outlet Syndrome for details on this very complex and controversial problem). Certain foods that are “vasoactive” such as red wine, chocolate and aged cheese are well-known triggers. In women, hormonal changes at the times of menstruation can be a trigger. Sometimes it can be weather changes, or glare while driving, and the triggers can be obvious, but sometimes they can be very difficult to determine.

Migraine is commonly associated with chronic fatigue. Is this from acetylcholine or brainstem sensitization? Dr Leighton Barnden, NCNED, recently presented MRI data from NCNED at the 2019 Organization for Human Brain Mapping Conference titled "Connectivity within the brainstem is impaired in chronic fatigue syndrome". (3)

Leighton's research reported significant differences were found between ME/CFS and HC for connectivity within the brainstem. Impaired brainstem connectivity can explain reported autonomic and compensatory structural changes in CFS as previously reported by NCNED (Barnden, 2015, 2016), and may also explain the impaired cognitive performance, sleep quality and pain of ME/CFS.

Mapping the causes of fatigue and co-morbidities when migraine is present is currently in its infancy, but a beginning is there. At least now we can work with the mechanical causes.

To complicate this is the research that implicates PFOs (Patent Foramen Ovale) as a cause of migraine "auras" in a number of adults (and it may be it is the same for kids), and again PFOs cause an inflammatory response, and when there is an aura (as described below) we may be looking at emboli (little TIAs or strokes) . There are not restricted to the brain as other vessels can be affected. The biggest problem I can see is the potential for dementia if this is not identified if present. Once the brain is damaged, it cannot repair itself.

It does not mean though, that if you have auras you have a PFO and will get dementia. At present, the current thinking is that they are both common, and that a percentage of people with migraine who also have PFOs, which puts them in the risk for vascular disease, and should be assessed correctly. At present, as the knowledge is expanding we must review these periodically to see where the understanding of the condition has progressed and whether changed are required in management. We also believe now, that if we can eliminate the migraines, especially the auras, we probably need to do no further investigation at present.

The link between migraine and PFO was identified some years ago. Getting accurate trials has been very difficult to achieve, but when the patient selection criteria are correct, we are able to provide an 85% cure rate from migraine with the closure of the PFO. The other inflammatory processes discussed above also need to be addressed, as closure of the PFO does not guarantee control of the migraines.

Around 20 to 25% of the population in general have foramen ovales that do not close at birth, but only a small percentage of patients with a PFO suffer with migraine and certainly not all migraine sufferers have a PFO. PFO is more common in migraine patients than in the general population- approximately 40 to 60% of people with migraine with auras have PFOs.

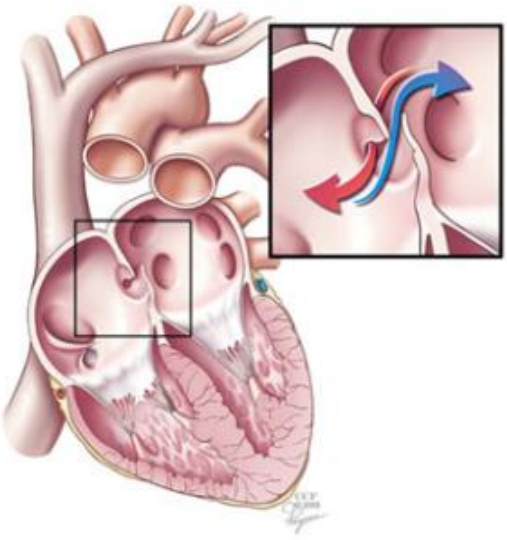
Approximately 40% of all strokes have no obvious cause, and this is more common in the under 60's. In this group there is a higher percentage of PFO. The risk is higher if there is any medical condition that raises the pressure in the right side of the heart eg lung disease, pulmonary hypertension, pulmonary embolus, Obstructive Sleep Apnoea, DVT, cancer or any severe acute or chronic illness. The presence of an atrial septal aneurysm (mobile atrial septum) associated with a PFO or atrial septal defect also increases the risk of TIA/ stroke to 5% yearly.

Those who should be referred for assessment for a PFO include:

1. The severe migraine with aura non responsive or intolerant to usual therapy.
2. Blindness, hemiplegia or other significant neurological events would be a strong indicator for assessment (especially those whose employment is at risk or these events would place them or others in physical danger ie commercial pilots and divers).

3. Anyone who we feel may have had a TIA (mini-stroke). Generally neurological symptoms lasting more than 20 mins in a migraine event could be TIA
4. Migraine or anyone with unexplained changes in the brain MRI
5. Migraine with aura who feel they have cognitive decline
6. Severe migraine variants eg vestibular, abdominal, hemiplegic.
7. The other masquerader is multiple sclerosis. If it's obviously MS so be it but some just don't behave clinically like it and the follow up MRIs don't fit

PFOs cannot be reliably diagnosed on an echocardiogram, the test most doctors use. They may need a Transcranial Doppler The actual PFOs are often very small, and may be only the size of a pinhead so there are no functional problems occurring in the heart. In the Transcranial Doppler, saline is shaken to produce tiny bubbles. The saline is then injected into a vein, and a doppler is used on the head to listen for "pinging" which should not occur unless there is a PFO or pulmonary issue allowing transfer of venous to arterial blood systems. If positive, the definitive test is usually an Transoesophageal echocardiogram, which requires an anaesthetic.



This diagram is an example of one of the closures available: Gore Helex Septal Occluder being inserted for PFO repair.

Not yet available in Australia, there is a suture-based system in use overseas (and I believe in trials in Australia) called the Nobel Stitch-I anticipate this and similar closures that appear to have major advantages over the older occlusion devices- for details: https://www.tctmd.com/news/novel-percutaneous-suture-based-solution-pfo-closure-shows-promise

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