

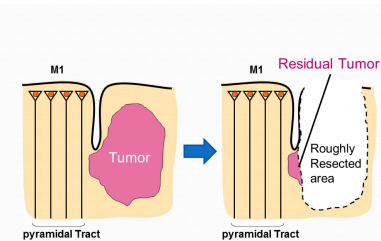
Introduction

The preservation of motor tract in glioma surgery is an essential issue to maintain the patients’ quality of life. Information from DTI in neuronavigation image is not reliable due to brain edema and intraoperative brain shift. The best way to recognize the under-passing motor tract is real-time intraoperative neurophysiological identification of motor fibers.

Methods

An electrode (NY Tract Finder) designed for navigation-assisted detection of motor tract in cerebral white matter, was used during the resection of 40 gliomas adjacent to motor tract. Multiple plastic needle sheaths were placed to track the motor fibers for surgical guidance after subcortical mapping (Pile Driving Technique). Neuronavigational information was used to determine the inserting direction but not the depth.

Glioma extending to Motor tract

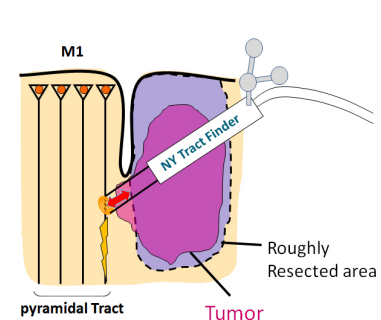


NY Tract Finder in combination with Navigation system



Bipolar needle electrode "NY Tract Finder" has a scale.

Recognition of Neural tracts by NY Tract Finder

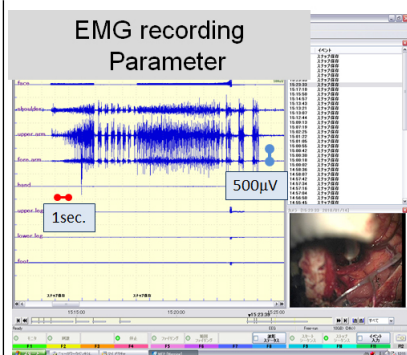


The deeply existing pyramidal tract can be electrically identified before injuring by excess removal.

Results

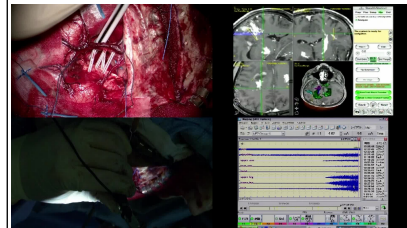
The tracking of motor fibers was practicable in surgical field. Inserted plastic tubes enabled the recognition of under-passing motor pathways even if they were not exposed. This method could guide safe resection of tumors without the injury of functioning motor fibers. No postoperative neurological deterioration occurred.

Monitoring Display showing muscle-MEP by pyramidal tract stimulation with minimal electical current



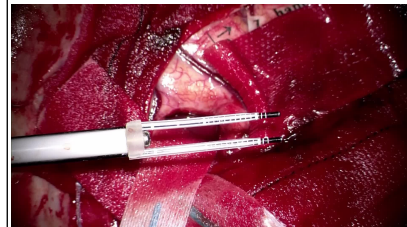
Step-down of electrical current can bring the tip of electrode in the closest proximity of neural tract.

Detection of Motor Tract



Characteristic m-MEP reactions by electrical stimulations at pyramidal tract

Plastic tube installed onto electrode for Pile Driving Technique

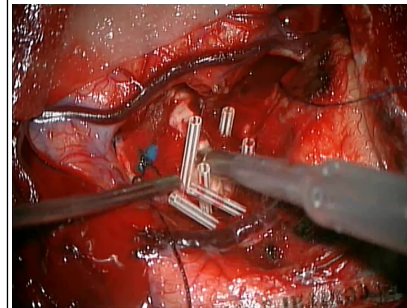


5mm-shorter tube for safety margin of resection. Only tubes are left after identification of Motor Tract.

Conclusions

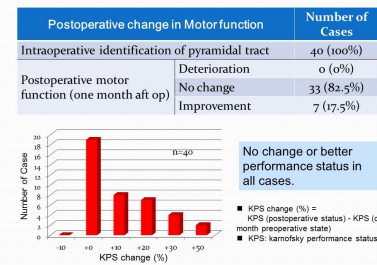
Three-dimensional Recognition of Neural Tracts is feasible by this method. Safe tumor resections result in protecting Patients’ Quality of Life and Medical Safety for Brain Tumor Surgery.

Pile Driving Technique



Safe resection of tumors can be performed without stepping into pyramidal tracts.

Functional outcome of the patients after Pile Driving Technique



Learning Objectives

Audience will learn the technique of intraoperative recognition of neural tracts and the importance of neurological preservation for patient's quality of life and medical safety.

References

1. Yamaguchi F, et al. J Neurooncol (2009) 93:121–5.
2. Yamaguchi F, et al. J Clin Neurosci (2007) 14:1106–10.