Gamma Knife®
Radiosurgery for the
Treatment of Tremors
Deep Brain Stimulation (DBS) can be a very effective therapy to tremors, although some patients cannot undergo this type of surgery. For example, some people taking anti-coagulation drugs can’t go without their medicine even for a short period of time or others are too unwell for the procedure. For these people, a non-invasive surgical approach, like Gamma Knife® surgery, may be beneficial. While Gamma Knife® has some disadvantages to DBS, it does offer another treatment option for some patients.

Gamma Knife® radiosurgery is a safe, effective and non-invasive procedure that uses radiation to treat conditions in and around the brain. It is sometimes used as a replacement for conventional surgery, but at other times it may be effective in situations where there is no conventional surgical alternative available. Not actually a “knife” at all, the Gamma Knife® is a machine that emits hundreds of powerful, highly focused gamma radiation beams. The Gamma Knife® allows for a more precise and concentrated treatment than do other radiation treatment options. This helps the doctors target the diseased area of the brain while sparing the healthy areas surrounding it.

**Assessment**

You will be seen in clinic first of all by members of the Movement Disorder Team. They will discuss your symptoms with you and any treatment you have tried in the past. The neurosurgeon and neurologist will discuss with you whether they think that DBS or gamma knife surgery will be the best treatment for you.

If the team recommends Gamma Knife® surgery then we will talk to you about what this involves. We will give you the opportunity to ask further questions about the operation and your care afterwards. There are some things that you will need to be aware of in terms of your lifestyle after gamma knife surgery and you will also be able to discuss what this will mean for you personally. You will be asked whether you wish to go ahead with the surgical treatment, but you may want to go away and think about whether you feel it would be right for you. We will not put you under pressure to make a decision on the day of your appointment.

If we have recommended Gamma Knife® surgery and you decide to go ahead with this, we will arrange several appointments as part of a pre-operative workup. Depending on your circumstances this workup will be organised as a planned admission to the Princess Alexandra Hospital (usually for about 3 days) or through separate outpatient appointments.
Workup

The Pre-operative workup includes the following:

- A baseline physical and neurological assessment. This includes video recordings of you during various activities.
- A neuropsychological assessment. This will measure your memory and other thinking skills, ensure that there are no major problems in these areas, and provide a baseline against which the effects of Gamma Knife® surgery can be evaluated later on. Our neuropsychology team will also assess how well you understand the risks and potential benefits of Gamma Knife® surgery, as well as the follow-up required, and discuss what supports you have available to you.
- A neuropsychiatric assessment. This looks at your mood and mental health.
- A Magnetic Resonance Imaging (MRI) brain scan. This scan helps the team to see the area that will be targeted during the operation. People might need a general anaesthetic for the MRI scan as any movements during the scanning procedure can worsen the image quality.

If, after the assessments, we feel that gamma knife surgery would not be appropriate, the procedure will not be offered. If this is the case, you will have the opportunity to discuss this decision with the team.

Consent

Our aim is to make sure that you have enough information to help you make an informed decision about whether to go ahead with surgery or not. You will have the opportunity to talk with different members of the Movement Disorder Team about any concerns or queries that you may have.

If you decide to go ahead with the procedure (having been told that you are suitable for Gamma Knife® surgery) our neurosurgeon who understands all the possible risks and benefits will explain the operation to you. If you are happy with the explanation you will then be asked to sign a consent form before the operation takes place. The main risks and benefits are described later in this information sheet.

Precautions

It is very important that you tell us about any new symptoms or medical diagnoses that develop whilst you are waiting for surgery, as these may mean we have to change the surgical plan. As each person is different, it is important that you phone the hospital team so that we can discuss a plan for you.
Your treatment day

Gamma knife surgery will only be done as an outpatient appointment. You would need to arrange your own accommodation if that is required.

When you arrive

On the day of treatment you will report to the Radiation Oncology reception. From here, a nurse will greet you and take you through to the Gamma Knife® treatment suite where they will verify your personal details, complete a short check list and take your vital signs. If you have not yet completed an informed consent, this will also be obtained at this time.

We recommend that you do not wear any make-up, jewellery, hair pieces/pins on the day of your treatment. You may be asked to remove your contact lenses, eyeglasses, and dentures prior to fitting the head frame. The doctor will insert a small needle (cannula) into a vein in your arm.

Planning

Neurosurgical staff will fit the head frame for Gamma Knife® treatment under local anaesthetic. The head frame is a guiding device to ensure the Gamma Knife® beams are focused accurately on the target area to be treated. The frame is light weight and does not cause any discomfort or pain. This frame will remain in place for the duration of the Gamma Knife® treatment.

Following the fitting of the head frame, you will undergo a magnetic resonance imaging (MRI) and computed tomography (CT) scan. These scans provide the Gamma Knife® team with a road map from which they can precisely plan your treatment, which can take 1 to 2 hours. During this time, you will rest in the comfortable waiting room where you can watch a movie, read a book, talk with your guests or simply rest.

Treatment

After planning is completed, your treatment on the Gamma Knife® machine begins. You will proceed to the treatment room where you will be positioned on your back on the treatment couch. At this point, treatment staff will then leave the room to administer your treatment. The room is fitted with cameras which allow the treatment staff to see you throughout the entire treatment. You will also be able to communicate with your team through an audio connection in the room. The couch moves into the circular dome and commences your silent and painless treatment, which can last anywhere from a few minutes to an hour depending on the size of the treatment target.

After treatment

Following the completion of the treatment, the head frame will be removed by the neurosurgical team. In some instances, patients have complained of a mild headache, some nausea or minor swelling after the frame has been removed, however, this should only be temporary. You will be asked to remain in the Gamma Knife® treatment suite so that the nurse can monitor you for a short period following the removal of the head frame. You will then be allowed to go home, however, someone will need to escort you.
**Things to remember**

- Gamma Knife® treatment does not require any cutting or shaving of your hair.
- Gamma Knife® treatment does not cause you to lose your hair.
- The Gamma Knife® rays used in the treatment do not remain in your body and you will not be radioactive.
- Most patients do not suffer from any serious side effects related to Gamma Knife® treatment.
- If you feel well enough you can return to work and travel almost immediately after you have finished your treatment, however, any driving restrictions already in place will continue to apply.
- Even though you remain in the Gamma Knife® treatment suite for 5 to 6 hours the actual radiation treatment usually takes less than an hour.

Please note, if you suffer from claustrophobia it is important you inform the Movement Disorders Team of this during your workup. This will allow the team to prescribe a light sedation for you to take on the day of your treatment.

**Treatment effect and follow-up**

You will stay on long term follow-up with the Movement Disorder Team. The effects of your treatment on your condition will occur over time. In case of Gamma Knife® surgery for tremors the delay from treatment until any improvement is observed is usually between three and six months (but can vary widely from several days to one year).

The Movement Disorders Team will stay in contact with you to assess your progress, which may include follow-up MRI or CT images.

There are several routine follow-up reviews you will undergo:

- Our Neuropsychiatrist will see you following the procedure to see if you have developed a mood or mental health disturbance post-operatively
- Our Neuropsychology and Movement Disorder Team will perform cognitive and physical follow-up assessments between six and twelve months after surgery.

These follow up assessments will help us determine how much of an impact the surgery had on your symptoms and if any cognitive problems have developed due to the surgery.
Risks, complications and benefits

As with all types of surgery, Gamma knife surgery involves some degree of risk and the chance of complications.

- Because of potential side-effects with bilateral treatment only side of your brain (and therefore your body) can be treated.
- About 75% of patients have a good response to the treatment with little or no side effects.
  - 5% of patients (so called hyper-responders) however exhibit excess reactions to the Gamma Knife treatment and can develop side effects such as weakness and numbness affecting one side of their body. In the majority of cases these are not permanent.
  - 20% of patients (so called hypo-responders) developed no or only little response to Gamma knife treatment causing no or only minor improvement.
- There is a chance that the surgery will not benefit you as much as you would like and it is not possible to be certain before the operation how much benefit you will obtain.

Early complications (common but usually mild)

- Some local discomfort of the scalp relating to the pin sites which are used to fix the frame - resolves within a few hours, almost certainly by the following morning.
- Numbness of the scalp around pin sites may occur which resolve over a day or two.
- Headache - again usually mild, resolving rapidly.
- Mild nausea.

Delayed complications (uncommon)

- Radiation effects on surrounding brain tissue causing weakness and/or numbness
- Hair loss (very localised) adjacent to treated area
- Epileptic seizures (very rare)

Benefits

- The risks of infection, haemorrhage and spinal fluid leakage are eliminated, as is the scarring and potential disfigurement that results from conventional neurosurgery.
- The small risk associated with general anaesthesia is also eliminated. A mild sedative is occasionally used.
- Gamma knife surgery is a day procedure except in occasional circumstances.
How to contact us

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References:
This information leaflet is adapted from a leaflet provided by the Oxford University Hospital NHS Trust, Department of Neurological Surgery, John Radcliffe Hospital, Oxford, UK (with kind permission).
Partnering with Consumers - This patient information brochure supports National Safety and Quality Health Service Standard 2 (2.4.1)
Consumers and/or carers provided feedback on this patient information.

Date created: March 2017
Review date: March 2020
Brochure no. PIB0066/v1