A Multi-Center Experience with Image-Guided Surgical Navigation in Complex Craniomaxillofacial Surgery: Should it be the New Standard of Care

Todd E Thurston M.D., M.S.M.¹, Brian T. Andrews, M.D.¹, Neil Tanna, M.D., M.B.A.², P. Niclas Broer, M.D.², Jamie P. Levine, M.D.², James P. Bradley, M.D.³

¹University of Kansas Medical Center, Kansas City, KS, USA
²New York University, New York, NY, USA
³University of California, Los Angeles, CA, USA

Abstract

Purpose: CT image-guided surgical navigation is used by many specialties to reduce complications and improve surgical outcomes. Its use has become standard of care for many complicated procedures in both Neurosurgery and Otolaryngology. The authors hypothesize that CT image-guided surgical navigation has a wide scope of utility in craniomaxillofacial surgery. With time and experience, its use will reduce peri-operative complications and may become standard of care in craniomaxillofacial surgery as well.

Methods: A multi-center retrospective review was performed. All craniomaxillofacial procedures utilizing CT image-guided surgical navigation were included over a ten year period. A chart review was performed. Intra-operatively, accuracy of CT image-guidance was evaluated by comparing visualized anatomic landmarks to those reported by the navigation system.

Results: Twenty-three patients were identified who underwent a total of 31 CT-guided navigation procedures involving upper (n=3), middle (n=12), and lower (n=6) facial reconstructions. Imaged-guided surgical navigation was used for pan-facial reconstruction in 2 cases. Upper facial reconstruction procedures included a skull base surgery and two cases of frontal sinus/forehead reconstruction. Mid-facial procedures included eight orbit fracture reconstructions, two cases of bilateral orbit and midface reconstruction for Treacher Collins syndrome, one case of enophthalmos repair, and one case of orbital neurofibroma excision and orbital box osteotomy. Lower facial procedures entailed four cases of bilateral temporomandibular joint bony ankylosis release and two cases of condylar reconstruction in mandibular hypoplasia. In all procedures, the image-guidance system correctly identified the surgical anatomy to less than 2 mm. Patient follow-up demonstrated no complications and no revisionary procedures to date with all patients at least six months post-op.

Conclusion: CT-guided navigation is a safe and effective tool with multiple applications in craniomaxillofacial surgery. Further experience will expand its clinical utility in craniofacial surgery. With time, its utilization may become standard of care in selected complex craniofacial procedures.

Disclosure/Financial Support:

None of the authors received financial support for the research presented in this manuscript. None of the authors has a financial interest in any of the products or devices mentioned in this manuscript.