

IPS Implants®

Orthognathics





Oral and maxillo-facial surgery is our passion! Its further development, together with our customers, is our ambition. Every day we work on developing innovative products and services which meet the highest demands on quality, and which contribute to the wellbeing of the patient.

IPS Implants® Orthognathics

Dysgnathia in its various manifestations affects the quality of life of many patients – both physiologically and psychologically. In addition to orthodontic treatment, orthognathic surgery is a proven means of rectifying functional disorders and achieving balanced esthetics.

The use of modern technologies opens up new options in oral and maxillofacial surgery, particularly in the field of dysgnathia surgery. With the development of preoperative virtual planning as well as its realization through patient-specific planning aids and implants, further options have been created to reliably achieve predictable results. IPS® offers matched solutions for the computer-based planning of surgical procedures, the efficient design of customized treatment concepts and the realization of these concepts in the operating theater with functionalized implants and planning aids.



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Feature, Function and Benefit




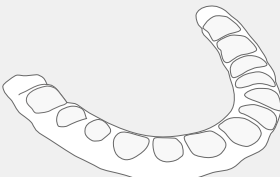
IPS® is ideal for solutions customized to the patient by a simple and efficient process – from planning to the functional implant.

We provide IPS Gate®, a platform that guides surgeons and users reliably and efficiently through the process of inquiring about, planning, and completing patient-specific products. The intuitive concept offers the user maximum mobility, flexibility, and functionality. With the HTTPS standard IPS Gate® ensures encrypted data transmission, which is additionally certified by the TÜV Süd seal.

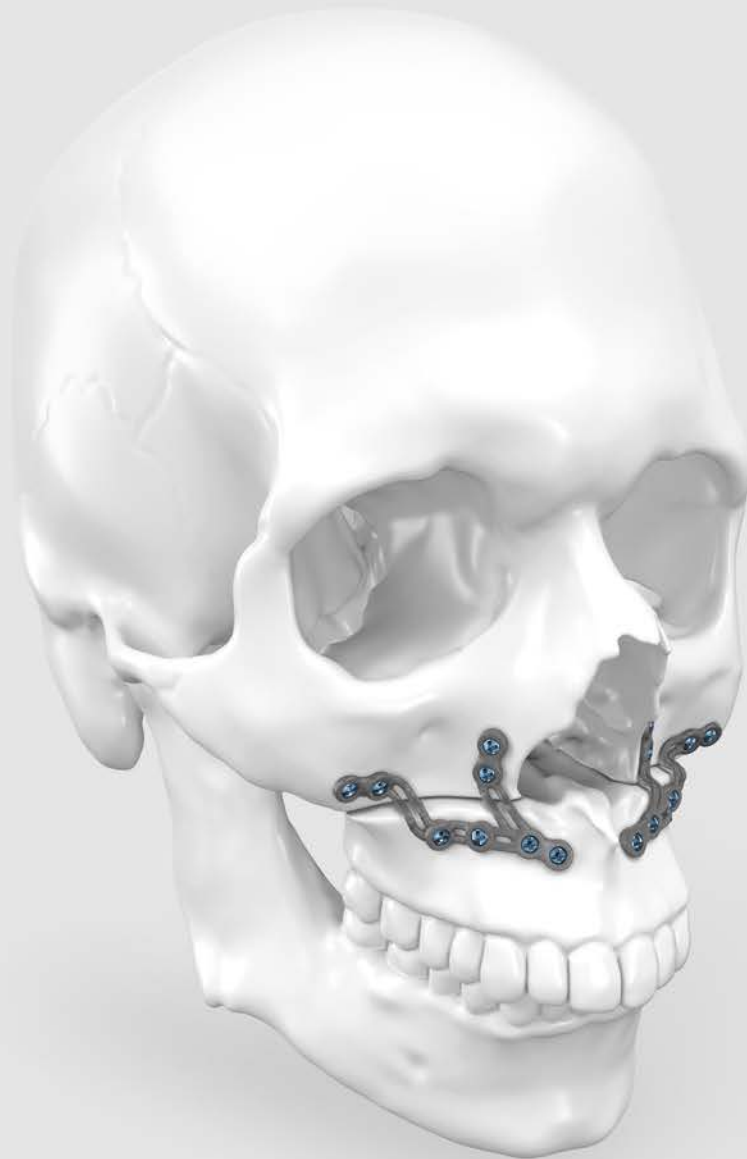
Patient-specific guides are made from various materials using state-of-the-art fabrication technologies. Thanks to computer-based planning and functionalized patient-specific implants, preoperative planning can be implemented in surgery with unprecedented precision.

The resulting advantages for patients are reduced complication rates, improved esthetic and functional results, reduced surgical time and faster rehabilitation.

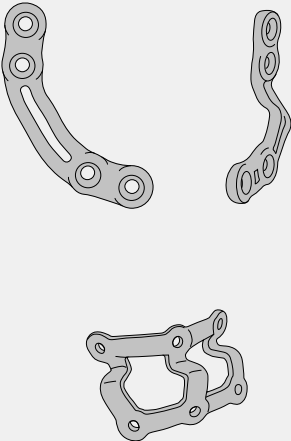
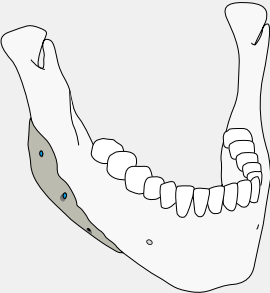
IPS Implants® Orthognathics

	Feature and function	Benefit
<p>Planning process</p> 	<ul style="list-style-type: none"> ■ Orthognathic case planning with the KLS Martin planning software IPS CaseDesigner® ■ Simple and efficient interaction with the IPS® designer via the IPS Gate® ■ Planning, fabrication, shipping from a single source ■ Range of options for planning <ul style="list-style-type: none"> - Predetermination of screw positions - Screw diameter selectable, Ø 1.5 mm by default, alternatively Ø 2.0 mm - Realization of diverse implant geometries ■ Planning time 8-9 working days 	<ul style="list-style-type: none"> ■ Virtual planning created by user builds basis for potential designing of guides and implants ■ Maximum mobility, flexibility and functionality ■ Complete service with the requirement for coordinating multiple services eliminated ■ High degree of safety in planning ■ Save time with efficient case processing
<p>Drill, marking and saw guides</p> 	<ul style="list-style-type: none"> ■ Enables transfer of virtual planning to the OR ■ Integrated steel sleeves ■ Made of Polyamid or additive manufactured titanium alloy 	<ul style="list-style-type: none"> ■ Maximum safety with accurate determination of plate position and screw holes ■ No need for additional drill guides ■ Variability in planning options and high biocompatibility
<p>Orthognathic splints</p> 	<ul style="list-style-type: none"> ■ Orthognathic splints made of acrylate/ methacrylate resins ■ Various design options available 	<ul style="list-style-type: none"> ■ Transparent and processible ■ High degree in flexibility e.g. for reinforced palatal support, wiring holes and further geometries

Feature, Function and Benefit



IPS Implants® Orthognathics

	Feature and function	Benefit
Implants 	<ul style="list-style-type: none"> ■ Production using the latest additive manufacturing technology ■ Manufactured as standard from high-strength Ti6Al4V titanium alloy ■ Implant based on the individual CT scan of the patient, already checked for perfect fit ex-works ■ Various maxillary plate design options <ul style="list-style-type: none"> - Classic multi-plate - Pre-connected multi-plates and single-plate design featuring double-ridge bars between screw holes 	<ul style="list-style-type: none"> ■ Additive manufacturing technology provides complete freedom of design for implants ■ High implant stability ■ Best possible three-dimensional precision-fit ■ Rounded, atraumatic edges avoid trimming and bending ■ Huge variety with implant designs <ul style="list-style-type: none"> - Allowing optimal anatomical fit of implants - Great flexibility in choice of design
Onlays 	<ul style="list-style-type: none"> ■ Onlays for bone augmentation ■ marPOR <ul style="list-style-type: none"> - Ultra-high-molecular-weight polyethylene - Porous 3D interconnecting pore structure - Delivered sterile ■ Onlays made from PEEK 	<ul style="list-style-type: none"> ■ Correction and reconstruction of craniofacial defects ■ Allowing soft tissue ingrowth <ul style="list-style-type: none"> - Flexible and strong material - Good drainage properties - Can promote cell ingrowth, vascularization and osteointegration - Ready-to-use ■ More rigid construction



For more information on the materials used for IPS Implants® please visit our website klsmartin.com/en/products/individual-patient-solutions-cmf/ips-implants

Step by Step to Optimal Fixation

Indications

Orthognathic procedures such as retrognathia, prognathia or skeletal open bite



Maxillary Osteotomies

- Guide
- Splints
- Implants



Bone Augmentation

- Midface
- Mandibular Angle
- Chin



Mandibular Osteotomies

- Guide
- Splints
- Implants



Genioplasty

- Guide
- Implants

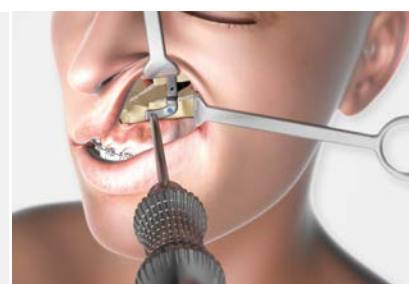


Surgical Techniques

Bimaxillary Osteotomy

Prof. Dr. Dr. Majeed Rana

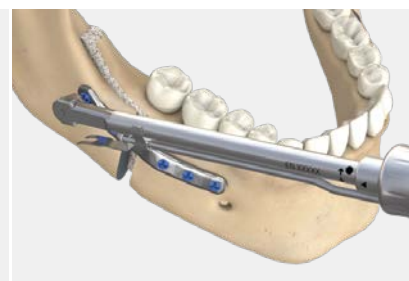
Pages 12-15



Bilateral Sagittal Split Osteotomy

Dr. Dr. Giovanni Badiali

Pages 16-17

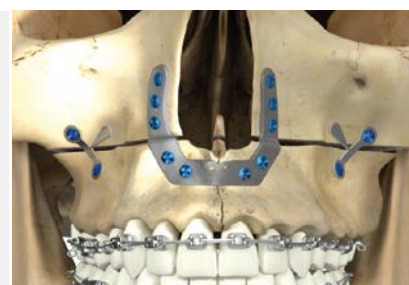


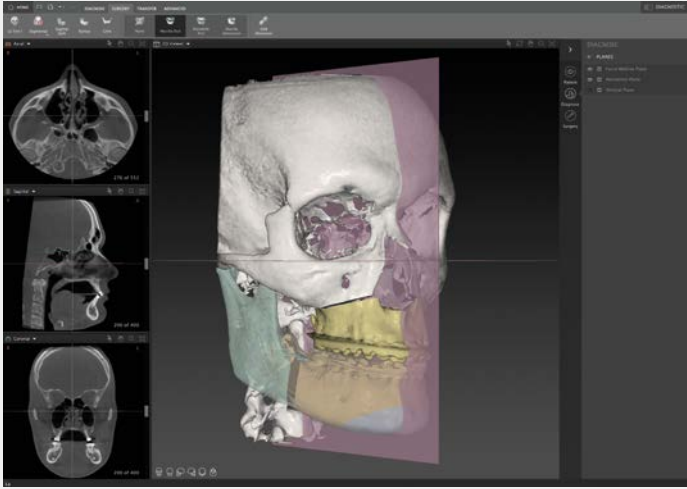
MI Le Fort I Osteotomy (Extract)

Prof. Dr. Dr. Gwen Swennen

Pages 18-19

Please find details in brochure L1® MI Orthognathics





1. Virtual planning

Orthognathic case and splint planning can be accomplished by the clinical user with the IPS CaseDesigner®. Alternatively, patient and model scans can be transmitted for case planning by KLS Martin via IPS Gate®. This planning forms the basis for the realization of patient-specific implants as well as for drilling and marking templates.

Note:

More detailed information on the preparation of patient data can be found in our brochure "Scan protocol for the virtual planning of orthognathic procedures".

2. Positioning the drill and marking guide

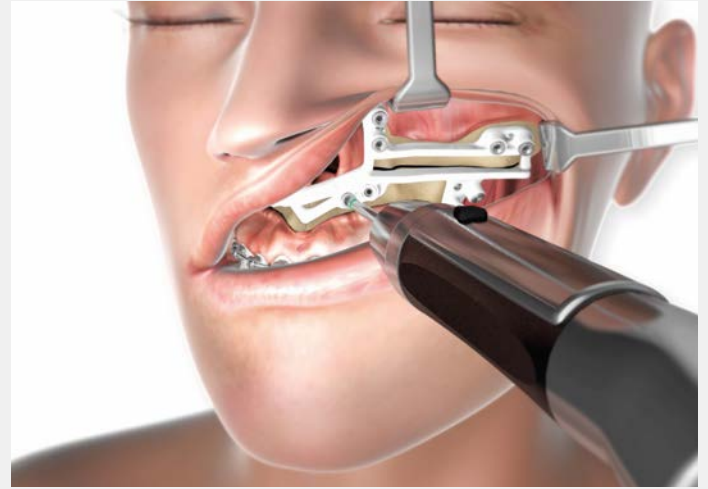
After preparation of the maxilla, the drill and marking guide is fixed to the maxilla with Ø 1.5-mm osteosynthesis screws. The small drill holes (without metal inserts) serve to fasten the template to the maxilla.



3. Marking the osteotomy line

The osteotomy lines are marked with a piezo device, for example.

Please note that polyamide marking templates are not intended for immediate osteotomization.



4. Drilling

The screw holes for the implants are predrilled through the drill and marking guide.

Steel sleeves are fitted into the drill guide so that drilling can be performed without requiring additional drill sleeves. When using drill and marking guides which do not contain steel sleeves, appropriate drilling guides must be used.



5. Maxillary osteotomy

After marking the osteotomy lines and predrilling the screw holes, the drill and marking guide is removed and the osteotomy is performed along the marked line. In addition, the posterior part of the maxilla must be osteotomized and the septum severed.



6. Fixation of the implants

The IPS® plates are secured to the maxilla with Ø 1.5-mm maxDrive® screws. At first only the screw holes of the mobilized maxilla have to be fixed. Preferably, the medial plate of one side is attached, followed by the posterior plate on the same side. The same procedure is to be applied on the opposite side.



After all the maxillary screw holes have been filled, the maxilla is moved into the planned position.

An intermediate splint can also be used for this step.

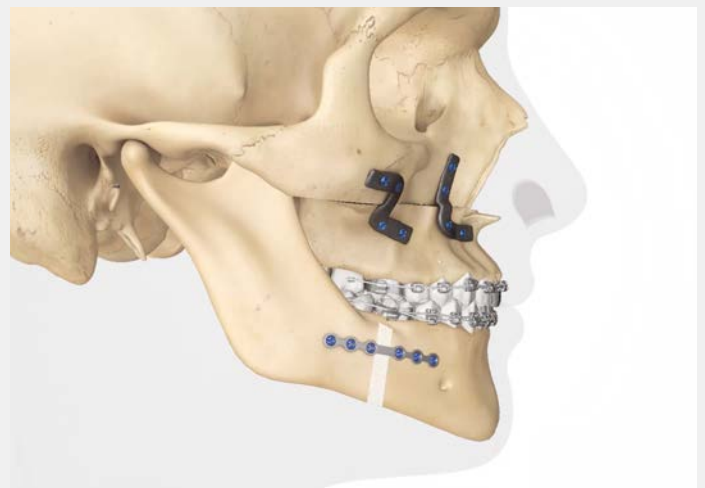


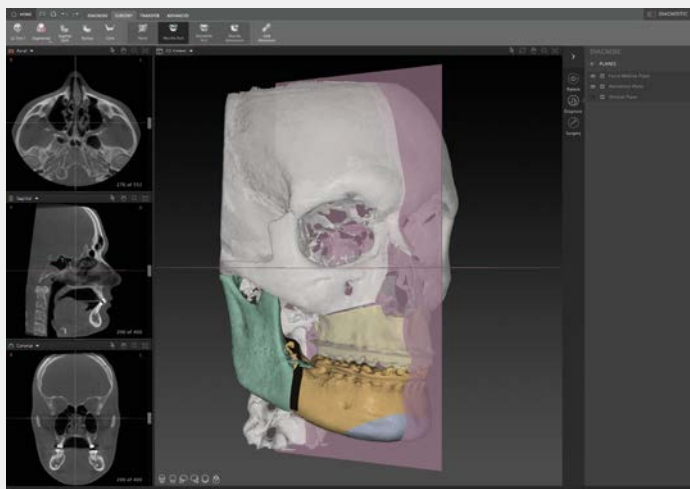
7. BSSO

To mobilize the mandible, a bilateral sagittal split osteotomy needs to be performed. After insertion of the final splint, the mobile mandible is moved into the planned position and fixated with osteosynthesis plates and screws.



8. Result



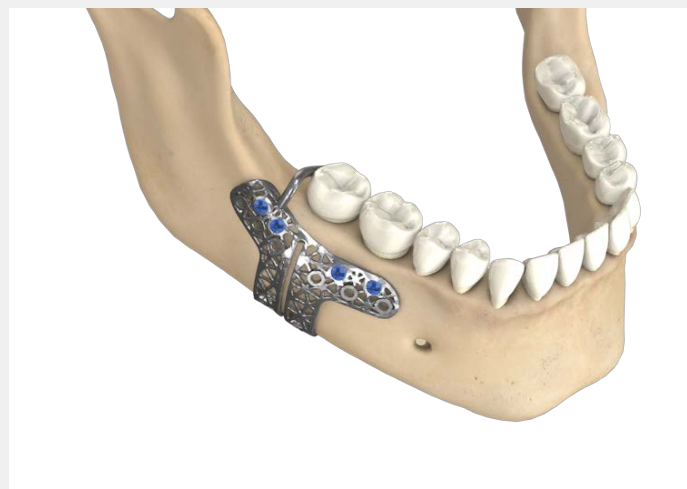


1. Virtual planning

Utilizing the patient's DICOM data set, a 3D virtual planning of the bilateral sagittal split osteotomy can be accurately performed with the IPS CaseDesigner® software by clinicians on their own. Patient-specific drill and marking / sawing guides can then be created with reference to the surgical plan.

Alternatively, the patient and model scans can be uploaded via IPS Gate® where a dedicated engineer will design the case plan.

In case of bimaxillary surgery the subsequently described procedure fits to the "Mandible first" protocol.



2. Positioning the guides

After preparation of the mandible, the drill and sawing guides made from titanium (picture above) are fitted onto the area of the mandibular body and linea obliqua using the inferior clamping element.

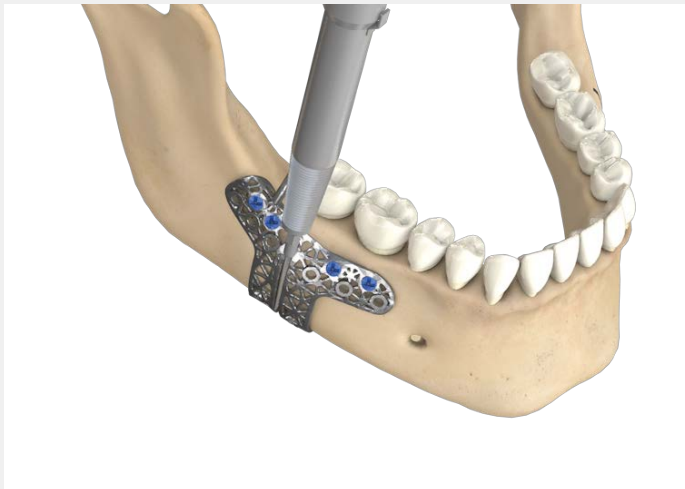
Alternatively, a superior bow can help to establish the horizontal placement of a guide by aligning the notch to the last molar tooth.

Guides are fixed to the mandible with Ø 1.5- / 2.0-mm osteosynthesis screws into the flat drill holes.



Tooth-borne drill and marking guides made of polyamide are usually placed via an element designed to fit into the occlusal plane. Each guide is also form-fitting with the linea obliqua, between the mandibular angle and body and supported by an inferior clamping element.

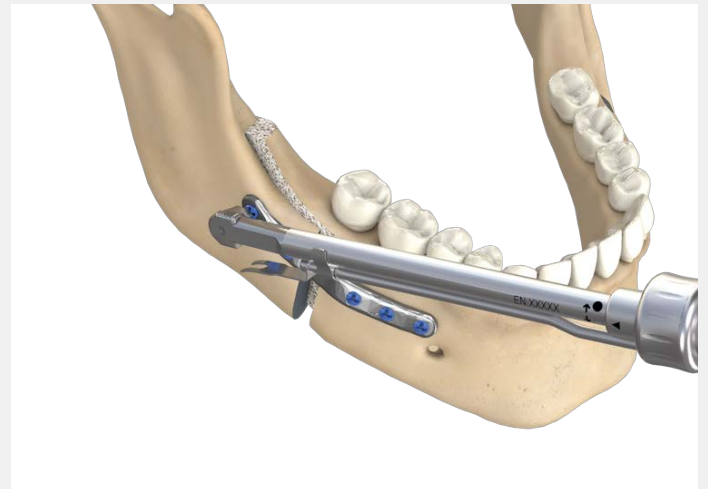
Guides are fixed to the mandible with Ø 1.5- / 2.0-mm self-drilling osteosynthesis screws.



3. Mandibular osteotomy

The osteotomy lines are marked with e.g. a piezo device. Immediate sawing directly between the guiding slots can be performed on titanium guides. Remove the guides to finalize the osteotomies.

The screw holes for the implants are predrilled through the drill guide using the guiding holes (higher profile compared to fixation holes).



4. Fixation of the implants

The IPS® plates are fixed to the mandible with Ø 2.0-mm maxDrive® screws in the predrilled holes.

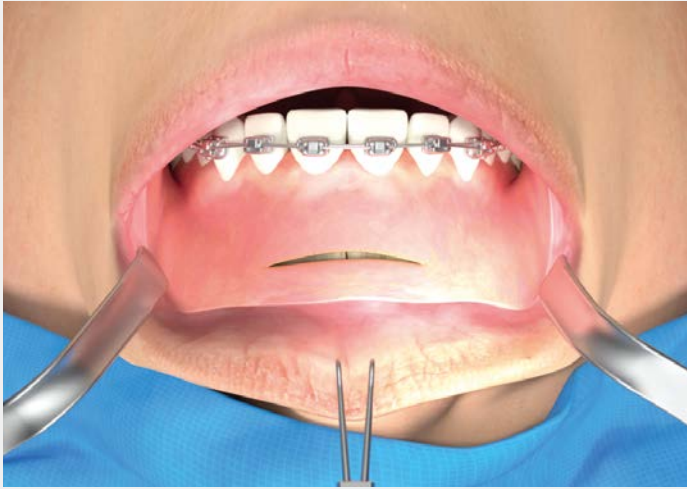
For insertion of the posterior screws we recommend using an angulated screwdriver such as the Angulus 2.

Before final fixation of the mandibular parts, the bone segments can be additionally stabilized and the correct positioning can be checked with a suitable splint.



Please note that polyamide marking guides are not intended for an immediate osteotomy. The completion of osteotomies must be carried out after the removal of the guides.

Steel sleeves are fitted into the drill guide so that drilling can be performed without requiring additional drill sleeves. The use of an angulated drill such as the Angulus 2 is recommended to meet the planned screw trajectory.



1. Soft tissue approach to the Le Fort I

The MI approach towards a Le Fort I osteotomy starts by gently placing a soft tissue double hook (HK1) by the operating surgeon in the midline of the mucosa of the upper lip close to its border. Consecutively, two small curved soft tissue retractors (2x RT1) are placed by the two surgical assistants to retract the soft tissues of the upper lip.

A mucosal incision is made from lateral to lateral incisor using a 15 scalpel or a Colorado knife followed by incision of the deep layers through the periosteum at the Le Fort I level allowing a good muscle bulk for paranasal cross-suturing of the nasolabial muscles.

2. Subperiosteal dissection of the medial pillar of the maxilla

Strictly subperiosteal degloving is now performed using the large part of the double-sided sharp raspatorium (MI1) along the right lateral nasal wall. Consecutively, the inner part of the lateral nasal wall is degloved initially using the small part of the double-sided sharp raspatorium (MI1) and then with its larger part.

Same procedure at the left side.



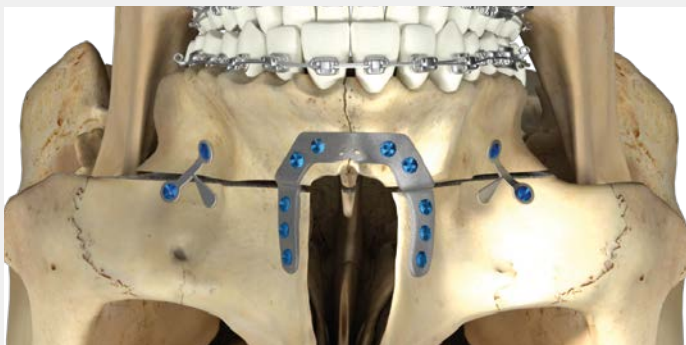
3. Repositioning of the maxilla in its 3D virtual planned position

A minimally invasive guide is used to transfer the virtually planned Le Fort I corticotomy and position of the maxilla.

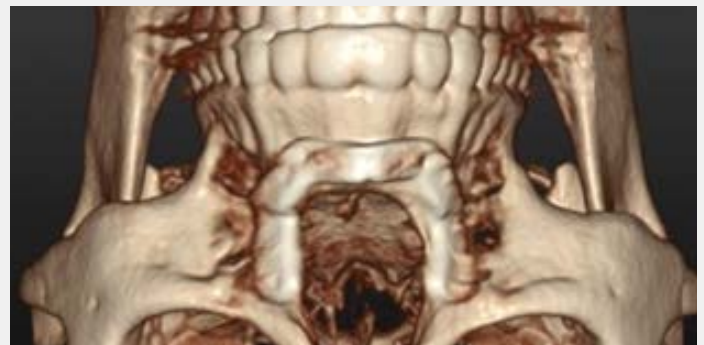


4. Fixation of the implant

The maxilla is repositioned and fixed in its planned position by the operating surgeon using a minimally invasive IPS® implant bilaterally at the lateral nasal wall.



Two straight plates with tab are additionally placed at the lateral buttress of the maxilla.



Using the IPS CaseDesigner® a post-surgical quality control is performed of the repositioned maxilla after MI Fort I osteotomy.



For further information please refer to our separate product brochure.



Y-shaped segmental Le Fort I osteotomy
Treatment with additive-manufactured drill and marking guide, polyamide



Le Fort I osteotomy
Treatment with additive-manufactured drill and saw guide, titanium alloy



Bilateral Sagittal Split Osteotomy (BSSO)
Treatment with additive-manufactured drill and marking guide, teeth-borne, polyamide



Bilateral Sagittal Split Osteotomy (BSSO)
Treatment with additive-manufactured drill and saw guide, bone-borne, titanium alloy



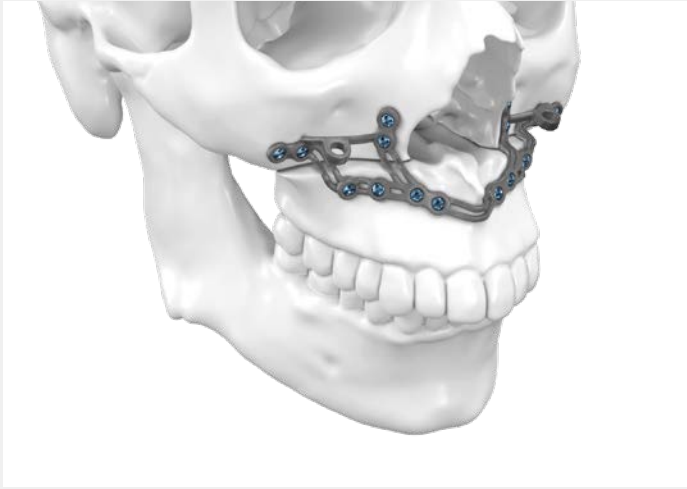
Le Fort I osteosynthesis fixation with multi-plate Le Fort I technique
Treatment with additive-manufactured IPS® implants



Genioplasty fixation
Treatment with additive-manufactured IPS® implants



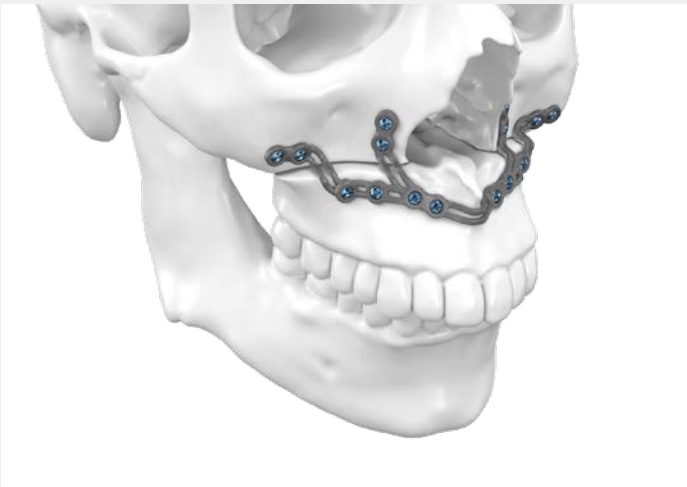
Bilateral Sagittal Split Osteotomy (BSSO)
Treatment with additive-manufactured IPS® implants



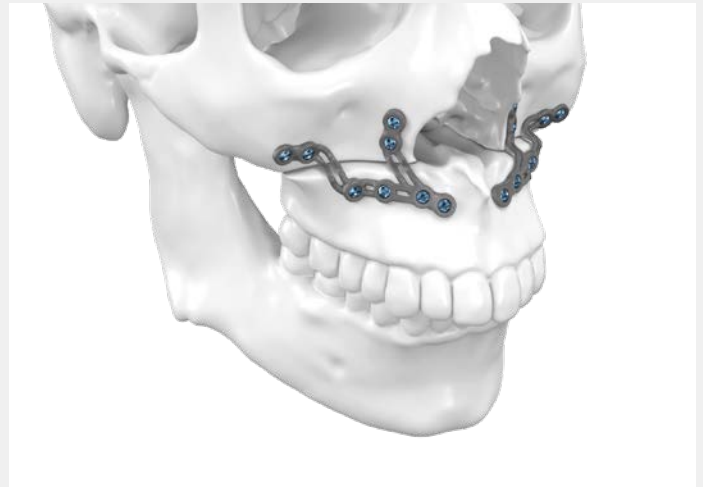
Upper jaw fixation with single-plate Le Fort I technique
Additive-manufactured IPS® implant with removable intra-operative positioning bars, double-ridge concept



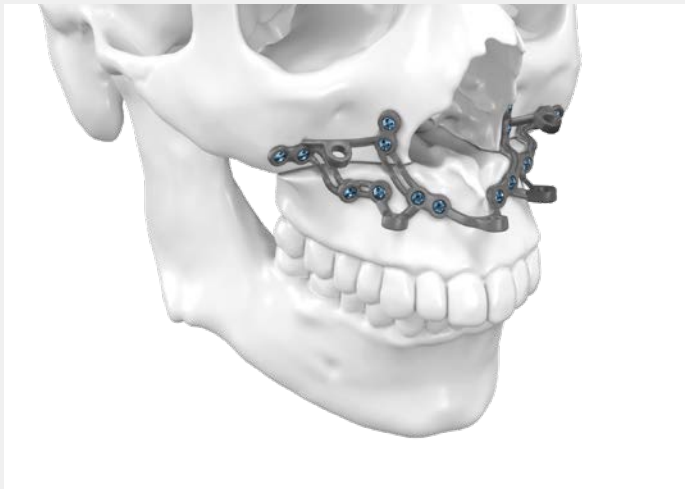
Upper jaw fixation with multi-plate Le Fort I technique, two U plates
Additive-manufactured IPS® implant with removable connecting and positioning bars, double-ridge concept



Upper jaw fixation with single-plate Le Fort I technique
Treatment with additive-manufactured IPS® implant, after removing positioning bars



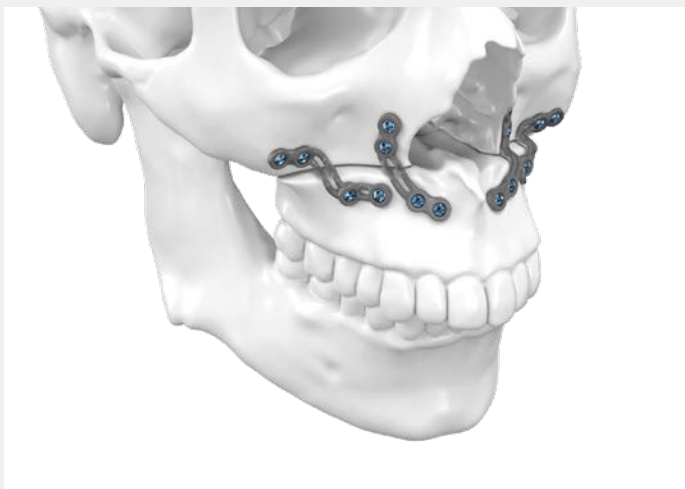
Upper jaw fixation with multi-plate Le Fort I technique, two U plates
Treatment with additive-manufactured IPS® implants, after removing connecting and positioning bars



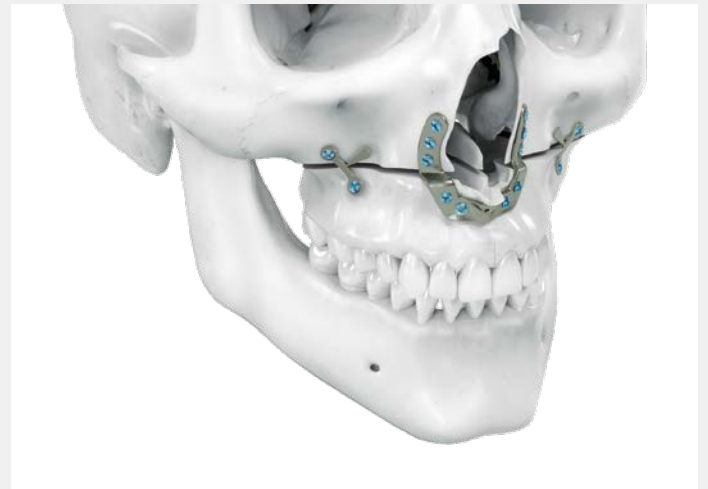
Upper jaw fixation with multi-plate Le Fort I technique, four L plates
Additive-manufactured IPS® implant with removable connecting and positioning bars, double-ridge concept



Le Fort I osteotomy with minimally invasive technique
Treatment with additive-manufactured drill and marking guide, teeth-borne, polyamide



Upper jaw fixation with multi-plate Le Fort I technique, four L plates
Treatment with additive-manufactured IPS® implants, after removing connecting and positioning bars



Upper jaw fixation with MI Orthognathics technique
Treatment with additive-manufactured IPS® implant and optional 2-hole stock plate



Classical splints
Intermediate and final splint



Piggyback splint
Final splint (top) and intermediate element



Palatal support
Final splint with drill holes and palatal arch



Palatal support
Internal, final splint with drill holes and palatal dome



Maxillary augmentation
marPOR onlay



Maxillary augmentation
PEEK onlay



Mandibular augmentation
marPOR onlay



Mandibular augmentation
PEEK onlay

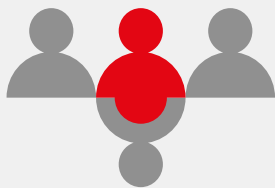
Osteosynthesis Accessories



In addition to the IPS® implant and the included drill, marking and saw guides, the following osteosynthesis accessories in sterile condition are required for the surgical treatment:

- A sufficient number of KLS Martin osteosynthesis screws in the planned diameters
- A screwdriver to fit the planned osteosynthesis screws
- A pilot drill to fit the planned osteosynthesis screws
- Ø 2.0-mm osteosynthesis screws (alternatively Ø 1.5-mm screws) for fixing the drill, marking and saw guides with matching pilot drill and screwdriver

The IPS® Product Range



IPS CaseDesigner®

The IPS CaseDesigner® makes virtual 3D surgical planning easier and faster than ever before. With this flexible software tool, orthognathic procedures can be efficiently and reliably planned and simulated, and then applied to treatment in the operation in a customized manner.



IPS Gate®

The web-based platform and app guide surgeons and users reliably and efficiently through the process of inquiring about, planning, and completing patient-specific products. With the HTTPS standard IPS Gate® guarantees encrypted data transmission, which is additionally certified by the TÜV Süd seal.



IPS Implants®

Patient-specific implants, planning aids, and anatomical models are made from various materials using state-of-the-art fabrication technologies. Thanks to computer-based planning and functionalized patient-specific implants, preoperative planning can be implemented in surgery with unprecedented precision.



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