

# Incidence and anatomical correlation of speech disturbances induced by navigated transcranial magnetic stimulation in brain tumour patients

Judith Rösler; Birat Niraula; Valerie Strack; Peter Vajkoczy MD; Thomas Picht MD

Dept. of Neurosurgery

Charité - Universitaetsmedizin Berlin, Germany



## Introduction

Transcranial Magnetic Stimulation (TMS) has been validated as a reliable method for preoperative identification of essential motor sites. Recently, TMS helps to locate the speech eloquent areas of the brain in patients with tumours in the perisylvian regions and aids to justify as well as prepare for their forthcoming awake operations. Further more, the cortical stimulation of the brain through TMS, helps in categorizing the different object naming errors performed during the stimulation and in judging the respective neuroanatomical correlates as well as its cortical localisation.

## Methods

20 Patients suffering from tumors of the dominant perisylvian cortex which were not eligible for awake surgery underwent cortical language mapping with the help of navigated repetitive TMS. Resting Motor Threshold (RMT) for the dominant hemisphere was defined, patients were shown photos of different objects, a baseline naming of objects without stimulation was evaluated and patients were told to name the respective objects during the stimulation. Intensity between 80-120% of RMT and frequency between 5-10Hz with 1sec trains were varied. Different language errors performed by the patients were categorized as: speech arrest, performance, phonological, semantic and neologism.

## Results

Altogether 3826 stimulations were performed and 788 errors were noted (20.6%). Among the five gyri stimulated, the error distribution, along with the total number of stimulation were: inferior frontal gyrus 136/754, precentral gyrus 270/1216, postcentral gyrus 146/846, supramarginal gyrus 94/450 and superior temporal gyrus 142/560. 146 speech arrests (including anomia), 196 performance, 52 phonological, 360 semantic and 34 neologism were altogether seen. The individual maps of language representation were taken into account during surgical planning.

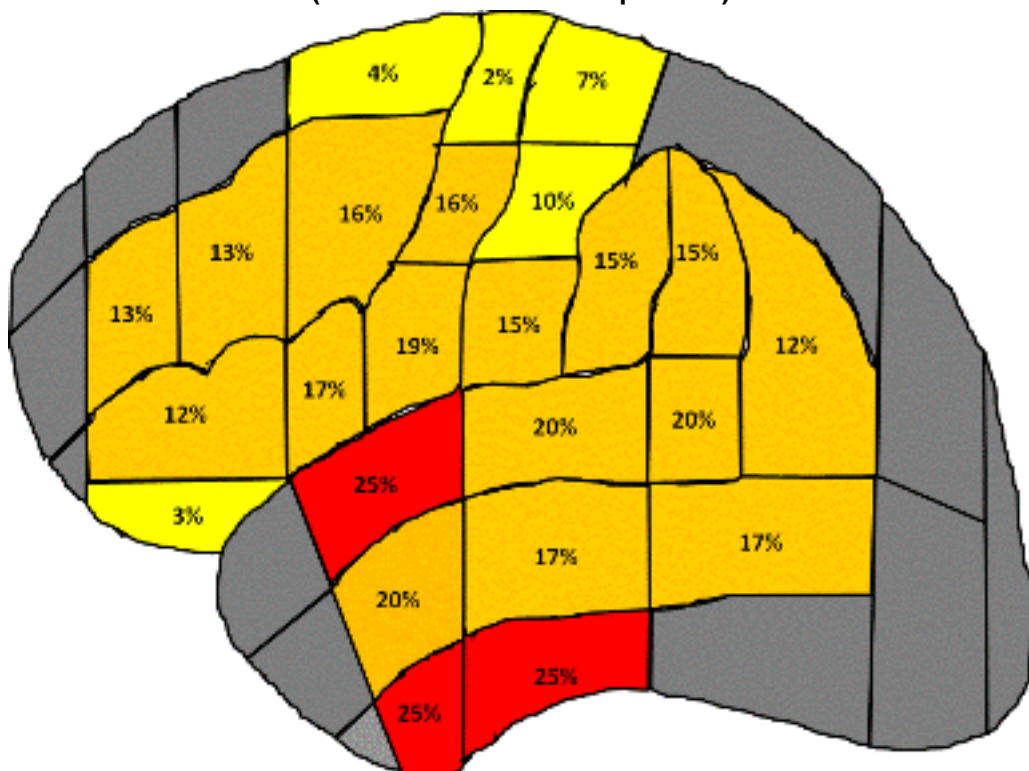
## Conclusions

TMS can be generally used to specify the language dominant hemisphere and to categorize different language errors by the patients with tumours in the perisylvian region of the dominant hemisphere. The validation of this method is yet to be fully proved and its specification still underlies the direct cortical stimulation.

## Learning Objectives

By the proposed abstract, participants will be motivated to use non-invasive means for mapping of the language cortex in patients not eligible for awake surgery which otherwise might not be operated at all.

Relative Distribution of TMS Induced Errors: All Categories  
(3826 stimulations in 20 patients)



Relative Distribution of TMS Induced Errors: Speech Arrest

