

MRI-Guided Laser Ablation Surgery for Epilepsy

MRI-guided laser surgery is used to successfully treat a variety of brain abnormalities including hypothalamic hamartoma, tuberous sclerosis, temporal lobe epilepsy, cortical dysplasia, and corpus callosotomy. This technology can target tissue at the speed of light with extraordinary precision. It uses real-time MRI-guided thermal imaging and laser technology to destroy epilepsy-causing lesions in the brain that are too deep inside the brain to safely access with usual neurosurgical methods.

The basic steps of the procedure include:

- After being placed under general anesthesia, a head frame is placed around the patient's skull with a set of markers to best guide Dr. Adelson on a safe path.
- A CT scan is then taken in order to orient the brain to the frame in three dimensions. MRI and CT images are studied by Dr. Adelson to determine the location of the targeted tissue. With the help of computer software, a safe path through the brain is calculated.
- Dr. Adelson then makes an incision and drills a small hole through the skull, only 3.2 millimeters wide. The laser applicator, a tube about the width of a strand of spaghetti, is inserted and guided through the brain into the diseased area. Once inserted into the brain, the head frame is removed and the patient is transported to the MRI scanner.
- After confirming proper placement of the laser applicator, Dr. Adelson uses real-time MRI imaging and performs a small test firing. Once confirmed everything is accurate, the laser is heated to destroy the diseased tissue. Once completed, the applicator is taken out and the scalp is closed with a single stitch.
- The patient is brought to recovery for one night and typically goes home the next day.

The advantages of the MRI-guided laser surgery procedure include:

- A safer, significantly less-invasive alternative to open brain surgery with a craniotomy.
- No hair is removed from the patient's head.
- Only a 3 mm opening is needed for the laser. It is closed with a single suture resulting in less scarring and pain for the patient.
- A reduced risk of complications and a faster recovery time for the patient. Most patients are discharged the day after surgery.

Key Points:

- These procedures are usually done as the first case of the day for Dr. Adelson.
- Patients typically spend 4-8 hours under general anesthesia. The majority of this time is surgical planning and MRI scanning after the laser applicator is placed. The actual ablation itself, when the laser is turned on and tissue is destroyed, only takes minutes.
- After being placed under general anesthesia, a head frame is placed around the patient's skull and the patient heads to MRI to determine the location of the targeted lesion.
- Once the lesion is found on the MRI, the patient then heads up to OR for Dr. Adelson to place the small laser applicator/catheter. This is a 3 millimeter bur hole through which the laser will be inserted to destroy the diseased tissue.
- The head frame is then removed and the patient then heads back to MRI where the actual laser ablation takes place in real-time with the help of computer software.
- After the ablation of the targeted tissue, the laser applicator is then removed in MRI, a single stitch is applied, and the patient goes to PICU (The patient does not go back to OR).
- Patients are usually discharged after 24hrs and have minimal post-op complications or bleeding