

MRI-thermometry Guided Laser Interstitial Thermal Therapy for Recurrent Cerebral Metastases

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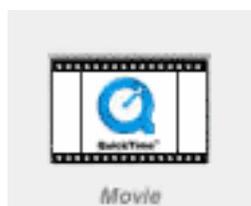
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Introduction

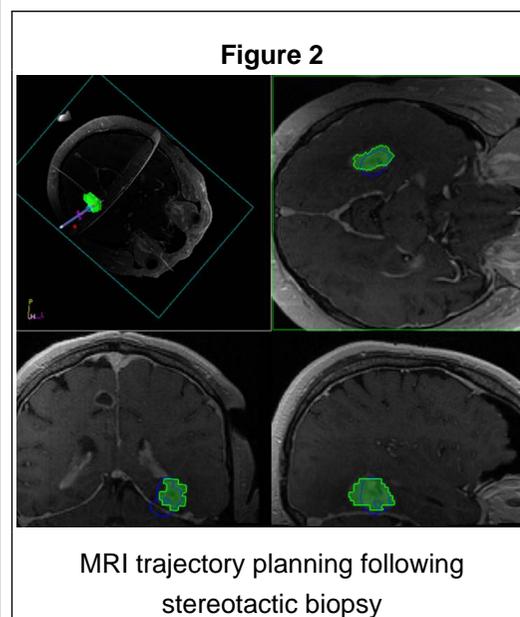
As the lifespan of patients with cerebral metastases improves, recurrence after whole brain radiation and stereotactic radiosurgery is more common. Laser interstitial thermal therapy (LITT) is a new minimally invasive technique that destroys tissue through the administration of heat and can be used to treat lesions in locations undesirable for open surgery. A CO₂-cooled YAG laser that fires perpendicular to the laser-delivery catheter is introduced through a burr hole using stereotactic guidance and used to provide thermal energy to ablate the lesion. LITT is monitored with real-time magnetic resonance imaging (MRI) thermometry and software is available to sum the regions heated sufficiently to achieve thermal ablation (Figure 1).

Figure 1. Video animation of Laser Interstitial Thermal Therapy demonstrating delivery of thermal energy perpendicular to laser probe.



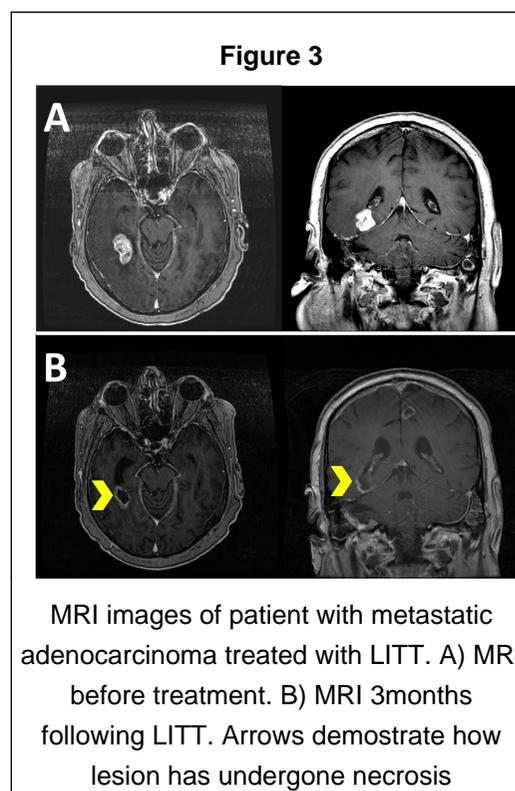
Methods

We describe LITT on five patients with enlarging enhancing lesions at the site of cerebral metastases that had been previously treated with Gamma Knife (GK). Patients were taken to the operating room for fixation of an MRI-compatible guide (Monteris Medical, Axiis) to the skull and a stereotactic brain biopsy. Following the biopsy, patients had LITT to the lesion in the MRI suite (Figure 2).



Results

One biopsy demonstrated metastatic carcinoma. Pathology from four of the five biopsies was consistent with radiation necrosis rather than tumor recurrence. Three patients did well post-treatment without complications. One patient had wound infection requiring readmission. One patient had a hemorrhage at the biopsy site resulting in worsening hemiparesis and aphasia both of which have largely but not completely resolved with therapy. Follow-up imaging shows obliteration of the lesion in all five instances.



Conclusions

LITT is a minimally invasive neurosurgical technique that can be used for the treatment of recurrent brain metastases or radiation necrosis in patients who are poor candidates for conventional surgery because of the location of the lesion.

Learning Objectives

1) Describe the technique of laser thermotherapy and how it can be utilized for treatment of intracranial lesions 2) Compare and contrast the use of laser thermotherapy to other conventional neurosurgical interventions (i.e. surgery, SRS) 3) Discuss treatment algorithms for patients with recurrent cerebral metastases

References

- 1) Ellis TL et al. The role of surgery, radiosurgery and whole brain radiation therapy in the management of patients with metastatic brain tumors. *Int J Surg Oncol*. 2012. epub ahead of print.
- 2) Schulze PC et al. Laser induced thermotherapy of neoplastic lesions in the brain underlying tissue alterations, MRI-monitoring and clinical applicability. *Acta Neurochir*. 2004. 146: 803-12.
- 3) Schwarzmeier HJ et al. MR guided laser induced interstitial thermotherapy of recurrent glioblastoma multiforme: preliminary results in 16 patients. *European Journal of Radiology*. 2006. 59: 208-15.