

# Subcortical Mapping: Correlation Between Stimulation Intensity and Distance to the Corticospinal Tract

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## Introduction

Subcortical stimulation is a method to evaluate the distance from the stimulation site to the motor tract (CST) and to decide whether a resection should be terminated. It is believed that each 1mA of stimulation intensity needed to elicit a MEP response corresponds to 1 mm distance from the CST. However, this assumption has not been properly substantiated.

## Methods

Monopolar subcortical stimulation was performed in addition to continuous MEP monitoring in 37 consecutive patients with a motor-eloquent lesion (25 HGG, 5 LGG, 5 metastasis, 2 AVM).

The functional boundaries of the resection were identified with the help of subcortical stimulation.

At the end of the resection, the point at which a MEP response was still elicitable with minimal stimulation intensity was marked with a titanium clip.

The intensities at this point for different stimulation variants were documented using:

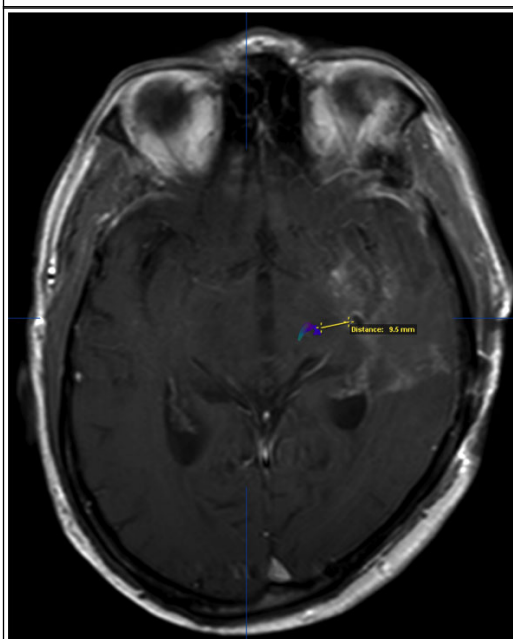
- i) cathodal or anodal stimulation
- ii) 0.3, 0.5 and 0.7 ms pulse width.

The distance between the CST (based on the postoperative DTI data) and the titanium clip was measured.

The distance is blotted against the current intensity ( mA x ms ).



The monopolar probe is mounted on the Mayfield clamp to avoid movement during stimulation



The Distance between the CST and the Titanium clip ist mesured

## Results

One Patient with a postoperative bleed and displacement of the titanium clip was excluded.

Current intensity ( mA x ms) was blotted against the mesured distance between the CST and the titanium clip.

Regression Analysis revield a non-linear correlation.

Anodal Stimulation :

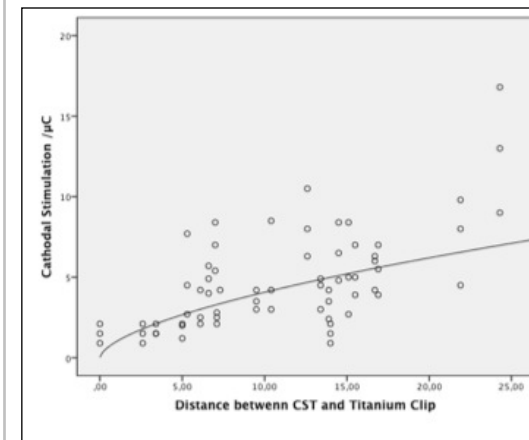
$$\text{Current} = \text{Distance}^{**}0,709; R2= 0,865$$

Cathodal Stimulation :

$$\text{Current} = \text{Distance}^{**}0,606; R2= 0,889$$

There were no cases with a permanent new postoperative neurological Deficit. A transient new postoperative deficit was seen in 14 % (N= 5/36) of cases.

Gross total resection was achieved in 75% (N= 27/36). Subtotal resection (all > 80% of tumor) was achieved in 25% (N=9/36) of cases, 8 HGG and one insular LGG.



## Conclusions

The subcortical stimulation is an excellent intraoperative method to determine the distance to the CST during resection of motor eloquent lesions. This should minimize the risk of injuring the CST. There is a non-linear correlation between stimulation current and the distance to the CST. Cathodal stimulation seems better suited than anodal stimulation.

