

EDITORIAL

The usefulness of a navigation system in endoscopic surgery in and through the nose

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Neuronavigation is a neologism used to describe the set of computer-assisted technologies used by neurosurgeons to guide or “navigate” within the confines of the skull or vertebral column during surgery. The term is also used, in a more universal sense, outside the field of neurosurgery, in areas of medicine such as otorhinolaryngology (ENT), orthopedics, general surgery and urology, with similar purposes in different anatomical areas.

Computer-assisted neurosurgery enables precise projection of high-resolution data from imaging studies [computed tomography (CT) and/or magnetic resonance imaging (MRI)] onto the operative field, thus defining anatomical landmarks, pathological changes and their margins. To achieve this, multiple image-guiding or computer-aided systems – that is, neuronavigation – enabling precise spatial targeting, were constructed.

Various types of localization systems are recently used to navigate through and between tangled anatomical structures in paranasal and skull base regions.

Endoscopic surgery gained an outstanding development. Regions like the skull base, the clivus, the middle and posterior cranial fossae, the orbit and lachrymal pathways together with the pterygopalatine and infratemporal regions are much easier and safer assessed with the virtual time imaging machines. It completes a fine surgical procedure in areas with important vascular and nervous structures.

Revision endoscopic sinus surgery cases can benefit from this tool, due to the fact that sometimes there are no landmarks after the previous operations and the surgeon should work in fibrous tissue. Approaching tumors of the skull base is also an important indica-

tion for the navigation systems to be used, as the surgeon can control the proximity of the dura, optic nerve or internal carotid artery.

Moreover, the transnasal surgery for endocranial pathology, clivus tumors or posterior fossa tumors is safer in the presence of the navigation systems. It allows a precise localization of the instruments and it increases the quality of the dissection.

According to our experience, the accuracy of registration performed using an electromagnetic neuronavigation system, expressed as registration error, ranged from 0.7 mm to 4.4 mm. The imaging modality (MRI or CT) used to construct a three-dimensional model of the patient’s head, or registration of more than 6 landmarks, did not affect the registration accuracy.

Even in ordinary cases of endoscopic sinus surgery, the system could be useful for the beginners in order to have continuous control of the ethmoidal arteries region, the skull base and olfactory region and, of course, the optic nerve and ICA. In addition, for the frontal recess region, the system is valuable for tailoring the surgery and dealing with the anatomic variations of the agger nasi or Kuhn’s cells.

The preoperative planning and the calibration are essential for the accuracy of the procedure.

The operatory time is increased and the system is expensive but, due to the reduced risk of complications and postoperative follow-up, it’s important to achieve skills in manipulating such a device. And, of course, it is important to convince the management of the hospital that an expensive tool will create a good cost-efficiency rapport in time.