

Abstract Text:

Traumatic craniofacial injuries often present as difficult reconstructive challenges for plastic surgeons. In cases of severe facial trauma, restoration of the normal facial width, facial height, and sagittal projection may not be easily achieved. Furthermore, marked swelling accompanying facial trauma may limit the surgeons' ability to palpate and recognize subtle bony defects and malalignment.

Our group has recently employed a novel technique of *virtual 3D surgery* to overcome limitations associated with conventional approaches to craniofacial trauma. Using standard 3D CT data sets uploaded onto an interactive web-based software program, we first perform 'virtual 3D-surgery on the craniofacial skeleton in order to properly align displaced bony fragments. Intraoperative jigs/splints are then manufactured that are used intraoperatively to achieve the desired reduction. Reduction jigs have been designed to fit along various anatomic areas based on stable segments (for example, the frontal bar or temporal-zygomatic area).

To date we have performed this technique on 6 trauma patients. Cases in which this technology has proven beneficial include a variety of injury patterns, including complex midface (combined Lefort I/II/III), NOE complex, comminuted mandible, and panfacial trauma. In addition to the use of jigs to align bony segments, additional templates have been generated via virtual planning. These have included optimized alloplastic implants (i.e. cranioplasty) as well as templates for harvesting and shaping of autologous bone grafts.

Virtual Surgery offers several advantages when used for maxillofacial trauma reconstruction, including the ability to (1) visualize and reduce bony fragments in their proper 3D alignment through computer-aided design, (2) fabrication of surgical jigs that can be applied intra-operatively to aid in bony alignment, and (3) the manufacture of autologous and/or alloplastic implants to be used for operative fixation. We believe this technology yields more precise reconstructive results and allows for more precise surgical intervention than the traditional approaches used in craniomaxillofacial reconstruction.