



Oral Maxillofacial Surgeon Increases Accuracy, Reduces Operating Time Using VSP Orthognathics

VSP Orthognathics for double-jaw surgery enables streamlined transfer of a pre-surgical plan to the operating room with patient-specific splints.

VSP® (Virtual Surgical Planning) Orthognathics offers surgeons a pathway to greater accuracy and more ideal anatomical outcomes for routine and complex orthognathic surgery¹. In the case of this surgery, performed by Deepak Krishnan, DDS, of Cincinnati's UC Health, the patient presented with a unilateral cleft lip and palate. The patient was diagnosed with maxillary hypoplasia, mandibular hyperplasia, and facial asymmetry resulting in the inability to chew properly, poor speech, and disfigurement.

Double-jaw surgery was scheduled and pre-planned using 3D Systems' VSP Orthognathics service. According to Dr. Krishnan, the use of VSP contributed to improved surgical planning, an efficient transfer of the pre-operative plan into the operating room, and reduced operating time.

Double-jaw surgery was scheduled and pre-planned using 3D Systems' VSP® Orthognathics service. VSP planning sessions enabled Dr. Krishnan to digitally explore several surgical options using 3D models of the patient's precise anatomy before determining the final surgical plan to implement.

CHALLENGE:

Accurately and efficiently pre-plan and perform double-jaw surgery to reduce operating time and enable enhanced patient outcome

SOLUTION:

VSP® Orthognathics pre-surgical planning and patient-specific instrumentation to transfer the virtual plan to the operating room

RESULTS:

- Improved pre-surgical planning with 3D visualization of interacting bony anatomies
- Streamlined transfer of digital plan into operating room
- Reduced operating time



Patient-specific splints were used to bring the patient into the correct occlusion. Pre-surgical jaw position pictured above. Post-surgical jaw position shown below.



Pre-planning orthognathic surgery with VSP

The digital 3D models that serve as the foundation of VSP provide clinicians with a more complete view of the intrinsically unique anatomy of each patient. This enables the presiding surgeon to accurately visualize and analyze patient-specific anatomical discrepancies, explore multiple treatment options for each patient, and visualize, anticipate and prepare for possible surgical obstacles prior to beginning the surgery. Such preparation is not possible using conventional surgical planning with stone models and articulators, as conventional methods do not present the planned corrections within a larger anatomical context.

Planning a surgery with VSP Orthognathics begins by sending medical imaging data of the patient, produced using CT or CBCT technology, to 3D Systems to create a digital 3D model of the patient's precise anatomy. For this surgery, dental models were also overlaid on a CT scan to ensure the best possible occlusion was achieved.

3D Systems then hosted a web meeting with Dr. Krishnan in which the patient-specific 3D rendered anatomy was shared.* Using 3D software to manipulate the digital model of the patient's anatomy in real-time, 3D Systems' biomedical engineers can analyze patient discrepancies, simulate surgical osteotomies, perform bony movements and assess potential surgical complications. The placement of reconstructive plates or bone grafts can also be accurately simulated within VSP online sessions in cases where they are prescribed.

Dr. Krishnan pre-planned the surgery with assistance from 3D Systems' VSP Orthognathics team by talking through the sequence of movements he wanted to make to deliver the patient's ideal anatomical correction. "VSP planning sessions are invaluable to understanding the patient anatomy and details," says Dr. Krishnan. "The ability to consider different treatment alternatives during the planning is also immensely helpful. I was able to explore several options for this patient with the VSP engineer before choosing the one I felt was best to implement."

As Dr. Krishnan requested each movement, the 3D Systems' engineer updated the digital model in real-time to reflect the desired outcome. To the maxilla, these changes included a LeFort I osteotomy; midline correction of 3 millimeters to the right; roll correction to address left-to-right vertical asymmetry; 9-millimeter maxillary advancement; and a 3-millimeter impaction of the maxilla. Following these corrections, Dr. Krishnan prescribed a 7-millimeter mandibular set back via BSSO to complete the surgical correction of the occlusion.

At the end of Dr. Krishnan's web session, each surgical update and obstacle had been accounted for to enable the outcome Dr. Krishnan planned to deliver.

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Transferring the pre-surgical plan to the operating room

After the online planning session, 3D Systems' biomedical engineers designed and SLA 3D printed the occlusal splints Dr. Krishnan would use in surgery to correctly place the bony anatomy. 3D Systems' SLA technology offers the highest accuracy and smoothest finish of all 3D printed parts. The SLA splints are sterilized by the surgical teams prior to use in the operating room.

In the VSP planning session Dr. Krishnan decided to move the mandible first, so an intermediate splint was created to relate the upper teeth to the lower teeth. Once the mandible was positioned in surgery according to the digitally pre-planned movements, the surgical team fixated it there using plates and screws.

Following the intermediate splint, a second and final splint was used to bring the upper jaw to meet the lower jaw, putting the patient into the correct occlusion.

Dr. Krishnan says VSP enabled him to save time in the operating room by determining his exact movements ahead of time. “The patient-specific splints ensured that the planned moves were executed and minimized the intra-operative carpentry,” he says.

Patient and surgeon benefits of VSP Orthognathics

Beyond enabling precision surgical planning and operation time savings for the surgeon, the use of VSP Orthognathics can reduce the amount of time the patient is under anesthesia, contribute to improved surgical outcomes and enable more orthognathically ideal outcomes.^{2,3}

To learn more about VSP Orthognathics, get in touch with our healthcare team: denver.healthcare@3dsystems.com

*All of 3D Systems' VSP services are HIPAA compliant.

References:

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