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New Procedure to Make Brain Surgery Safer

To increase patient safety in clinical practice and minimise risks and damage that may arise during surgery, computer support and digital medical imaging are key technologies. Before brain operations, neurosurgeons can now evaluate patient-specific surgical risks, achieve increased safety, and avoid unacceptable risks.

Brain interventions must be planned so that the neurosurgeon can access and remove the tumour without causing unnecessary damage. The Fraunhofer MEVIS Institute for Medical Image Computing in Bremen, Germany has pioneered a procedure that analyses uncertainty in patient-specific images, modeling, and reconstruction and incorporates this information into reconstructions of patient data. This procedure allows safety margins around nerve tracts in the brain to be more accurately determined. In addition, the reliability of the reconstructed data is calculated to supply the surgeon with accurate information concerning nerve tract locations, paths, and intersections and to construct safety margins around the nerve fiber tracts. By integrating errors in measurement, reconstruction, and modeling, the exact locations of tracts in a space-occupying tumour are calculated. This gives the neurosurgeon a reliable prognosis concerning where the incision in the brain should be made and which safety margins should be chosen to avoid harming nerve tracts and irreversibly damaging important functional areas. Before an intervention, the surgeon can evaluate patient-specific risks. These software assistants will be refined and implemented for neuronavigation in future operations, providing the surgeon with updated information during surgery that can be compared to planning data.

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