Migraine and the greater occipital nerve
What is the greater occipital nerve?
The nerves that travel from your spine (in the neck) to the back of the head and scalp are known as the occipital nerves. There are two types: the lesser occipital nerve and the greater occipital nerve. It is the greater occipital nerve that is treated in preventative measures for migraine. This region of the brain deals with vision including colour recognition, spatial awareness and word recognition. Most people who experience migraines and headaches on a regular basis also have tenderness in the sub-occipital region of their skulls.

Occipital nerve stimulation
Occipital nerve stimulation (ONS) is used as a preventative method to treat chronic headache.

In this instance, the definition of chronic headache includes tension headache, migraine, cluster headache and hemicrania continua. Occipital nerve stimulation involves implanting an electrode under the skin at the base of the head. The electrode delivers electrical impulses to the occipital nerve at the base of the head with the aim of masking the pain. The patient controls the strength of the impulses manually by adjusting them to the appropriate level to relieve the pain. Learning how to manage the impulses takes practice and it may be some months before the patient begins to feel any benefits.
Research

Popeney and Alo [1.] used ONS to treat 25 patients; 80% of patients were ONS responders, with at least 50% reduction in headache frequency or severity. Oh and colleagues [2.] used ONS in 10 patients with transformed migraine. At six months follow-up, six patients reported more than 90% pain relief, two patients reported 75%-90% relief and one was lost to follow-up. Schwedt and colleagues [3.] used ONS in eight patients with chronic migraine. After a mean follow-up of 18 months, headache frequency reduced from 90/90 days to 60/90 while the severity decreased from 6.8 to 4.5. Weiner and Read [4.] reported a series of cases of intractable occipital neuralgia responding to ONS though detailed phenotyping of eight cases in association with a functional imaging study by Matharu and colleagues [5.] demonstrated that all patients had chronic migraine. In these eight patients, ONS resulted in excellent response in four patients (complete suppression or rare breakthrough headaches), very good response in two (complete suppression most of the time with breakthrough headaches on approx. 10 days per month) and good response in two (continued constant headaches but with severity reduced by 50% - 75%).

In 2011 St. Jude Medical released data from a study testing ONS for chronic migraine. An investigational device, called Genesis™ Neurostimulation System, was evaluated in clinical research studies and emits mild electrical pulses to generate peripheral nerve stimulation (PNS) of the occipital nerve in the back of the head. 105 individuals tested the active device whilst 52 tested the placebo, both groups experienced an average of 26 headache days per month. Researchers reported a 28% decrease in headache frequency after 12 weeks compared with only a 4% drop among patients tested with a placebo. The primary endpoint of the study was not significant and the effectiveness was less than what might be expected in the average migraineur using more standard treatments. Nevertheless the other endpoints were enough to allow the Medicines and Healthcare Products Regulatory Agency (MHRA) to grant a licence in chronic migraine. It will be interesting to see how this approach is adopted by the NHS. [6.]

ONS is emerging as a promising treatment option and has already provided a better quality of life for some individuals. However, the ultimate confirmation should come from randomised, double-blind, placebo-controlled trials. This poses a special problem in designing blinded studies of treatment with stimulation since there is no placebo equivalent for the paraesthesia that accompanies stimulation. Any credible sham device would, therefore, be required to produce a discernible stimulus, which could then be criticised for providing neurostimulation. Nonetheless, there are now two controlled trials (ONSTIM, PRISM) ongoing in chronic migraine and their results are eagerly awaited. Ideally, results from these controlled trials should be available before widespread open-label use of ONS can be recommended; it may be several years before these studies are published.
FAQs

Do I automatically qualify for this treatment if I have a chronic headache condition?
No - you must have tried at least four other preventative medications that have failed to work before this treatment will be considered.

What will actually happen?
You will be admitted to hospital and the device will be programmed to your individual requirements. You will be given a control pad so that you can switch the device on and off as required and alter the strength of the signal.

You will remain in hospital for 3 - 7 days after the operation. There will be some discomfort at the operation sites until these are fully healed. This is likely to affect your ability to carry out certain daily activities e.g. driving, lifting etc. Depending on your occupation you may be unable to work for 3 - 6 weeks after the operation.

You will be given an outpatient appointment for approximately 6 weeks after the implant so that the operation sites can be checked and the device re-programmed if required. The device may need to be re-programmed up to 6 times before it is operating optimally. Adjustments can be made at the hospital at six weekly intervals. Once an optimal setting has been found you will be invited for out-patient appointments at six monthly intervals.

The device contains a battery which will need to be replaced at intervals of approximately 1 - 2 years (depending on how much it is used) and this will require further surgery.

Are there any side effects?
ONS is a relatively safe procedure with no reports of any serious side effects. Side effects reported include lead migration, lead site pain, incision site pain, neck stiffness, discharge battery, battery site pain and contact dermatitis.
The greater occipital nerve block

Many patients with frequent headaches have tenderness in the sub-occipital region, which is the area at the back of the neck just below the skull. Injection of the greater occipital nerve (GON) with local anaesthetic has been widely used in clinical practice for many years in the management of headache.

The doctor locates the GON by simply feeling the area in the skull which has the most pain or tenderness at the back of the head at the top of the spine. The skin is then cleaned with a swab and an injection with a fine needle inserted over the area of the most pain in this region. A local anaesthetic often in combination with corticosteroids is then injected. The injection takes a few minutes and is uncomfortable rather than painful. Some people experience a warm sensation at the back of their heads after the procedure but this is short-lived. The anaesthetic effect begins after a few minutes and the steroid in the injection should start to take effect from between one to seven days later. The benefits in terms of pain relief can last from several days to a few months. This varies from person to person. The injection can be repeated after several weeks. The injection of the GON with local anaesthetic and corticosteroids has been widely used in clinical practice for many years with varying degrees of success.

Research

A study conducted at The Institute of Neurology in London looked at the use of a single GON injection for people with migraine and cluster headache. A total of 116 injections were administered to 101 patients. Out of the 116 injections 53% found some pain relief of whom 22% were pain free. The average length of time that these 26 patients were pain free was 20 days with a range of one to 90 days. Patients who experienced the tenderness around the region of the GON before the injection were more likely to benefit from the injection. [7].

At this stage the research into the use of the GON block is limited and fairly small scale. A further placebo controlled study with 40 patients is underway at The Jefferson Headache Centre, Thomas Jefferson University in Philadelphia, to determine whether the GON block is effective for the treatment of prolonged migraine attacks.
FAQs

What is in the injection?
The injection contains local anaesthetic. Sometimes, a dose of steroid is given in addition to the anaesthetic.

What should I expect?
A small needle will be used to perform the injection. The back of your skull and top of your head may be numb for several hours from the local anaesthetic that is injected around the nerve. Anything more than a small amount of pain, bleeding or swelling at the site of the injection is unusual, and you should report it to your doctor. Your healthcare professional will review you to assess your response and decide on further steps to help your headache if needed.

Will I be offered the nerve block again if it doesn’t work the first time?
No - if the procedure doesn’t work the first time it is not likely to work on another occasion.

Are there any side effects?
This is a relatively safe procedure taking only a few minutes. The nerves are outside the skull and so the procedure does not involve invasive brain surgery. It is usually well tolerated by individuals and side effects, such as numbness or pain at the back of the head wear off after a few hours. People who have the procedure are advised not to drive for a few hours but can usually return to work within 24 hours.

What is the site for the injections?
The diagram below illustrates where the injections will be made.
Tips for patients

• You may have to battle with your PCT to obtain funding for these procedures. Prepare a strong case (e.g. the annual cost of your current medication, the time you are losing from work, your inability to carry out other activities (e.g. child care) and impaired involvement in family, social and community activities. Be prepared to take your case to appeal and be willing to attend an appointment for a second opinion (this might be some distance from your home).

• If dehydration and / or lack of food are migraine triggers for you, talk to the anaesthetist about a glucose drip being set up for before, during and immediately after the ONS operation.

• Hospitals are busy, noisy, brightly lit places so you may wish to take an eye mask and ear plugs with you.

• You may experience a migraine whilst in hospital so take in some of your usual relief medication (keep it with you, although you should advise staff that you have it and when / if you have to take it) and also ask your healthcare professional to write some up for you so that the nursing staff are authorised to administer it as soon as you need it.

• Ensure that someone to collects you from hospital when you are discharged.

• Ensure that you are given an adequate supply of appropriate pain relief medication for post operative / injection pain before leaving hospital (paracetamol is unlikely to be sufficient).

• Be prepared for the impact of these procedures e.g. pain, feeling unwell, inability to carry out normal daily activities, help with housework / childcare etc., time off work.
For further information, advice on migraine management and for updates on the latest migraine research, please contact Migraine Action by calling 0116 275 8317, emailing info@migraine.org.uk, or visiting the charity’s website at www.migraine.org.uk. All of our information resources and more are only made possible through donations and by people becoming members of Migraine Action. Visit www.migraine.org.uk/donate to support one of our projects or visit www.migraine.org.uk/join to become a member.

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References