

Navigated Transcranial Magnetic Stimulation in Clinical Practice and Research

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Abstract— Navigated transcranial magnetic stimulation (nTMS) enables precise targeting of the induced electric field to selected cortical targets found by alignment of the head with a 3-D model of the subject's brain. This is particularly important in studies of neurological patients as some neurological diseases, such as brain tumors or strokes, may modify the brain anatomy and function so that the external skull landmarks are not any more aligned with the brain structures as expected.

Keywords— *nTMS, brain tumors, epilepsy, stroke, chronic pain*

I. INTRODUCTION

Comparison with nTMS localization of motor cortex to findings in direct cortical stimulation (DCS) during surgery

have found 4-10 mm differences between functional maps obtained by the two methods. Preoperative nTMS mapping is associated with smaller craniotomies and more extensive resections of tumors. Mapping of speech areas with nTMS during videoed object naming is less specific but more sensitive than DCS and produces reliable "negative" maps: if speech nTMS does not find active sites from the area to be resected, DCS findings are highly improbable as well. The first study of clinical impact infers that speech nTMS is associated with smaller craniotomies and less postoperative speech dysfunctions. Navigation appears also useful in precise selection of cortical targets in stroke rehabilitation and pain amelioration by nTMS, but verification of these findings requires larger patient populations.