

Brain Mapping Assisted Motor Strip Lesions Excision: Series of 3 Cases

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Abstract The excision of lesions around motor strip amounts to profound morbidity in term of neurodeficit in postoperative period. Use of navigation and motor strip mapping, connectome study preoperatively for better surgical outcome are useful tools to minimize the neurodeficit specially in patients who are not a candidate for the awake craniotomy. We present our three patients who underwent brain mapping in the excision and gave good postoperative outcome.

Keywords: brain mapping

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1. Introduction

Brain mapping takes many forms, but maps of all types can be categorized as either structural or functional in nature. Structural mapping reveals aspects of the neural hardware, that is, the anatomical connectivity linking one part of the brain to another part and the principles that apply to the way in which these linkages are ordered. Methods for this type of mapping almost always consist of electrical stimulation of neurons and pathways. The measured output variable may take several different forms, including intracellular potentials, field potentials reflecting underlying synaptic inputs to an area of the brain, extracellularly recorded unit potentials, or electromyographic (EMG) activity. The distinguishing factor in structural mapping is that a part of the system is stimulated electrically or magnetically, and a response, usually in the form of some type of electrical activity, is recorded from another part of the neural circuit.

Unlike structural methods of brain mapping, functional mapping, as the name implies, reveals the spatial representation within the brain of some natural parameter such as touch receptors on the body surface, movement of a body part, the frequency of an auditory stimulus, or the location of a light stimulus in the visual field. Functional mapping involves the orderly localization of natural stimuli or movements to examine organization within a particular brain region.

In our series all three patients underwent structural brain mapping and gave an excellent post-op outcome.

2. Material and Methods

We admitted three patients. In last 6 months 3 patients as per [Table 1](#). Age ranged from 28 yrs to 49 yrs. All were male patients. Presentation ranged from headache, seizures to opposite sides weakness. All patients underwent CT brain followed by MRI brain with spectroscopy sequences. Two patients revealed right sided motor/perimotor strip lesions and one patient had left sided parietal lesion at motor strip. All patients were thoroughly counselled for all risks and benefits of surgery. Once they agreed all were subjected to navigation guided and brain mapping assisted lesion excision.

3. Results

All patients underwent navigation guided craniotomy and after Dural opening the brain mapping was done by applying the electrodes on brain surface and marking of the eloquent areas say hand, leg etc and numbering them. After confirming the areas microsurgical excision of the lesion was done causing minimal handling and damage to the motor strip.

Postoperative period was uneventful. After suture removal once wound healed patient were sent to radiation/medical oncology for further treatment as per histopathology. No increased deficit was noticed after surgery in these patients.

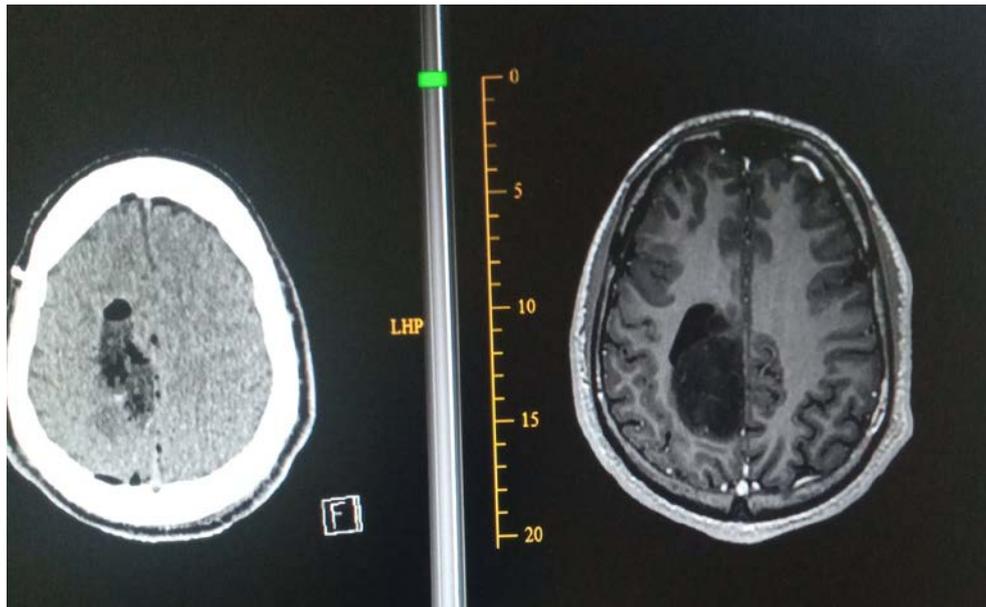


Figure 1. Shows the pre and post operative CT/MRI images of patient with right parietal Glioma

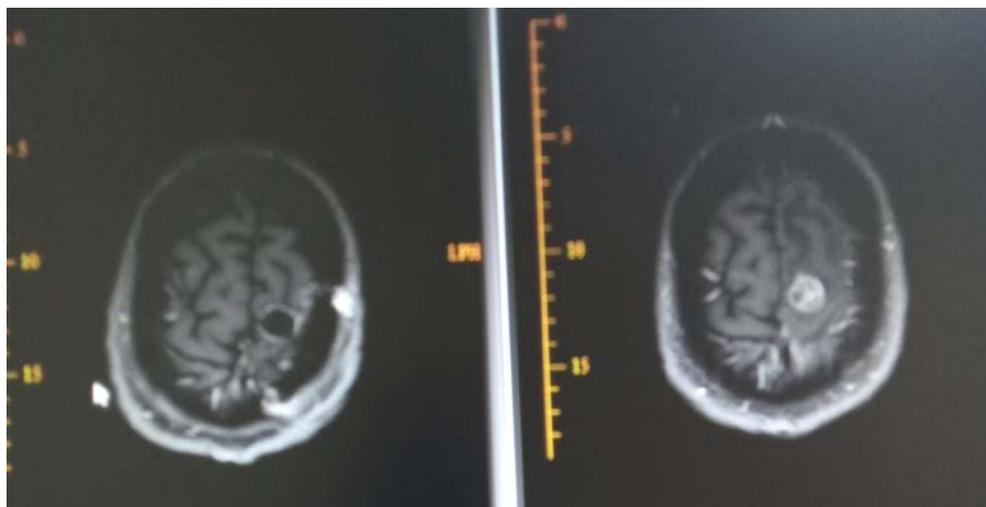


Figure 2. Shows the images of patient with left parietal metastasis

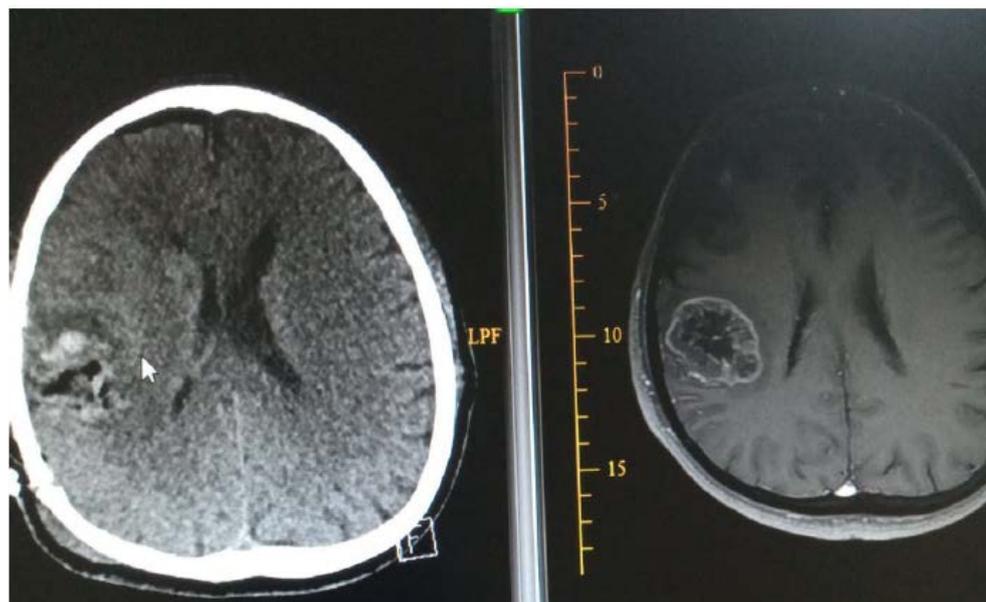
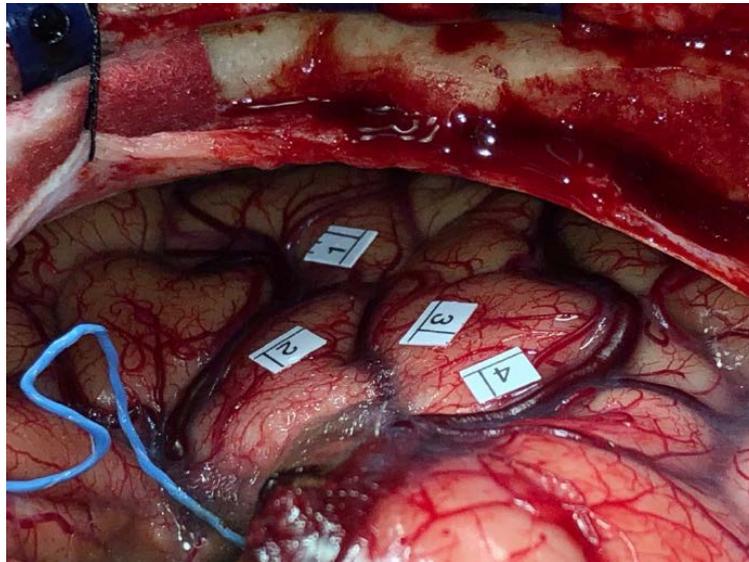
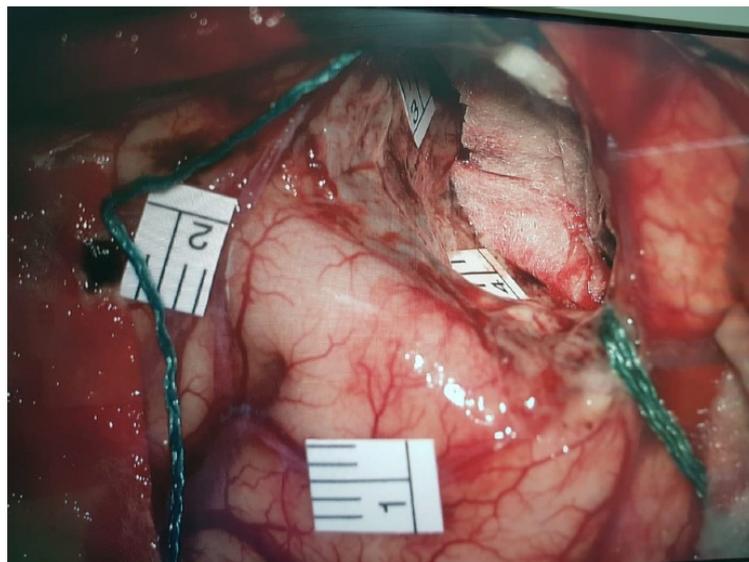


Figure 3. Shows images of the patient with right parietal Glioblastoma

Table 1. List of patients

S.No.	IP no.	Age	Sex	Diagnosis	Histopathology	Surgery	Post op status
1	1049931	47	M	Rt parietal lesion	Glioma	Craniotomy excision	Improved
2	1050719	49	M	lt parital lesion	metastatic adenocarcinoma	Craniotomy excision	Improved
3	749636	28	M	Rt parietal	Glioblastoma	Craniotomy excision	Improved

**Figure 4.** Intraoperative brain mapping of eloquent areas 1 face area, 2 hand area, 3&4 arm and shoulder area**Figure 5.** Intraoperative brain mapping of eloquent areas .

4. Discussion

Sagar S et al in 2018 gave a overview of the functional brain mapping to minimize postoperative deficit [1]. Sobotka SB in 2002 studied the comparison of preoperative PET images and on table image guided surgery with brain mapping and concluded later to be better [2]. Steimier R also in 2002 studied functional images use versus intraoperative brain mapping in low grade gliomas around speech area [3]. Fuji M in 2009 studied intraoperative MRI as a tool to minimize eloquent areas damage in surgery [4]. Yordanova Y N in 2011 studied awake surgery to minimize the postoperative deficit in left sided lesions excision and discussed the term supratotal resection [5]. Duffau H in 2009 studied the functional outcome in 24 patients who underwent brain mapping

assisted eloquent cortex lesion excision [6]. Hart MG studied the feasibility of connectomes study in the patient for a better surgical planning and a good surgical outcome [7].

5. Conclusion

Brain mapping along with navigation is another option for patients not willing or unsuitable for awake craniotomy. And if done properly will give minimal additional deficit to patients with motor area neoplasms. Our patients underwent brain mapping assisted excision of lesions and had no additional neurodeficit asserting the benefits of intraoperative brain mapping.

Hence all the tools discussed above are towards a better post-op outcome minimizing the perioperative morbidities

References

- [1] Sagar S, Rick J, Chandra A, Yagnik G, Aghi MK. Review article Sagar S, et al. *Neurosurg Rev.* 2018. Functional brain mapping: overview of techniques and their application to neurosurgery.
- [2] Sobottka SB, et al. *Comput Aided Surg.* 2002. Comparison of functional brain PET images and intraoperative brain-mapping data using image-guided surgery.
- [3] Steinmeier R, Sobottka SB, Reiss G, Bredow J, Gerber J, Schackert G. *Onkologie.* 2002. Surgery of low-grade gliomas near speech-eloquent regions: brain mapping versus preoperative functional imaging. *Dec; 25(6): 552-7.*
- [4] Fujii M, Wakabayashi T. Image-guided neurosurgery using intraoperative MRI. Review article Fujii M, et al. *Brain Nerve.* 2009.
- [5] Yordanova YN, Moritz-Gasser S, Duffau H. Awake surgery for WHO Grade II gliomas within "noneloquent" areas in the left dominant hemisphere: toward a "supratotal" resection. Clinical article. Yordanova YN, et al. *J Neurosurg.* 2011.
- [6] Duffau H1, Moritz-Gasser S, Gatignol P. Functional outcome after language mapping for insular World Health Organization Grade II gliomas in the dominant hemisphere: experience with 24 patients. Duffau H, et al. *Neurosurg Focus.* 2009.
- [7] Hart MG, Price SJ, Suckling J, Br J *Neurosurg.* Connectome analysis for pre-operative brain mapping in neurosurgery. 2016 Oct; 30(5): 506-17. Epub 2016 Jul 22.



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