

## CLINICAL ISSUE

Achieving a desired surgical outcome requires planning. Whether a complex or relatively simple change, accuracy is important. When manipulating boney structures, additive manufacturing (AM), aka 3D printing, can provide a plan that can reduce operative time and increase successful outcomes.

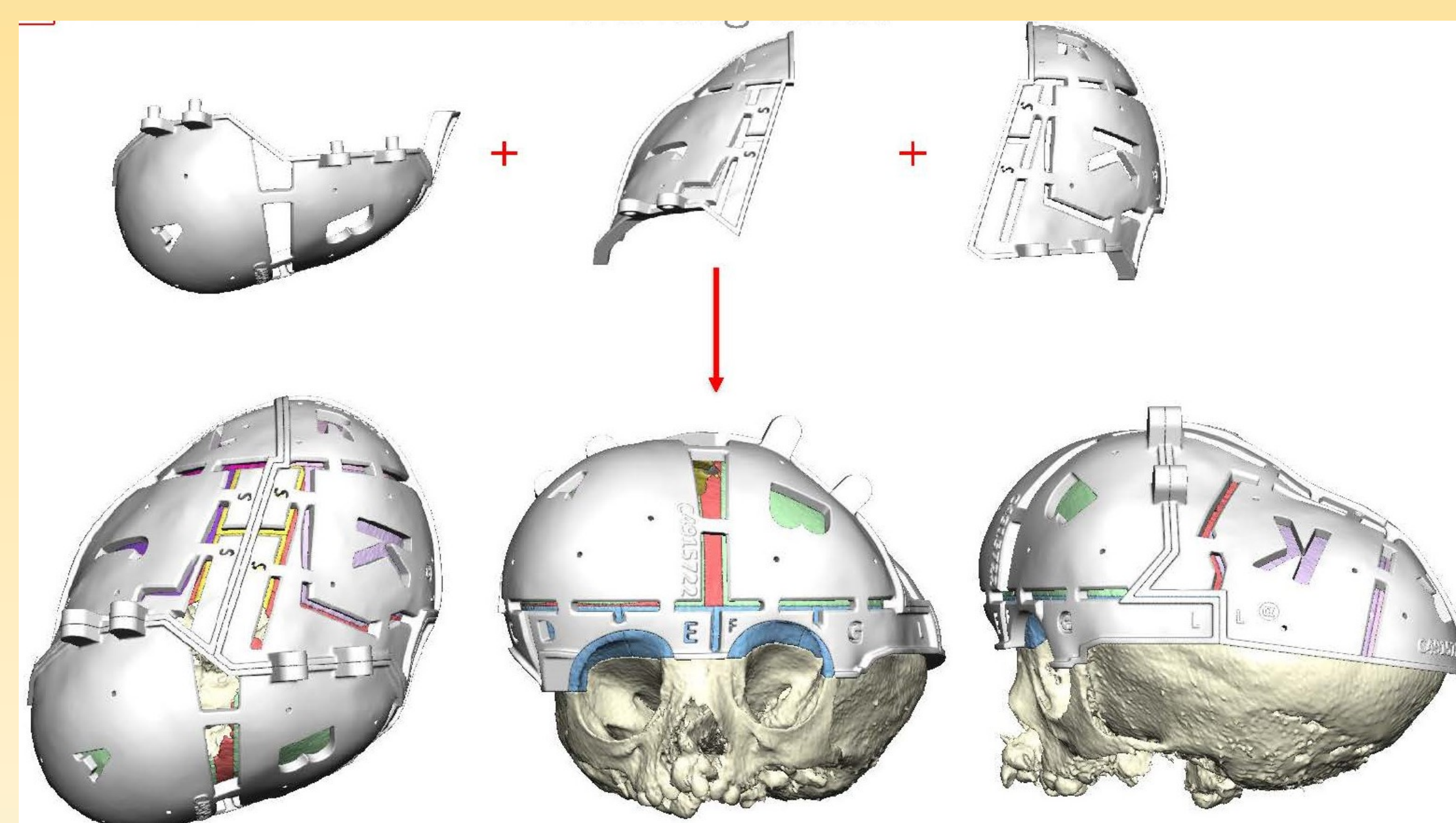
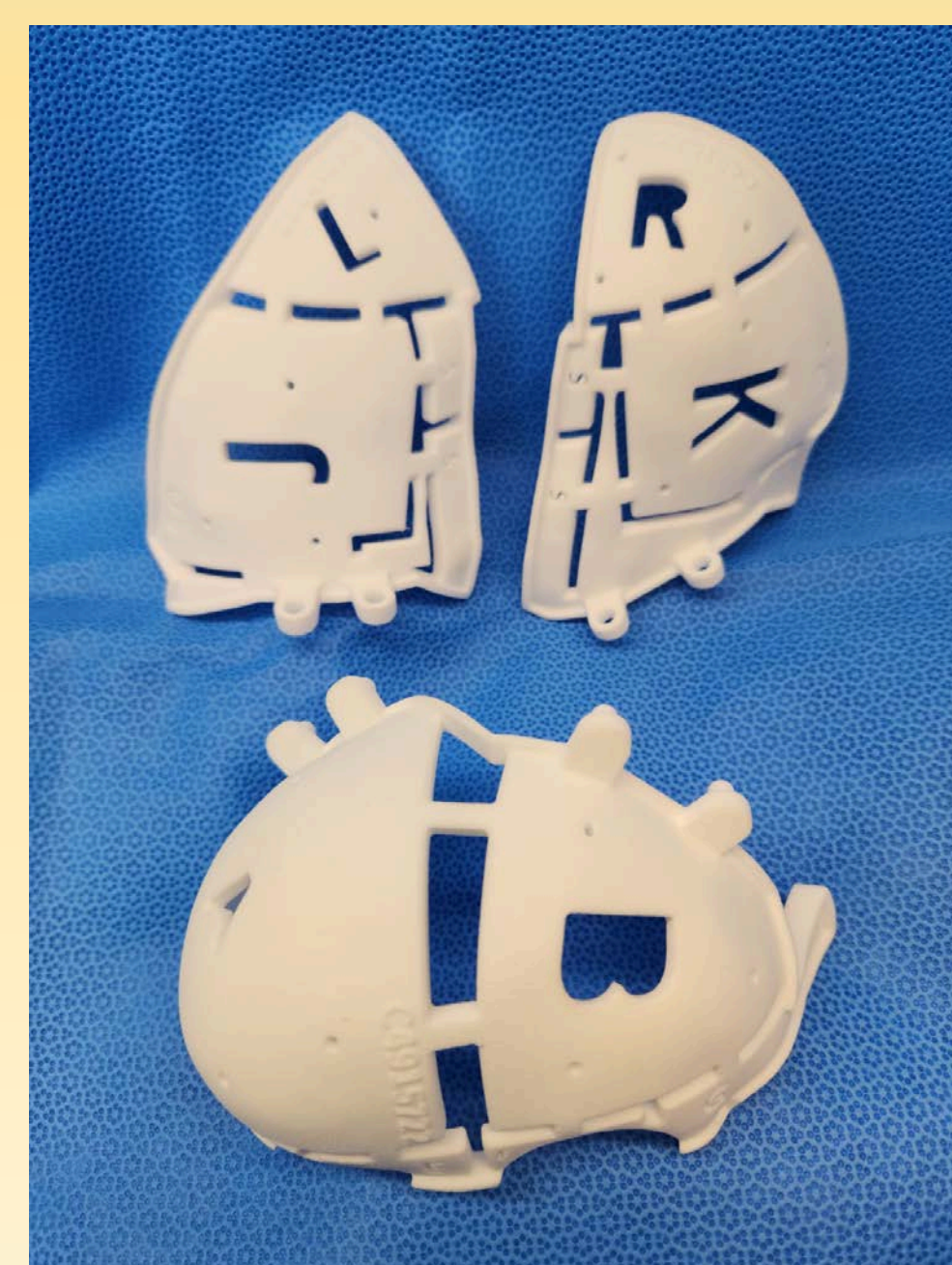
## TEAM

Surgeons, nurses, and industry associates make up a team focused on determining possible approaches to moving, changing and affixing structures to achieve the best result.

## ASSESSMENT

The surgeon's determination to use guides is based on the desire for accuracy and complexity of the surgery. Some guides, like splints for orthognathic surgery, are part of routine procedures. The more distant or complex the structures involved (i.e. fibula to mandible or multi piece cranial remodeling), the more important virtual planning and the development of diverse guides becomes.

### PLANNING FOR CRANIAL VAULT REMODELING



- The guide is divided into sections and given distinct letters to prevent confusion and errors.
- The letters and bone cut lines are transferred to the skull pieces with marking ink or pencil.

## PREP / PLANNING

Computerized tomography (CT) scans of the areas are taken a minimum of three weeks before surgery. A virtual meeting is attended by the surgeon and software engineers to determine the best way to manipulate the bone in order to achieve the desired outcome. Important structures (i.e. vessels and nerves) are identified with exact distance in millimeters from osteotomies, drill holes, or rasped areas. Once the plan is finalized, guides are printed in the materials requested.

## IMPLEMENTATION

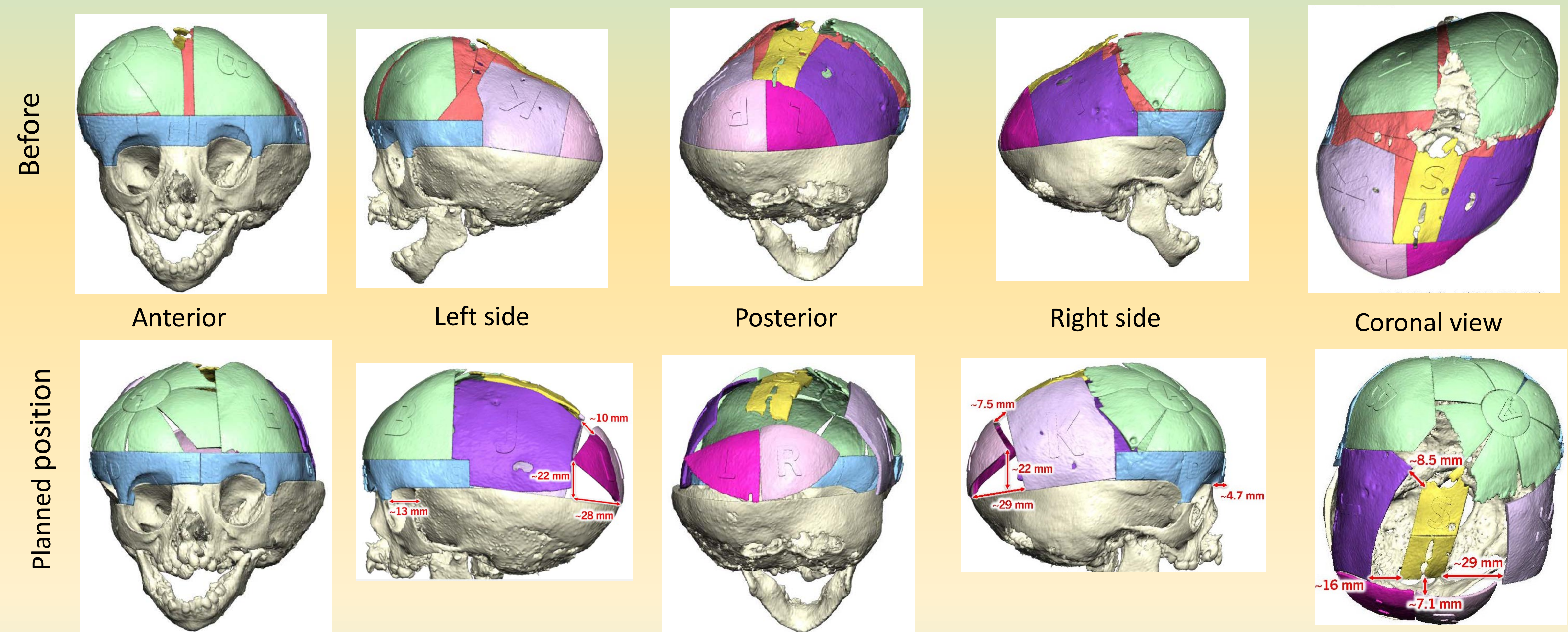
Most guides are made of plastic, nylon, or titanium. Diagrams showing guide placement are displayed in the OR suite for the procedure. This allows the entire team to study the orientation and fit. As the surgery progresses, the surgeon makes adjustments based on direct visualization and fit to the operative site. Medical device representatives support the surgical team by offering suggestions on use of the guides and their markings.

## OUTCOME

Real time assessment of goal attainment, are made based on preoperative discussions between the surgeon and patient. Some patients may repeat a procedure if they feel the goals have not been reached.

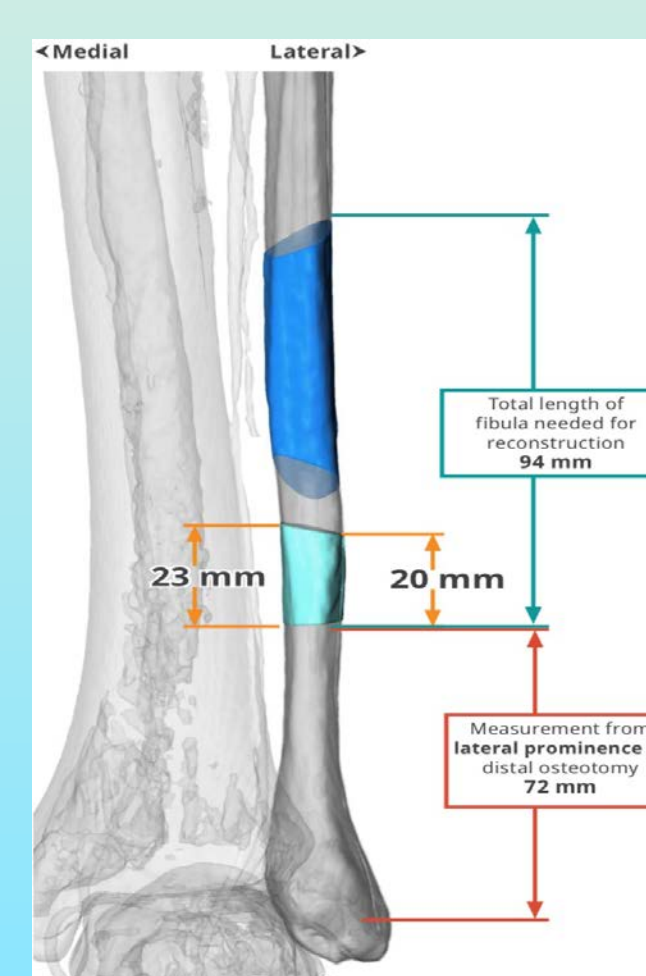
## IMPLICATIONS FOR NURSING

Making sure guides are sterile and available is a coordinated effort with the company representative and sterile processing. The embossing of the patient name or initials on each guide, confirms the correct intended patient. Nursing staff should be aware that some materials used for guides are brittle and are sensitive to mishandling.

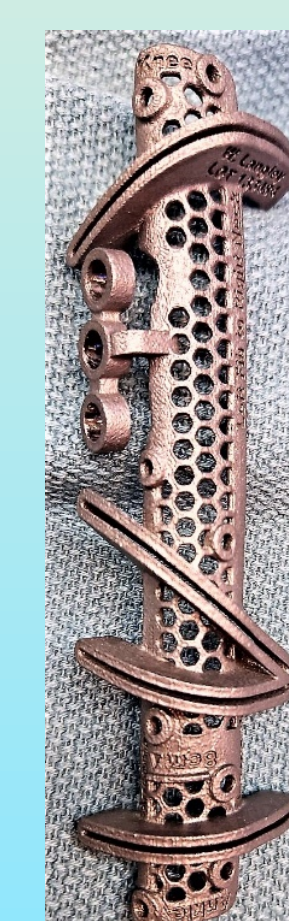


- The skull is cut according to the guide. The skull is reconstructed by reshaping and/or changing position of each piece to eliminate or minimize the defect.
- Any gaps in the bone are grafted with the excess bone pieces that are removed during the remodeling process.

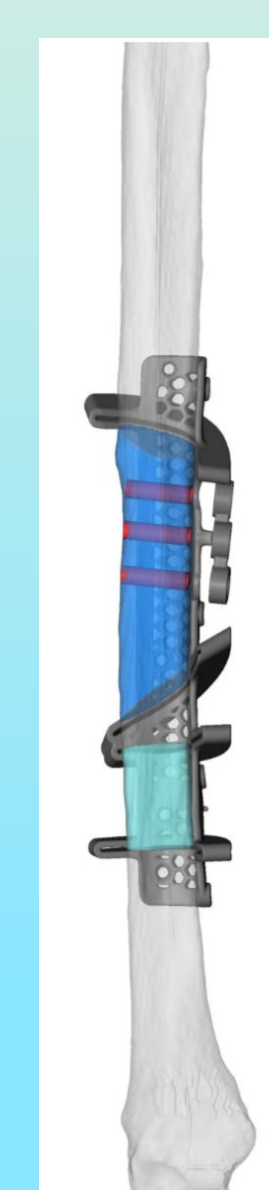
### PLANNING OF FIBULA FREE FLAP FOR MANDIBULAR RECONSTRUCTION



Fibula bone segments needed.



Fibula cutting and interosseous screw placement guide.



Mandibular bone resection cutting guides.

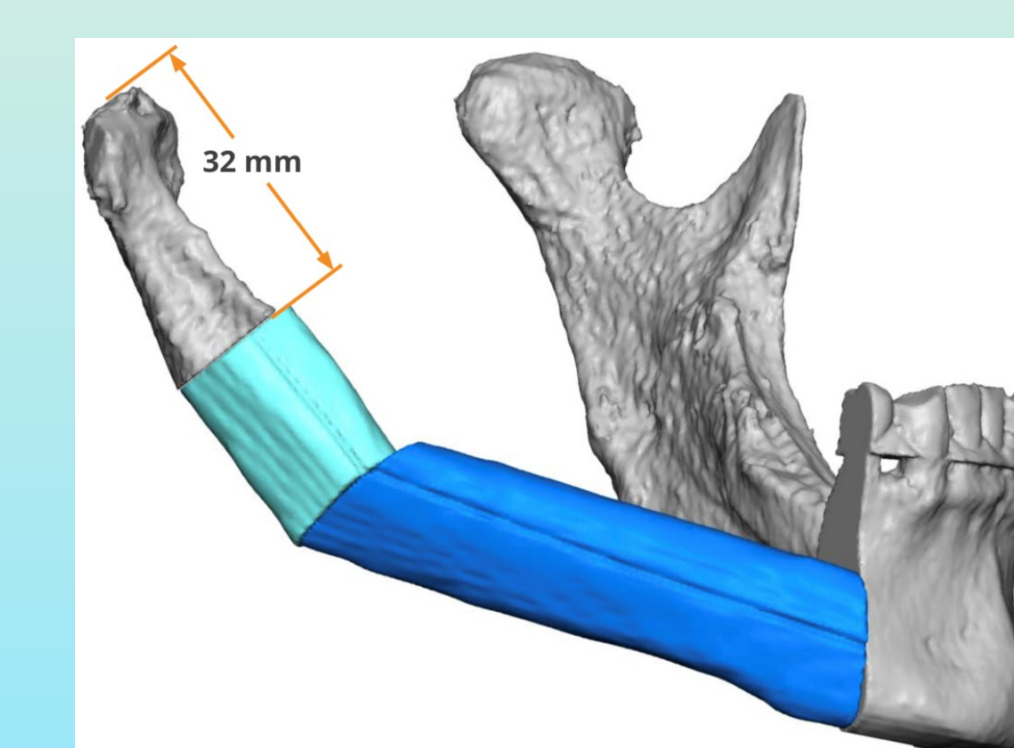
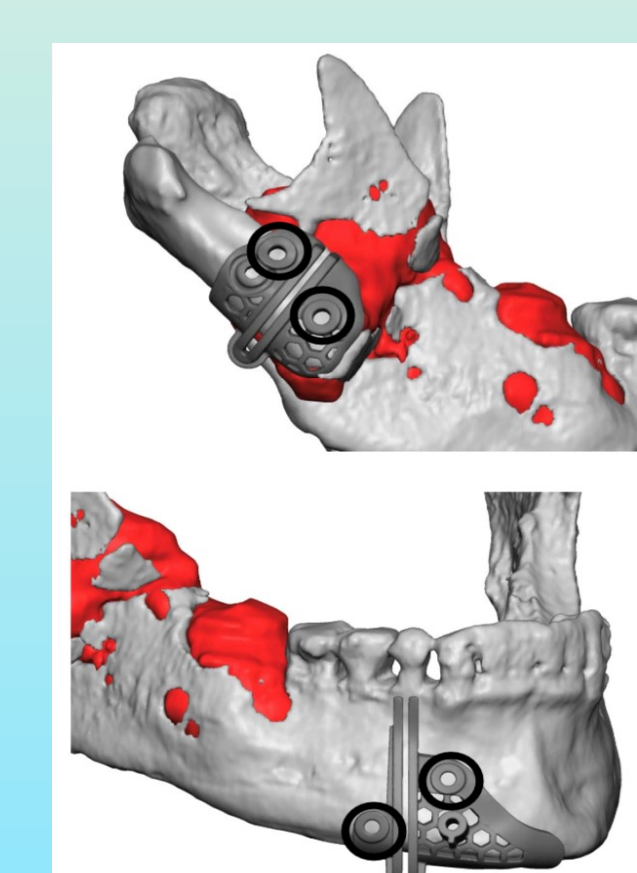


Illustration of fibula bone segments placement in resected mandible.



Graphic of fibula bone segments and identification of interosseous dental implant position ( 1,2,3)and placement of reconstruction plate.

