ACS 2025 Surgeons and Engineers: A Dialogue on Surgical Simulation Meeting

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Promoting Technology and Collaboration

Cost Friendly 3D-Printed Surgical Guide for Orbital Floor Fractures

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Background: Inferior orbital floor fractures are common fractures that can result from facial trauma such as physical assaults and car accidents. They comprise 30-40% of facial fractures, and 4-16% of isolated facial fractures. Current surgical treatment for orbital floor fractures consists of locating the fracture along the inferior orbital rim (IOR) using CT imaging. An incision is made under the eye to gain access to the orbital rim, and a titanium implant is positioned under the globe and fixated into the inferior orbital rim with screws to provide structural support.Surgeons are oftentimes unable to see exactly where the orbital implant is being placed relative to both the IOR and the fracture during operations. This forces surgeons to rely solely on clinical judgment during the procedure.This can lead to complications related to malplaced orbital implants including muscle entrapment, and implant-related infection.

Technology Overview: Our concept solution utilizes 3D printing to create an adjustable device to guide implant placement. The standard device will be cr-eated in a Computer-Aided Design (CAD) software, and 3D printed with FDA-approved biocompatible filament. It can fit a wide range of IOR measurements with its adjustable length that can be altered manually to fit specific patient's measurements. A sliding indicator along the rim will allow the tracing of the fracture position relative to the visible IOR with a feature to mark screw location. This technology is cost-friendly and easily manufacturable.

Potential Application in Surgical Simulation and Education: This device could aid in early surgical training and education to improve surgical skills, clinical judgment, and patient outcomes allowing providers to translate simulation skills into real-world clinical applications.

Potential Opportunities to Collaborate: Collaborations with biotech companies producing IOR implants could improve translatability, and productivity. The seamless integration of orbital floor implants and the associated guide would increase overall effectiveness.