

AbstractID: 6888 Title: Rapid fabrication of custom router guides for craniotomy

Purpose: Image guidance allows surgeons to perform accurate and minimally invasive surgical procedures. Advancements in the field of rapid prototyping have provided the opportunity to design patient specific guidance systems. At the University of Florida, this technology has been applied to the fabrication of patient specific routers that allows guiding a surgical drill during craniotomy.

Methods and Materials: First, the CT scan of a patient's head is used to model the patient's face. A custom fitted facemask is built from this model and physically fabricated using our subtractive rapid prototyping (SRP) machine. Second, the same CT scan is used to model the patient's skull and to draw a craniotomy contour on the surface of the skull. The model and the contour are then processed to build a router guide that can provide guidance not only for following the craniotomy contour, but also for monitoring the depth of the drill bit as it is moved around the route. The router guide is fabricated with our SRP and attached to the facemask. During surgery, the facemask provides a unique positioning for the router on the skull. A head CT scan was used to fabricate 3 different router guides. A plaster phantom representing a hybrid head (face on the front and skull on the back) was fabricated from the CT scan and used to experiment the router guides.

Results: The 3 facemasks provided a unique fit on the phantom and the cut along the route was regular, leaving only a thin layer of bone (from 0.1 to 0.3 mm) that could be easily broken and detached from the skull. Each device was designed and fabricated in less than 4 hours.

Conclusion: This experiment demonstrates that a SRP machine can be used for fast and accurate fabrication of custom guides for surgical tools.