curac2004
3. Jahrestagung der Deutschen Gesellschaft für Computer- und Roboterassistierte Chirurgie e.V.

Magnetisch geführte Neuronavigation bei transsphenoidaler Resektion von Hypophysenadenomen

Magnetic guided neuronavigation in transsphenoidal surgery of pituitary adenomas

Christian Schichor[1], Uhl[2], Schöller[2], Tonn[2], Witte[3]

[1]Neurochirurgische Klinik, Ludwig-Maximilians-Universität München Großhadern
[2]Neurochirurgie Univ. München Großhadern
[3]Brainlab AG Heimstetten

Objective

Integration of neuronavigation in transsphenoidal surgery can help to avoid intraoperative misdirection especially in re-operations and patients with anatomical variants by providing more accuracy in approaching sellar structures. Disadvantages of current optical tracking systems are the so-called „line-of-sight" problem, since optical sensors can get hidden by drapes or by the surgical microscope, and rigid pin-fixation of the patient`s head. Aim of this study was to evaluate the potential to avoid these problems and the accuracy of a newly developed magnetic tracking system in patients with transsphenoidal surgery for pituitary tumors. The pointer of the system is a flexible stylet whose distal tip is tracked. Rigid pin-fixation of the patients head was unnecessary as an magnetic reference–sensor was fixed to the patient`s head.

Methods

The sensor (4 mm magnetic coil, diameter 0.95 mm) of the flexible 30 cm stylet, placed at the tip of the instrument, was tracked by a 3D magnetic system (AURORA Tracking System, Northern Digital Inc controller®), based on a Kolibri® (Brainlab AG, Munich) Image Guidance System. During surgery the accuracy of the magnetic tracking system was controlled by bony landmarks (vomer, sphenoid sinus, sella) that could be easily recognized visually or radiologically. 12 patients with transsphenoidal surgery for tumors of the pituitary gland were included. Possible intraoperative magnetic fields and metallic instruments were tested for their influence on the navigation system.

Results

In cadaver tests, the accuracy of the system was similar to optical tracking systems (which only track the proximal end of the probe). But tracking the sensor at the tip of the flexible instrument also enabled the system to guide anatomical points which would not have been assessed by rigid optical tracking systems. The influence of magnetic fields and metallic instruments in the operating theatre was low and could be easily avoided by enlarging the distance between tracking magnet and larger magnetic parts. In 12 patients with pituitary tumors the accuracy of the neuronavigation was estimated below 4mm. During the initial phase of our study, in 4 patients the system showed disturbances due to magnetic parts within the tracked volume, resulting in a accuracy worse than 4 mm. This could by avoided by modifying the operative setup (learning curve of the operating team). In all patients, whose head were not fixed in a rigid mayfield pin fixation, accuracy of the system was maintained.

Conclusion

Magnetic tracking of the tip of the stylet is a reliable method, applied during endonasal transsphenoidal surgery. The magnetic guided Neuronavigation is a valuable addition to the armamentarium of navigational systems existing so far.