

## **Computergestützte virtuelle Planung und navigationsgeführte Reposition von Jochbeinfrakturen**

### **Computer-assisted virtual planning and intraoperative surgical navigation for treatment of complex orbitozygomaticomaxillary fractures**

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#### **Introduction**

Skeletal healing of displaced zygomatic bone fragments after insufficient fracture reduction results in an inadequate projection of the zygomatic body and thus facial asymmetry. Accurate assessment of the position of the zygomatic bone in relation to the cranial base posteriorly and the midface anteriorly is the key to the acute repair of midfacial fractures as secondary reconstruction of posttraumatic deformities of the orbitozygomaticomaxillary complex remains a major surgical challenge.

**Material and Methods:** Noncomparative series of 10 consecutive patients with zygomatic fractures were scheduled for virtual reality-planning and image-guided repositioning by use of a wireless passive infrared surgical navigation system (VectorVision™, BrainLAB). The preoperative high-resolution computed tomography (CT, Siemens Somatom Sensation 16) data was obtained before surgery. Using special software facilities, bone fragments were segmented and the fracture site was reduced virtually. This pre-planned virtual reality was transferred into the operating room using navigational guidance. Patient-to-image registration was performed using surface scanning with a class I laser device called *\_z-touch™*. The intraoperative accuracy was visually checked with identification of anatomical landmarks.

## Results

In all cases a safe anatomic approach to the zygomatic fracture using preoperative virtual reality planning was possible. Preoperative virtual fracture reduction allowed a precise anatomic repositioning of the zygomatic segment. Fixation was performed using miniplates and screws. Postoperative X-ray revealed an accurate anatomy in all patients and there was no requirement for secondary corrections.

**Conclusion:** Image-data-based virtual planning and navigation-assisted zygomatic trauma surgery provides effective treatment options.

Despite a few limitations, we believe that, with improved tools and further refinements anatomical midfacial fracture repositioning can be performed less invasive. Further steps of virtual treatment planning include craniofacial osteotomy planning facilities.