



Technical note

A novel combination of two minimally invasive surgical techniques in the management of refractory radiation necrosis: Technical note



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ABSTRACT

Background: Minimally-invasive approaches are attractive alternative to standard craniotomy for large intracranial tumors with potentially lesser morbidity. In this report, we describe a sequential combination of two minimally-invasive surgical techniques to treat a large intracranial tumor. **Clinical presentation:** A 49 year-old woman presented with a history of breast cancer and large left parietal metastasis with significant perilesional edema. This was initially managed by whole brain radiation therapy and stereotactic radiosurgery. The patient underwent laser ablation of the tumor followed by internal tumor debulking using an exoscopic-assisted tubular retractor system. Post-operative MRI showed gross total coverage of the tumor by laser ablation and alleviation of mass effect. The patient recovered well and discharged on second postoperative day. **Conclusion:** The minimally-invasive combination of laser ablation followed by internal debulking using a tubular retractor device could be done safely and effectively as a minimally invasive alternative to standard craniotomy for large intracranial tumors.

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1. Introduction

Despite advances in neurosurgical techniques that make management of brain tumors highly safe and effective, there have been concerted efforts towards developing minimally invasive techniques to reduce morbidity associated with a large craniotomy. These techniques consist of cryoablation, radiofrequency ablation, invasive or non-invasive ultrasound, and laser thermal ablation therapy [1–3].

Laser ablation works on the principle of thermal energy induced cell damage and coagulation of pathological tissue [3,4]. Laser ablation have increasingly being used in patients with glioma, metastases and radiation necrosis with satisfactory outcomes [5–8]. However, the inevitable consequence of thermal coagulation is edema and volume expansion with a potential to cause catastrophic intracranial hypertension in patients with large tumors [7,9]. The post ablation swelling is invariably controlled with corticosteroids but may become refractory in certain instances. Thus minimally invasive debulking of post laser ablation tumor mass is conceptually attractive in larger tumors. Such techniques have been described for intra-axial brain tumor and include innovative tubular retractor systems for creating minimal access corridors

[10–15]. These tubular retractor systems help achieve the least possible corticectomy and minimal white matter tract disruption while at the same time providing excellent stereoscopic visualization and application of microsurgical techniques to obtain maximal tumor resection.

We herein describe a novel technique where we sequentially combined two minimally invasive techniques (laser ablation and a tubular access system for tumor debulking) in a patient with a large recurrent brain tumor.

2. Case description

A 49 year old female with a known diagnosis of stage IV breast cancer and prior history of biopsy of left parietal metastasis followed by whole brain radiation therapy and stereotactic radiosurgery (twice) for progressive left parietal lesion. Several months later, she noticed increasing walking difficulties and decline in recent memory. MRI showed increase in size of the treated left parietal tumor which measured 4.1 cm (more than 40 cc volume) with significant perilesional edema and negative perfusion consistent with radiation necrosis (Fig. 1). She was initially treated with high dose corticosteroids with considerable improvement. However, she became steroid dependent. Given her history of multiple cranial radiation treatments and hence increased risk of wound healing, she was selected for a minimally invasive approach in lieu of an open craniotomy. Therefore in conjunction with a biopsy

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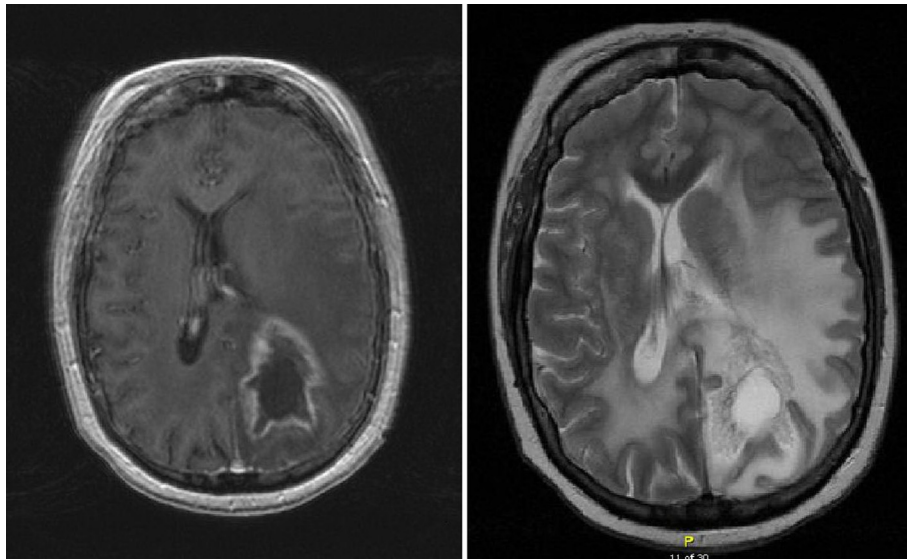


Fig. 1. Preoperative MRI brain (T1W and T2W) showing left parietal tumor with significant perilesional edema.

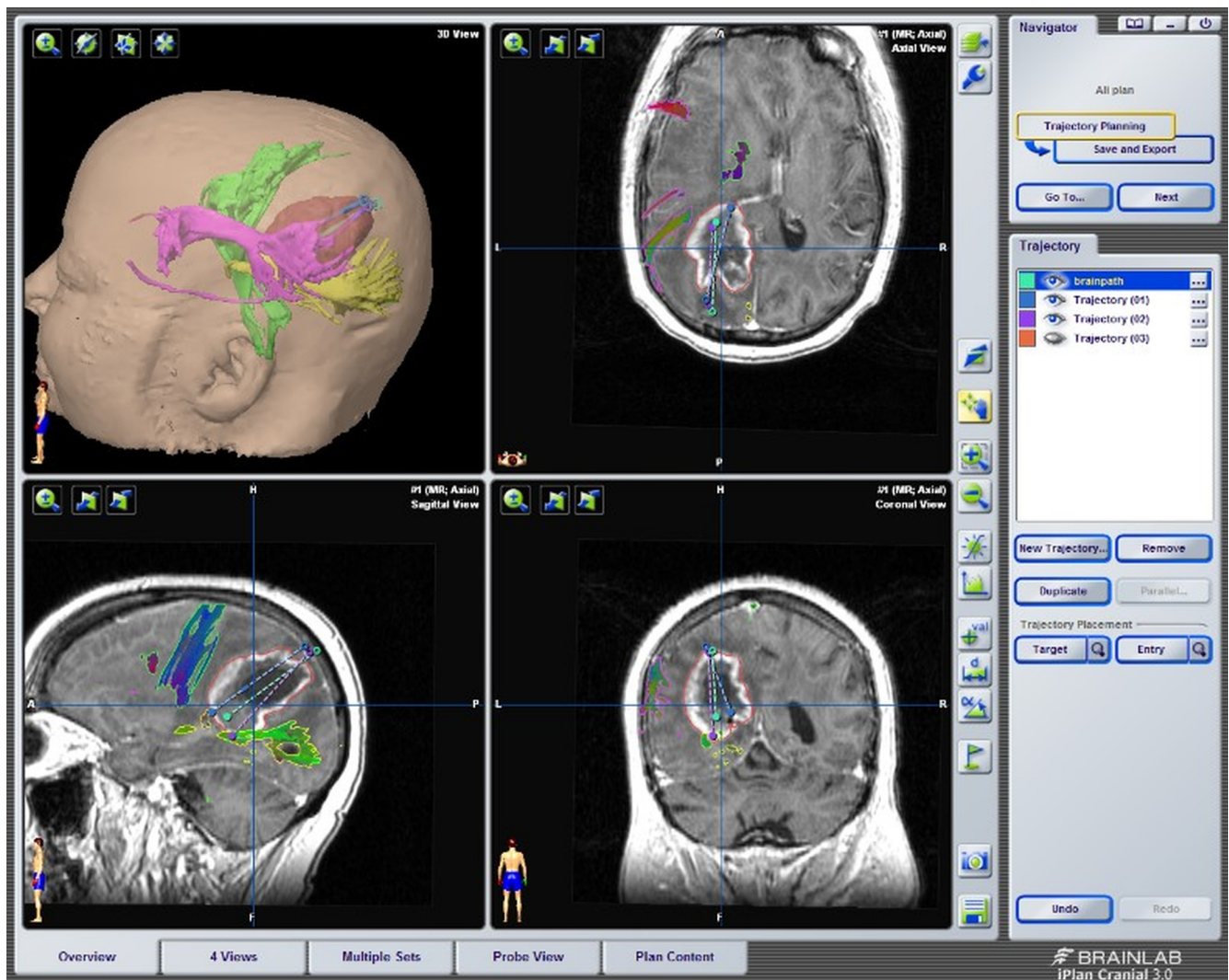


Fig. 2. iPlan™ (Brainlab) screenshot showing trajectories planned for laser ablation (blue and purple) and BrainPath™ (green).

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