



Gamma Knife

Trigeminal neuralgia

The London Gamma Knife Centre
at The Wellington Hospital

part of **HCA**Healthcare uk



Trigeminal neuralgia

This guide should be read in combination with the general information brochure which outlines the principles of Gamma Knife stereotactic radiosurgery and details the options relating to head immobilisation during treatment (mask or frame). The content of this leaflet reflects the experience and opinion of the author and should be considered a useful guide, rather than an authoritative manual.

Trigeminal neuralgia is an uncommon form of facial pain which typically gives rise to severe, intermittent, sharp pain, often described as 'stabbing' or 'electric-shocks'. The cause of most trigeminal neuralgia is still debated but may be due to an artery pulsating against the nerve which gives feeling to the face (the trigeminal nerve, sometimes referred to as the fifth nerve). Other causes include tumours compressing the nerve, and multiple sclerosis which causes loss of the 'insulation' around nerve fibres.

There are two trigeminal nerves, one for each side of the face. They are each formed of three branches which give feeling to the forehead, cheek and jaw respectively. Most patients

with neuralgia experience pain only on one side of the face, usually the cheek and/or jaw, with fewer patients suffering pain in the forehead and eye. One common presentation is with 'toothache' and some patients have undergone extensive dental treatment, including extractions, before the true diagnosis is made.

There are well described, classical triggers for the pain such as touching the affected part of the face, eating, chewing, talking, cold wind, shaving, putting on make-up and cleaning the teeth. Even standing under a shower with water hitting the face can provoke an attack. The severity of the pain is said to be worse than childbirth and sufferers are desperate for relief.

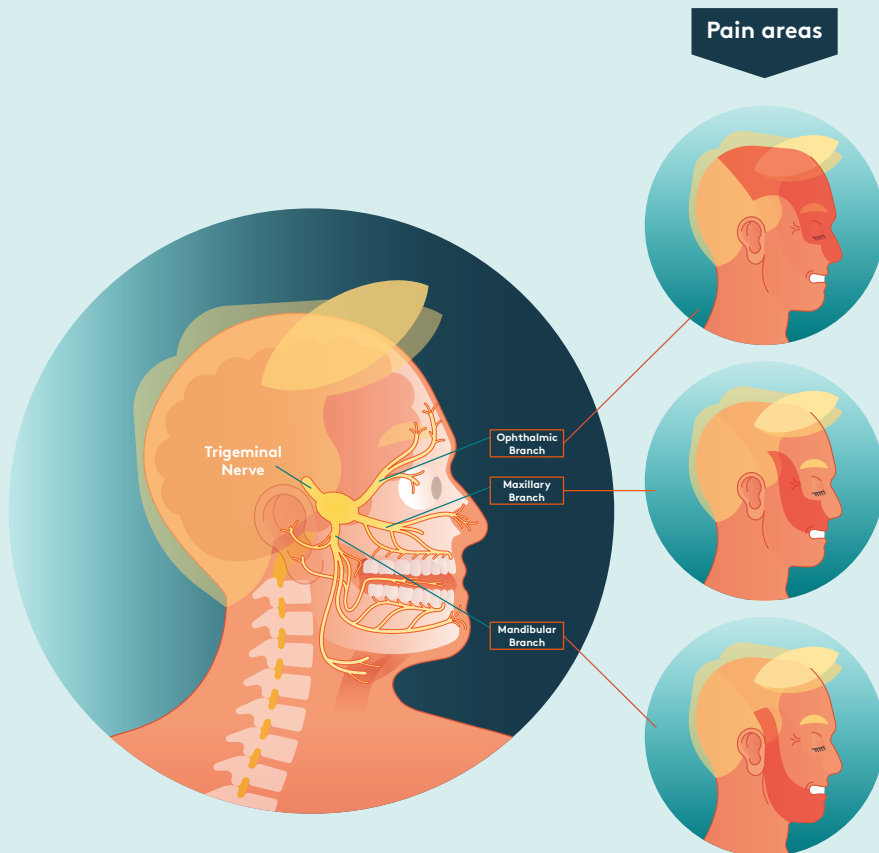
The neuralgic pain is not constant, but comes in waves or spasms, sometimes lasting for minutes at a time before easing off. In between attacks the victim is normally pain-free but fearful of talking, eating or otherwise triggering the next spasm.

These are the typical symptoms, but some sufferers experience 'burning' in the face after an attack, which may over the years become increasingly

problematic. If these 'atypical' features predominate, the diagnosis may not be trigeminal neuralgia, but instead may be atypical facial pain or one of the various forms of 'trigeminal headache'. It is important that the diagnosis is correct, as treatment for trigeminal neuralgia is not the same as treatment for other types of facial pain.

Most patients will be referred to a medical neurologist, usually by their GP but sometimes by their dentist. Sometimes a referral will be made

directly to a pain relief clinic or to a neurosurgeon. The diagnosis is made on the basis of the symptoms and pattern of attacks; as yet there are no tests which can confirm the medical opinion. Normally a high quality and very detailed MRI scan will be ordered as part of the investigations. This gives a good view of the trigeminal nerves and will reveal the presence of tumours or multiple sclerosis in rare individuals. It may also show if an artery is compressing the nerve on the affected side.



Treatment options

Medication

The mainstay of treatment is medical, using a variety of drugs which have been found to give either complete or partial relief. The most effective drugs are carbamazepine (Tegretol) and the related compound oxcarbazepine (Trileptal). These usually provide relief once the dose has been increased sufficiently. Starting with a high dose is associated with unacceptable side effects, but a low dose often doesn't provide pain relief. It can take a few weeks to achieve a dose high enough to affect the pain without severe side effects.

Trigeminal neuralgia almost always responds to carbamazepine, and the response is so specific that it is sometimes considered to be a diagnostic test for the condition. There are, however, patients who cannot tolerate the side effects, particularly drowsiness, and others may suffer an allergic reaction such as a skin rash, requiring the drug to be stopped.

Alternative medication includes pregabalin (Lyrica), gabapentin (Neurontin), amitriptyline, levetiracetam (Keppra), baclofen (Lioresal), phenytoin (Epanutin), and

lamotrigine (Lamictal). They are not as effective as carbamazepine and are generally considered second-line.

Surgery

If medication fails to control the pain, or the side effects are too great, there are surgical options which include:

- Injections into the trigeminal nerve
- Cryotherapy (freezing) of the nerves as they emerge from the skull to supply the face
- Microvascular decompression
- Gamma Knife radiosurgery

Injections

These are performed under general anaesthetic, with a needle passed through the cheek and skull base into the trigeminal nerve (trigeminal ganglion) using X-ray guidance. Once in the correct location, the needle tip may be heated to damage the nerve (rhizotomy). Alternatively nerve damaging agents can be injected (glycerol) or a balloon can be inflated to crush the nerve. These have variable results, but generally the pain recurs after an interval, which may be 3–18



months depending on the procedure. All of these destructive procedures can lead to a degree of facial numbness which may or may not recover over time. If facial numbness is severe, a different pain may arise – anaesthesia dolorosa or painful numbness. This is a burning pain which is difficult to control although anti-depressants can give some relief.

Cryotherapy

Normally performed by oral surgeons and previously very commonly used, the small branches of the trigeminal nerve in the face are identified by injections of local anaesthetic and subsequently frozen using a probe cooled by liquid nitrogen. There is a good early response rate and the numbness provoked in the face normally recovers within a few months. The pain is often relieved for a period, but usually recurs as the nerves recover from the damage.

Microvascular decompression

This is the most effective form of treatment currently available. It involves an incision behind the ear on the affected side, the drilling of a small hole in the skull to allow access to the brain, and exploration of the trigeminal nerve, with placement of Teflon wool between the nerve and any arteries or veins which appear to be compressing the nerve. It is a surgical operation performed under general anaesthesia and the hospital stay is normally a few days. There are potential complications, including hearing loss on the operated side, facial numbness, failure to relieve the pain, recurrence of pain, cerebro-spinal fluid leak, infection, bleeding and stroke. These complications are rare, and most people are relieved of pain immediately after surgery, although there is a significant recurrence risk of up to 30% over five years.





Gamma Knife radiosurgery

By delivering a high dose of radiation to the trigeminal nerve, the pain of neuralgia is usually relieved, probably by blocking the transmission of the pain fibres within the nerve. The effect is normally delayed and may require weeks or months to become obvious. Occasionally there is an exacerbation of the pain before it eases, and there is a risk of recurrence over time.

The Icon Gamma Knife delivers 192 beams of converging radiation to the trigeminal nerve, with unparalleled accuracy. The trigeminal nerve is a small target, just a few millimetres in diameter. To deliver radiation to the nerve with precision, it has to be identifiable on an MRI scan so that it can be targeted. Head movement during treatment would reduce the accuracy of the radiation delivery, but this is prevented by the use of a frame attached to the head which is then docked into the treatment couch.

Treatment time is variable depending on the rate of delivery of the radiation and may vary from 30-60 minutes. There is no pain or sensation that radiation is being delivered to the nerve and many patients fall asleep during treatment. When the full dose of radiation has been given, the frame is removed, and patients are normally

fit to leave the department within an hour.

At first all pain medication should be continued at the normal dose. This can gradually be reduced once the pain reduction from the radiosurgery starts to become apparent, which can take weeks. Side effects from treatment are uncommon but in our experience around 15% of patients experience some alteration of sensation in the face on the treated side which is sometimes described as a mild tingling, with complete loss of sensation only occurring in less than 1%.

Most patients will benefit from treatment, but there is a relatively high risk of recurrence with around 50-60% experiencing pain again at a variable time from the radiosurgery. If this does occur, the severity of the pain may be much less and is often controlled with small doses of medication. If severe, a repeat Gamma Knife treatment can be considered, especially if there has been a good first time response despite the subsequent recurrence. Second treatments are associated with a higher risk of bothersome facial numbness, but this is generally considered preferable to the pain.

Despite the risk of recurrence of pain, in some centres Gamma Knife treatment has become the first-line therapy for patients who are not fit enough or who are unwilling to undergo microvascular decompression surgery.

It is one of the few radiosurgical treatments to have been assessed by the National Institute for Clinical Effectiveness (NICE) as long ago as

2004, and is approved by them for patients who are fully counselled about the risks as well as the benefits. It specifically refers to the Gamma Knife as other radiosurgery platforms (CyberKnife, other Linacs) do not have the same evidence of effectiveness. Currently the only radiosurgery platform allowed to treat NHS patients is the Gamma Knife.

For further information please contact:

The London Gamma Knife Centre
The Platinum Medical Centre
15-17 Lodge Road
St John's Wood
London
NW8 7JA

T 020 3214 3500

gammaknife@hcahealthcare.co.uk



Underground

St John's Wood (Jubilee line) is a 15 min walk

Baker Street (Bakerloo, Circle, Hammersmith, Jubilee & Metropolitan lines) is a 20 min walk

National Rail

Marylebone is a 20 min walk

Bus

Bus stop: Park Road / Lord's Cricket Ground. Bus no 13, 82, 113, 274, N13

Parking

Car parking is limited at the centre however parking is available nearby at the Q-Park St John's Wood car park on Kingsmill Terrace



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