



# Intraoperative Update of Residual Tumor Volume Without Additional Imaging: A New Software Tool for Skull Base Surgery

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## Introduction

Especially in benign skull base tumors, the concept of deliberately left remnants in order to maintain functional integrity has been shown to be associated with tumor control rates comparable to more aggressive approaches. To optimize the combination of microsurgery and focal irradiation, a software tool has been developed to update the information about the residual tumor volume during the process of surgery and to concomitantly calculate appropriate treatment plans for radiotherapy/stereotactic radiosurgery. Purpose of this study was to validate this software with intra-and postoperative imaging.

## Methods

In this pilot study a navigated tool was prospectively used to register the resection cavity of skull base tumors and to update online the residual tumor volume during surgical resection. Preoperatively, the entire tumor volume, anticipated residual tumor volume and risk structures were segmented on MRI. The intraoperatively simulated residual tumor mass was visualized, quantified, and correlated with results from CT and MRI as primary end point. Secondary end point was the surgeons' impression of the usefulness for intraoperative decision making.

## Results

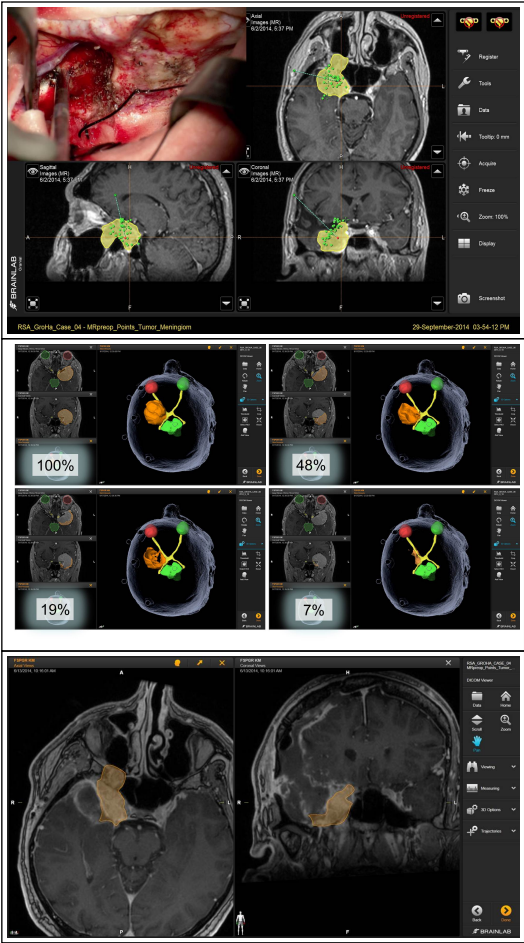
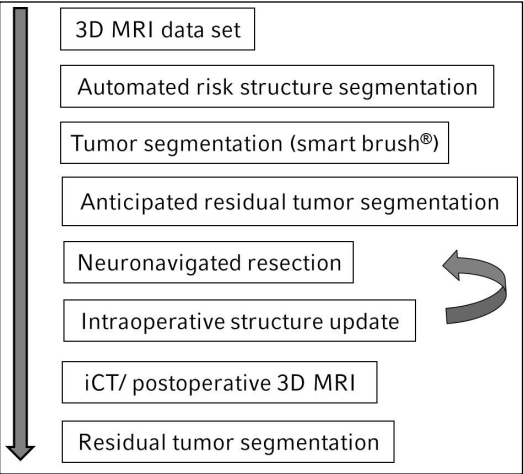
11 patients (6 male,; mean age: 53.3 years) were included (10x skull base meningioma 1 x chondrosarcoma of the petrous bone). Segmentation of objects took 12 min/patient (mean). Extent of resection was virtually determined during resection between 2 and 9 times. Complete resection was achieved in 1 patient, and 65% to 83% tumor removal in the remainder. Correlation with postoperative imaging (pMRI in all patients plus intraoperative CT in 3 patients) showed good accordance with simulated residual tumor tissues (mean conformity index of 1.2).

## Conclusions

The software is easy to use, offers accurate information about residual tumor volume and can be integrated smoothly into the surgical work-flow. These data can be integrated into online calculation of appropriate treatment plans for radiotherapy/stereotactic radiosurgery.

## Learning Objectives

By conclusion of the session, participants should be able to: 1) understand the problems and pitfalls of intraoperative update of residual tumor volume 2) discuss the concept of combining microsurgery and radiosurgery 3) Identify the role of computer assisted planning in skull base surgery.



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