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COMBINING THE USE OF ARTIFICIAL INTELLIGENCE (AI) AND 3D PRINTING TO ACHIEVE ACCURACY IN REDUCTION AND STABILIZATION OF COMPLEX CRANIOMAXILLOFACIAL FRACTURES

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The surgical management of complex facial fractures is challenging and time consuming. Author highlights the benefits of combining AI and 3D printing to achieve optimal surgical outcomes, reduce operating time, and improve patient satisfaction. They present a workflow for using AI and 3D planning in the management of complex facial fractures. Literature related to AI applications in the field of craniofacial surgery, virtual surgical planning and 3D printing were reviewed. The team was completed multiple complex craniofacial trauma reconstruction cases using the proposed workflow. In all cases, 1mm thick CT scans were obtained and virtual reduction of fractured segments was completed in three dimensions. Based on this analysis, stereolithographic splints were then 3D printed and inserted intraoperatively. In a second case, custom-made fixation plates were fabricated. The same protocol was used in a third case to fabricate a custom prosthesis to replace severely comminuted bony segments. Post-operative CT scans were then obtained to evaluate accuracy of bony reduction. AI and 3D printing facilitated the fabrication of intraoperative and postoperative splints which modelled the desired outcome for bony reduction in patients with complex midface and mandible fractures. The splints were utilized during surgery to help sequence the steps in reconstruction. The splints were also helpful to stabilize the palatal vault and prevent distraction along fracture lines. Accurate reduction of all fractured segments was achieved and facial contours were restored. The workflow proved to be a powerful tool for managing complex cases and allows surgeons to manage complex craniomaxillofacial fractures in a structured and consistent manner. The use of virtual surgical planning can help achieve high-quality anatomical reduction and fracture stabilization. Thereafter, optimal facial height, width and contours are observed clinically. The ultimate outcome is reduction in operating time, reduced complications, shorter hospital stays and improved surgeon confidence.

BIOGRAPHY

Samer Abdelsamie, is the Associate Program Director of Academic Affairs at the Oral and Maxillofacial Surgery Division of Temple University Hospital, He is a Clinical Assistant Professor at Temple University Lewis Katz School of Medicine, Department of Surgery. He completed his Dental School at Temple University Kornberg School of Dentistry, and his OMFS Training at Loyola University Medical Center, and Hines VA Hospital in Chicago. He practice broad scope oral and maxillofacial surgery, with emphasis on management of maxillofacial trauma, reconstruction, orthognathic surgery, surgical and non-surgical management of TMJ disorders, and dental implants. His time is dedicated to teaching the post graduate residents at the Temple University Hospital, his research interests are in the advances in management of maxillofacial trauma, wound healing, management of patients with MRONJ and IV sedation in complex patient's population.

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