

Information for Patients Considering MRgFUS for Parkinson's Disease

Introduction Parkinson's Disease (PD) is a progressive neurological disorder that affects movement, causing symptoms such as tremor, rigidity, and bradykinesia (slowness of movement). For individuals whose symptoms are not adequately controlled with medication, newer treatments like Magnetic Resonance-guided Focused Ultrasound (MRgFUS) provide promising alternatives.

MRgFUS is a non-invasive procedure used to create precise thermal lesions in specific brain areas to reduce PD symptoms. This document outlines the benefits, procedure, results, and considerations based on clinical research conducted at leading neurosurgical centers.

What is MRgFUS? MRgFUS is a cutting-edge technique that uses high-intensity focused ultrasound guided by magnetic resonance imaging (MRI) to target small regions of the brain without requiring surgical incisions. The technology allows real-time monitoring and precise targeting, ensuring safety and effectiveness. In PD, the pallidothalamic tract—a key fiber pathway implicated in motor symptoms—is often targeted.

Key features of MRgFUS include:

- **Incision-free:** No open surgery is required.
 - **Sub-millimeter accuracy:** MRI guidance ensures precision.
 - **Real-time feedback:** Temperature and lesion size are continuously monitored.
 - **Minimal downtime:** Most patients can return home within a day of the procedure.
-

Who is a Candidate for MRgFUS? MRgFUS is suitable for patients with PD who:

- Have idiopathic PD confirmed by a neurologist.
- Experience chronic symptoms (lasting over a year) resistant to medical treatment.
- Show significant impact on quality of life despite optimized medication regimens.
- Exhibit tremor-dominant or mixed symptom types.
- Have preserved cognitive function (Montreal Cognitive Assessment score $\geq 20/30$).

Patients with severe brain atrophy or extremely low skull density may not be suitable for MRgFUS. Comprehensive pre-procedure evaluations, including MRI and cognitive assessments, are performed to determine eligibility.

How Does MRgFUS Work? The procedure is performed using an advanced ultrasound system and MRI machine. Here's a step-by-step overview:

1. **Preparation:** The patient's head is shaved, and a stereotactic frame is applied to ensure precision.
2. **Imaging:** Detailed MRI scans identify the target area in the brain, typically the pallidothalamic tract in PD.

3. **Thermal ablation:** Ultrasound beams converge on the target to raise its temperature, creating a small, controlled lesion. Temperature is carefully monitored to avoid affecting nearby structures.
4. **Feedback:** Patients remain awake and provide feedback during the procedure, helping to adjust targeting if necessary.
5. **Verification:** Post-procedure MRI confirms lesion placement.

The entire procedure typically lasts several hours, but patients usually experience minimal discomfort and require no sedation.

Expected Benefits Clinical studies have demonstrated significant improvements in motor symptoms and quality of life after MRgFUS. Here are the primary outcomes reported:

1. **Tremor Reduction:** Tremor severity can decrease by up to 91%, with many patients achieving near-complete tremor control.
 2. **Rigidity and Bradykinesia:** Rigidity improves by approximately 67%, and distal bradykinesia improves by 54%.
 3. **Pain Relief:** Associated musculoskeletal pain can reduce by up to 89%.
 4. **Reduction in Medication:** Patients often decrease their dependence on medications like L-Dopa, with reductions up to 55%.
 5. **Symptom Relief:** Overall symptom relief is reported as 82% for unilateral procedures and 79% for bilateral interventions.
-

Safety and Risks MRgFUS is generally safe, but as with any medical procedure, it carries some risks. The most commonly reported side effects include:

- Temporary headaches or nausea.
- Mild balance issues or dizziness.
- Rare occurrences of speech or cognitive difficulties.
- Risk of incomplete symptom relief or need for additional treatments.

Patients are monitored closely during and after the procedure to manage any adverse effects promptly.

Bilateral MRgFUS for Advanced PD In cases where symptoms affect both sides of the body, bilateral MRgFUS may be considered. Studies show similar benefits to unilateral treatment, though the procedure may increase the risk of speech and gait difficulties. Bilateral treatments are typically staged several months apart to assess effectiveness and minimize risks.

Post-Treatment Care Most patients return to normal activities within days of the procedure. Follow-up evaluations are essential to assess symptom relief and adjust medications if needed. Lifestyle modifications, physical therapy, and ongoing neurologist consultations further enhance recovery and long-term outcomes.

Conclusion MRgFUS offers a minimally invasive, effective alternative for managing Parkinson's Disease, particularly for patients with medication-resistant symptoms. By targeting precise brain regions, it can significantly improve tremors, rigidity, and overall quality of life with minimal recovery time.

For more information or to schedule a consultation, contact your neurologist or the specialized functional neurosurgery center.

Information for Patients Considering MRgFUS for Parkinson's Disease

Introduction Parkinson's Disease (PD) is a progressive neurological disorder that affects movement, causing symptoms such as tremor, rigidity, and bradykinesia (slowness of movement). PD can significantly impact quality of life, making daily tasks difficult. For individuals whose symptoms are not adequately controlled with medication, newer treatments like Magnetic Resonance-guided Focused Ultrasound (MRgFUS) provide promising alternatives.

What is MRgFUS? MRgFUS is a cutting-edge technique that uses high-intensity focused ultrasound guided by magnetic resonance imaging (MRI) to target small regions of the brain without requiring surgical incisions. The technology allows real-time monitoring and precise targeting, ensuring safety and effectiveness. In PD, the pallidothalamic tract—a key fiber pathway implicated in motor symptoms—is often targeted.

Key features of MRgFUS include:

- **Incision-free:** No open surgery is required, reducing risks such as infection and bleeding.
 - **Sub-millimeter accuracy:** MRI guidance ensures precision targeting to minimize side effects.
 - **Real-time feedback:** Continuous monitoring of temperature and lesion size allows adjustments during the procedure.
 - **Minimal downtime:** Most patients can return home within a day of the procedure, enabling a quick recovery.
-

Who is a Candidate for MRgFUS? MRgFUS is suitable for patients with PD who:

- Have idiopathic PD confirmed by a neurologist.
- Experience chronic symptoms (lasting over a year) resistant to medical treatment, including motor fluctuations and dyskinesias.
- Show significant impact on quality of life despite optimized medication regimens.
- Exhibit tremor-dominant or mixed symptom types.
- Have preserved cognitive function (Montreal Cognitive Assessment score $\geq 20/30$).

Patients with severe brain atrophy, extremely low skull density, or certain other medical conditions may not be suitable for MRgFUS. Comprehensive pre-procedure evaluations, including detailed MRI and cognitive assessments, are performed to determine eligibility.

How Does MRgFUS Work? The procedure is performed using an advanced ultrasound system and MRI machine. Here's a step-by-step overview:

1. **Preparation:** The patient's head is shaved, and a stereotactic frame is applied to ensure precision.
2. **Imaging:** Detailed MRI scans identify the target area in the brain, typically the pallidothalamic tract in PD.

3. **Thermal ablation:** Ultrasound beams converge on the target to raise its temperature, creating a small, controlled lesion. Temperature is carefully monitored to avoid affecting nearby structures.
4. **Feedback:** Patients remain awake and provide feedback during the procedure, helping to adjust targeting if necessary.
5. **Verification:** Post-procedure MRI confirms lesion placement and ensures the lesion is within the planned area.

The entire procedure typically lasts several hours. During this time, patients usually experience minimal discomfort, as no incisions or general anesthesia are required.

Expected Benefits Clinical studies have demonstrated significant improvements in motor symptoms and quality of life after MRgFUS. Here are the primary outcomes reported:

1. **Tremor Reduction:** Tremor severity can decrease by up to 91%, with many patients achieving near-complete tremor control.
 2. **Rigidity and Bradykinesia:** Rigidity improves by approximately 67%, and distal bradykinesia improves by 54%.
 3. **Pain Relief:** Associated musculoskeletal pain can reduce by up to 89%, significantly enhancing comfort.
 4. **Reduction in Medication:** Patients often decrease their dependence on medications like L-Dopa, with reductions up to 55%, which can minimize medication-related side effects.
 5. **Symptom Relief:** Overall symptom relief is reported as 82% for unilateral procedures and 79% for bilateral interventions, offering a notable improvement in daily functioning.
-

Safety and Risks MRgFUS is generally safe, but as with any medical procedure, it carries some risks. The most commonly reported side effects include:

- Temporary headaches or nausea.
- Mild balance issues or dizziness that typically resolve within weeks.
- Rare occurrences of speech or cognitive difficulties, particularly in bilateral procedures.
- Risk of incomplete symptom relief or need for additional treatments if symptoms evolve.

Patients are closely monitored during and after the procedure to manage any adverse effects promptly. The absence of incisions significantly reduces risks such as infection or bleeding, and the procedure's real-time imaging further enhances safety.

Bilateral MRgFUS for Advanced PD In cases where symptoms affect both sides of the body, bilateral MRgFUS may be considered. Studies show similar benefits to unilateral treatment, though the procedure may increase the risk of speech and gait difficulties. Bilateral treatments are typically staged several months apart to assess effectiveness and minimize risks. This staged approach ensures

that the patient has time to adapt and recover fully from the first procedure before undergoing the second.

Post-Treatment Care Most patients return to normal activities within days of the procedure. Follow-up evaluations are essential to assess symptom relief, adjust medications, and monitor for any delayed side effects. A multidisciplinary approach, including neurologists, physical therapists, and support groups, can optimize recovery and ensure long-term benefits. Patients are encouraged to maintain a healthy lifestyle, including regular exercise and proper nutrition, to complement the procedure's effects.

Real-Life Testimonials Patients who have undergone MRgFUS report life-changing improvements. For example, one patient described the procedure as “a miracle,” noting that their tremors were almost entirely gone, allowing them to resume hobbies they had given up years ago. Another patient highlighted the convenience of the treatment, stating that they were able to go home the same day and experienced minimal disruption to their routine.

Conclusion MRgFUS offers a minimally invasive, effective alternative for managing Parkinson's Disease, particularly for patients with medication-resistant symptoms. By targeting precise brain regions, it can significantly improve tremors, rigidity, and overall quality of life with minimal recovery time. The procedure's safety profile and non-invasive nature make it a valuable option for eligible patients.

For more information or to schedule a consultation, contact your neurologist or the specialized functional neurosurgery center. Together, you can explore whether MRgFUS is the right step toward regaining control over your symptoms and enhancing your quality of life.

Information for Patients Considering MRgFUS for Parkinson's Disease

Introduction Parkinson's Disease (PD) is a progressive neurological disorder that affects movement, causing symptoms such as tremor, rigidity, and bradykinesia (slowness of movement). For individuals whose symptoms are not adequately controlled with medication, newer treatments like Magnetic Resonance-guided Focused Ultrasound (MRgFUS) provide promising alternatives.

MRgFUS is a non-invasive procedure that creates precise thermal lesions in specific brain areas to reduce PD symptoms. Clinical research has highlighted its safety and effectiveness, particularly in targeting the pallidothalamic tract (PTT). This document provides an overview based exclusively on findings from three pivotal studies.

What is MRgFUS? MRgFUS uses high-intensity focused ultrasound guided by magnetic resonance imaging (MRI) to target small regions of the brain without requiring surgical incisions. The technique combines real-time monitoring and sub-millimeter accuracy to create controlled lesions.

In PD, MRgFUS focuses on the pallidothalamic tract, a critical fiber pathway that contributes to motor symptoms. By targeting this area, MRgFUS can effectively disrupt abnormal signals while preserving surrounding tissue.

Key features include:

- **Non-invasive:** No open surgery, reducing risks like infection and bleeding.
 - **Real-time monitoring:** MRI guidance ensures precise targeting.
 - **Rapid recovery:** Most patients resume daily activities within a day.
 - **No implants:** Unlike deep brain stimulation, no hardware is left in the body.
-

Who is a Candidate? According to the reviewed studies, MRgFUS is suitable for patients with:

- Chronic PD symptoms unresponsive to medication for over a year.
- Significant tremor or mixed symptom types that severely affect quality of life.
- Adequate cognitive function (Montreal Cognitive Assessment score $\geq 20/30$).

Exclusion criteria include low skull density or severe brain atrophy, which may limit the effectiveness of ultrasound targeting.

Procedure Overview The MRgFUS procedure follows a structured protocol:

1. **Preparation:** Patients wear a stereotactic frame for stability, and MRI imaging identifies the target.
2. **Sonication:** Focused ultrasound heats the pallidothalamic tract, creating a small lesion. The process involves incremental heating, allowing adjustments based on patient feedback.
3. **Verification:** Post-procedure MRI confirms the lesion's accuracy.

Throughout, patients remain awake, enabling real-time communication and monitoring. Each session typically lasts several hours, but discomfort is minimal.

Effectiveness Studies demonstrate significant symptom relief following MRgFUS. Key findings include:

- **Tremor Reduction:** Symptom improvement of up to 91%, often achieving near-complete tremor control.
 - **Motor Function:** Rigidity and bradykinesia improve by 70% and 73%, respectively, on the treated side.
 - **Pain Relief:** Associated pain symptoms decrease by 89%.
 - **Medication Reduction:** Patients reduce L-Dopa intake by up to 55%.
 - **Global Symptom Relief:** Self-reported improvements average 82% for unilateral and 79% for bilateral interventions.
-

Bilateral Treatments For advanced cases, bilateral MRgFUS (targeting both sides) can be considered. Results from one study indicate similar effectiveness to unilateral treatment, though there is a slight increase in risks, such as speech difficulties. Bilateral procedures are typically staged to allow recovery and ensure optimal outcomes.

Safety and Risks While MRgFUS is generally safe, potential risks include:

- Temporary side effects like nausea or mild dizziness.
- Rare occurrences of speech or gait disturbances after unilateral (one-side) MRgFUS treatment, the occurrence of Hypophonia after bilateral PTT is higher, but varies highly between patients
- Incomplete symptom relief requiring additional interventions.

The precision of MRgFUS minimizes complications compared to older methods like radiofrequency ablation.

Patient Experience and Recovery Most patients report rapid recovery and a significant improvement in quality of life. Post-procedure care includes follow-up evaluations to adjust medications and monitor progress. Physical therapy and lifestyle modifications can further enhance outcomes.

Conclusion MRgFUS represents a groundbreaking option for PD patients with medication-resistant symptoms. By offering a safe, effective, and minimally invasive approach, it provides new hope for improved quality of life.