Visualase Therapy:
A New & Exciting Technology

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### Treatments Offered By Tri-State Neurosurgery

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Laser ablation, or laser-induced thermal therapy (LITT), is a minimally invasive approach to treat focal areas of epilepsy and brain tumors.
Our Interventional MRI Suite: Multiple Uses for Many Disorders

- **DBS for Dystonia, Parkinson’s, Tremor**
- **Laser Ablation for Epilepsy or Brain Tumor**
- **Drug Delivery for Brain Tumor**
Laser-Induced Thermal Therapy

Visualase is a brand name for a type of laser-induced thermal (heat) therapy, or LITT, for short.
What is Laser Thermal Ablation?

Thermal destruction of tissue by elevation to lethal temperatures

>100°C
Vaporization of intra- and extra-cellular water. Rupture of cell membranes.

60°C - 100°C

44°C - 59°C
Time-dependent thermal damage. Thermal denaturation of critical enzymes; cell death.

~43°C
Critical temperature below which thermal damage does not occur regardless of exposure time

Laser thermal ablation is a procedure for destroying tissue using heat generated through light absorption.
The Visualase® Procedure
Minimally Invasive Neurosurgery

The Visualase system in combination with our interventional MRI suite allows extremely precise monitoring of laser destruction of virtually any area of the brain that contains tumor, epilepsy or other disease with a minimal incision.
The Visualase® Procedure
Minimally Invasive Neurosurgery

Advantages of a Minimally Invasive Neurosurgical Procedure:

• Most patients have little or no hair removed
• Minimal sutures required, typically a 1 stitch suture
• Most patients are discharged after a shorter stay as compared to open procedures
• Reduced scarring compared to open procedures

This procedure, as opposed to traditional surgery for epilepsy and brain tumors, does not require a large incision or an open craniotomy. This therapy is delivered minimally-invasively through a small 1-2 mm stab incision in the scalp. Patients can typically go home in 24-48 hours as compared to 5-7 days after an open brain surgery.
This is an example of the Visualase work station, which uses a small laser that can be inserted through the brain tissue to the surgeon’s chosen target.
Patient is placed in the MRI-compatible head holder, which is secured to the table. Interventional MRI Surgery

As a reminder of our general procedure, the patient is put under general anesthesia and then moved onto the MRI table.

The patient is secured into the MRI-compatible head frame for maximum safety.

There are two flexible RF receiving MRI coils placed on either side of the head to allow adequate imaging of the operative field.

Depending on the brain target, patients may be placed face up or face down on the operative table. All pressure points are padded for maximum comfort regardless of the body position.
The far end of the MRI bore is the sterile field. This arrangement allows the drapes, equipment and the sterile field to move with the patient in and out of the MRI as needed.
A two piece surgical apparatus, called the “Smart frame” is secured to the skull through several small screws that go through the scalp so a large open incision is not necessary.
MRI through the Smart frame identifies the three built-in markers so the surgeon can plan the target with precision on the computer.
A target in the patient’s brain is chosen by the surgeon on the computer with sub-millimetric accuracy. The target depends on the problem that is being treated. For epilepsy or seizures due to tumor or other disease, a temporal lobe target is common, as seen here.
This particular patient had undergone a prior open brain surgery for this tumor at another institution. Unfortunately only a portion of the tumor was removed at that surgery.

Since that time, six years ago, the patient has had seizures arising from the tumor that was left behind, despite taking medication every day. The seizures have disrupted his life, his family and his job.

However he was hesitant to undergo another big brain surgery for resection due to his prior experience as well as his work schedule.
Next a small incision is made in the scalp and a specialized drill is used to make a 3-5 mm hole in the skull. A small tube is inserted through the center of the frame, through the scalp incision, and into the hole through the brain tissue until the target is reached.
Now a specialized laser fiber is prepared by the surgeon and carefully inserted through the center of the small tube down to the brain target.
MRI images of the target are sent to the Visualase work station. The surgeon sets safety limits for the laser by programming the location of both the diseased structure (e.g. the tumor) that needs to be destroyed as well as nearby important structures that need to be protected. Once the target is confirmed by the surgeon and the laser is in place, the Visualase workstation is used to deliver laser therapy to the target. The surgeon observes live temperature updates and can see real-time damage to the tissue allowing precise destruction of the desired target while minimizing risk to surrounding normal brain structures.
Visualase® provides a real-time estimation of the tissue that has been destroyed. In general, this software accurately predicts the damage that will be seen on post-procedural imaging. Here, T1-contrasted MRI shows the actual damaged tissue as defined within a ring of enhancement, confirming that the target area of tumor/seizures has been adequately destroyed.
In a typical temporal lobe laser case, the surgeon obtains serial MRI scans that demonstrate in real time the laser insertion, the heat map during tissue ablation, and the final damage to the diseased brain structure.
The heat map (yellow) on the computer work station showing the laser ablation, or destruction, of our patient’s brain tumor.
A final T1 weighted contrast enhanced MRI scan showing the clean destruction of our patient’s brain tumor.
Visualase® Neurosurgical Cases
Cumulative Total Number of Neurosurgical Cases as of 11/24/14

Visualase is increasingly being used for tumors and epilepsy by neurosurgeons, with a dramatic expansion in the last few years.
The small Visualase laser can be placed nearly anywhere in the brain, allowing us to treat many different types of brain tumors and brain diseases.
Visualase is a published technology. In epilepsy, Visualase therapy is associated with fewer speech and memory difficulties in contrast to open epilepsy surgery, making it a particularly good option for our patients who do not have the time, money, or resources for inpatient or outpatient rehabilitation.
Our patient had a small incision, less than 1 cm, by the end of his tumor surgery. He felt fine afterwards and went home in good spirits the next day.
References