

The aim of the current PhD thesis is to verify the accuracy and applicability of the software packages OsiriX and Horos as a mean of preoperative planning in cranial neurosurgery. For the purpose the accuracy of the measurements taken in the program, using comparative data of real anatomical measurements as well as a literature review was done. A fast and effective method for preoperative planning and 3D simulation was done, which is applicable in different areas of neurosurgery, including neurooncology, vascular neurosurgery, neurotraumatology, reconstructive operations and planning in rare cases where three dimensional planning is essential for the success of surgery (for example basilar invagination). A whole algorithm for the planning and simulation of the neurosurgical position, skin incision, localization and marking of the projection of the lesions over the cranium, simulation of the surgical trajectory to deep seated lesions, simulation of craniotomies (standard and more complex). This algorithm is applied to 232 cases. By this was the possibility of creating a preoperative mental image of the each step of the operation was essential, therefore the surgeon can enter surgery with much more clear concept of the individual normal and pathological anatomy of the patient.

Moreover a technique using virtual reality technology for intraoperative control of the software, during the operation, without touching the trackpad or keyboard of the computer was implemented.

Another aspect of the PhD was development of an algorithm allowing export of the data from OsiriX software to one for 3D printing, allowing 3D printing of the models in OsiriX, bases on the DICOM images.

The whole purpose of the dissertation is to comply with the principles of open source and easy access to technology, which allows potential easy replication of the methods by other authors. The results were analyzed prospectively, published and presented and showed the advantages and disadvantages of the method.