Deterministic clinical tractography is highly accurate in the vicinity of eloquent gliomas: a study by IONM and elastic fusion based on intraoperative MRI data

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Background
Intraoperative neuromonitoring (IONM) is the gold standard technique for a safe resection of motor eloquent gliomas. To get an impression of the corticospinal tract (CST), diffusion tensor imaging fiber tracking (DTI FT) can be used. The study evaluates the correlation of IONM and DTI FT with the postoperative motor outcome by intraoperative magnetic resonance imaging (iMRI)-based elastic fusion (IBEF).

Methods
Of 154 patients with motor eloquent gliomas between July 2018 and July 2019, we performed a matched-pair analysis of five patients with (A) and without (B) an intraoperative amplitude loss of motor evoked potential (MEP) monitoring during resection, respectively. Preoperatively, we performed DTI FT of the CST in all patients. Intraoperatively, we performed an IBEF, which enables to adjust preoperative fiber objects to new conditions such as brain shift and resection cavity.

Results
After correction by IBEF, the CST was located within ischemic regions as shown by iMRI in all cases of group A and in no patient of group B.

Conclusion
Based on the visualization of subcortical pathways after IBEF, the present matched-pair analysis approves the reliability of DTI FT of the CST by its correlation to IONM and the postoperative clinical status of patients. The results prove the relevance of applying IBEF with the aim of adjusting preoperatively determined subcortical fiber objects.