Validation of Pre- and Intraoperative Image Fusion

Ille et al. (2021), in *Cancers*

Products
Elements Virtual iMRI, Elements Fibertracking

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Clinical Background
Treatment of eloquent brain tumors requires the maximum possible extent of resection (EOR) while preserving functions such as speech and motor function. Therefore, fiber tracts are visualized by nTMS based tractography (Elements Fibertracking) to adjust the subsequent resection strategy. However, preoperative tractography loses its accuracy as surgery progresses due to brainshift. Since rigid fusion with intraoperative MR data can cause spatial inaccuracies, elastic fusion (Elements Virtual iMRI) might be the means of choice.

Study Objective
The aim of the study was to evaluate whether Elements Virtual iMRI based on intraoperative MRI can appropriately update fiber tracts by compensating for brainshift in glioma resection.

N = 78 patients harboring eloquent gliomas, prospective cohort study

Results
- By applying Elements Virtual iMRI, the tract to cavity distance 5.0 ± 2.9 mm is correlated with no new surgery-related motor deficits whereas the distance 1.1 ± 1.6 mm is correlated with new permanent surgery-related motor deficits postoperatively ($p < 0.001$)
- By applying Elements Virtual iMRI, the tract to cavity distance 3.1 ± 4.5 mm is correlated with no new surgery-related language deficits whereas the distance 0.7 ± 1.2 mm is correlated with new permanent surgery-related language deficits postoperatively ($p = 0.541$)

Summary
- Elements Virtual iMRI supports surgical decision making with regards to the extent of resection by reliably updating preoperative image and functional data through brain shift compensation
- Elements Virtual iMRI supports risk assessment of the postoperative functional deficit rate by intraoperatively updating the spatial lesion-to-tract differences
- Elements Virtual iMRI appropriately and reliably updates fiber tracts during surgical procedures

Source: Ille et al. (2021): DOI 10.3390/cancers13081787, in *Cancers*, 13(8)