

3D Printing

innan, under och efter operationen



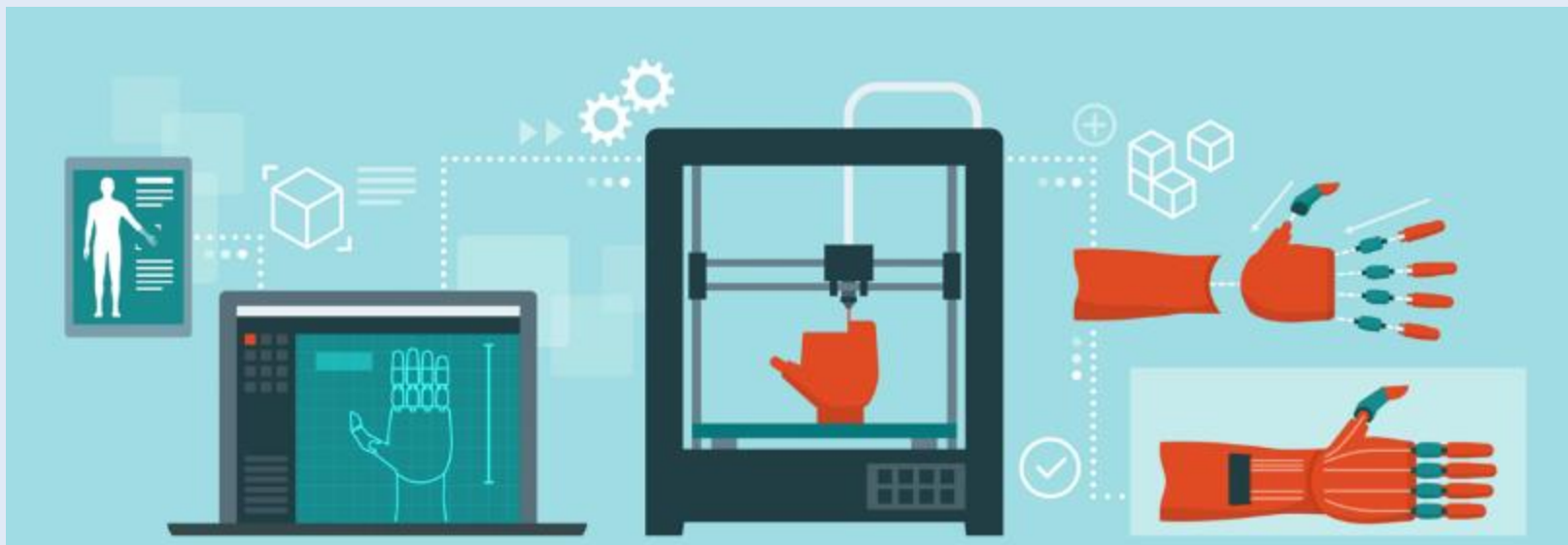
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Uppsala University



Ghanim Ibrahim,
Utvecklingsledare



Vad är 3D-printing/Additiv tillverkning?



DESIGN

- Idé
- Ritning/modell
- Segmentering

MATERIAL

- Utveckling
- Karakterisering
- Återvinning

PRINTING

- Teknik
- Inställningar
- Support

POST-PROCESS

- Polering
- Ytbehandling

UTVÄRDERING

- Analys
- Kvalitetskontroll

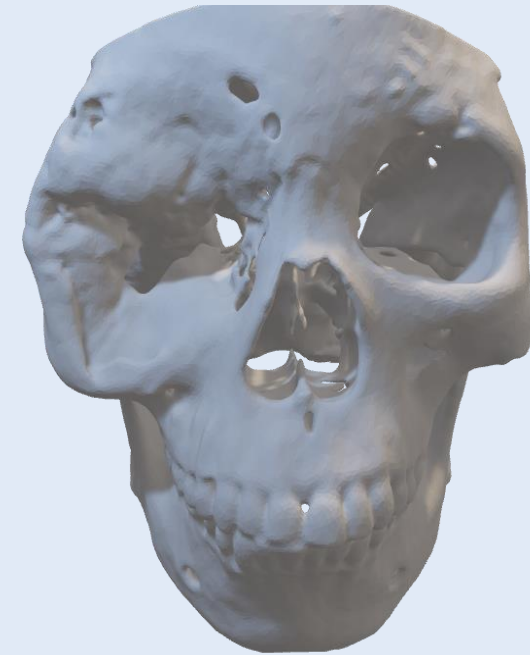


3D-Printfaciliteten på Akademiska sjukhuset

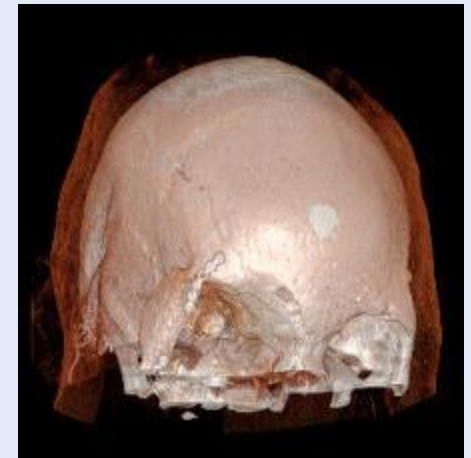
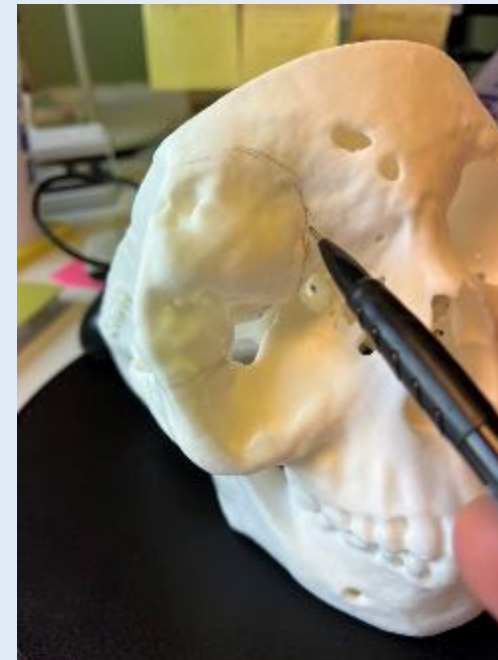


- 3D-printingfaciliteten på sjukhuset är nu produktionsklar
- Säkrad finansiering från Region Uppsalas egen budget
- Behovsanalys utförd där +100 personer har intervjuats
- Öppet hus 12 Dec – stort intresse (170 deltagare)
- +30 besök (sjukhusledning, politik, andra sjukhus, bolag etc.)
- Verksamhetsmodell
- Värdefull samverkan med andra 3D center på sjukhus (Skåne, Karolinska, VGR, med flera)

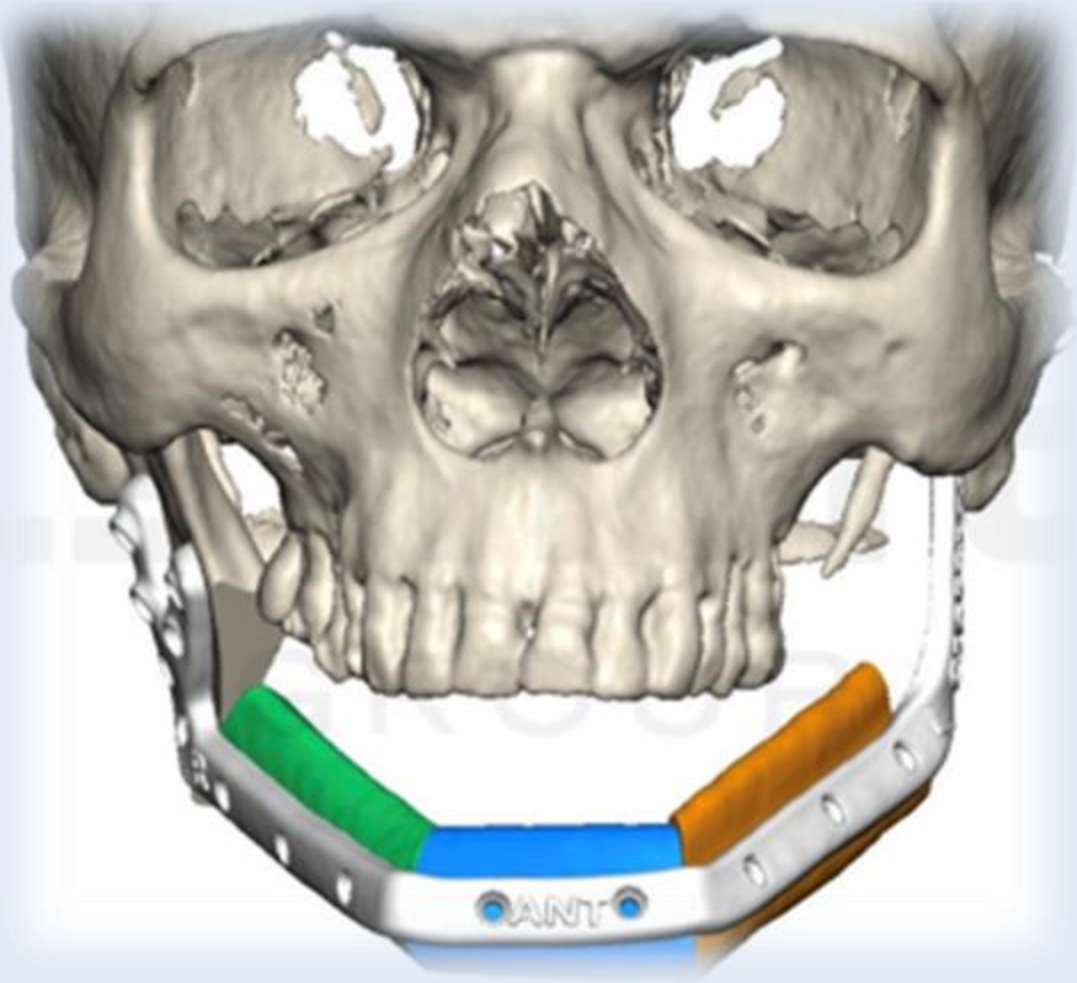
Preoperativt: multidisciplinärt tumöringrepp



- Patienten diagnostiseras med Pleomorft adenom runt höger orbita och skallbas och ingreppet inkluderar flera discipliner med varierande erfarenhet inom 3D-printing
- 3D-printad anatomisk modell ett bra verktyg för multidisciplinära diskussioner kring hantering och kirurgiskt körschema vid ingreppet för alla involverade
- En anatomisk modell underlättar diskussion och förståelse mellan kliniker och patienten och patientens anhöriga. Förståelsen kan reducera stressen inför ingreppet.
- Vid vissa fall kan man testa körschemat genom att utföra ingreppet delvis på modellen i förväg.



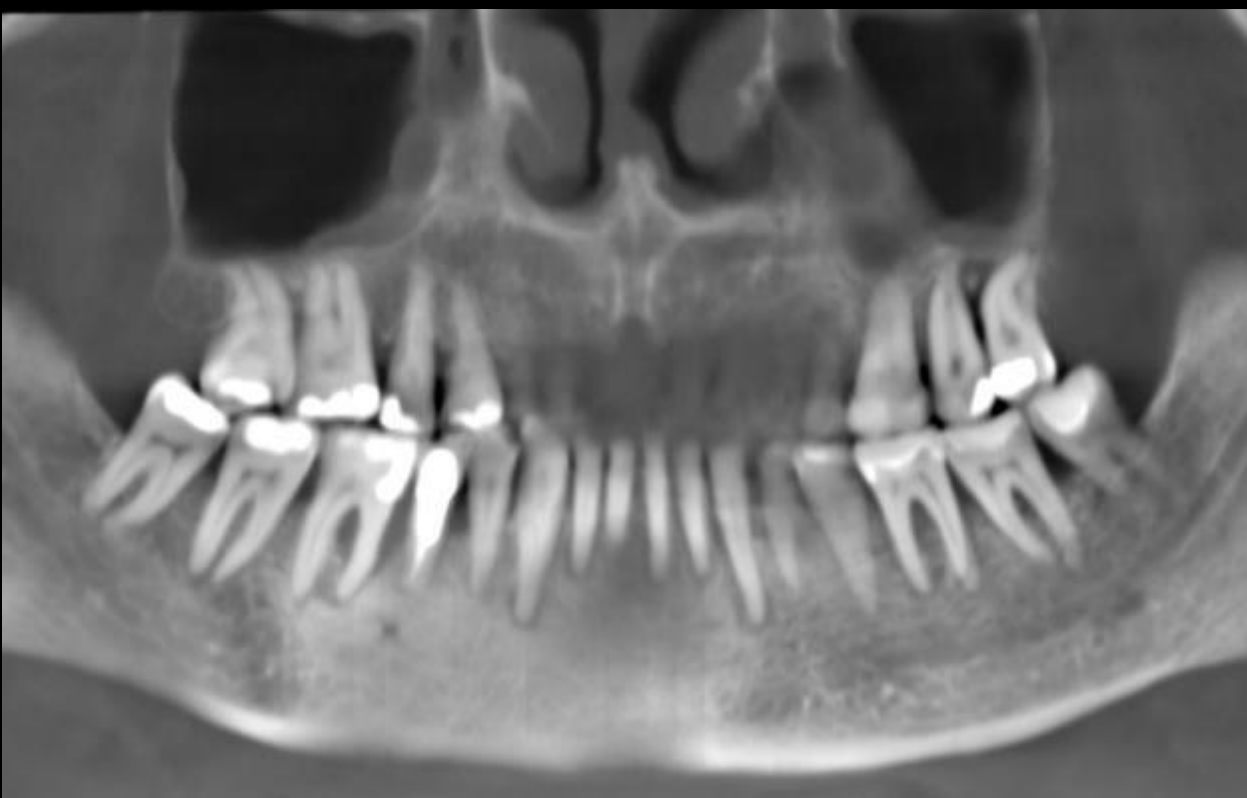
Peroperativt: Skräddarsydda implantat



- Virtuell kirurgisk planering
- Patientspecifika modeller, sågguider och implantat

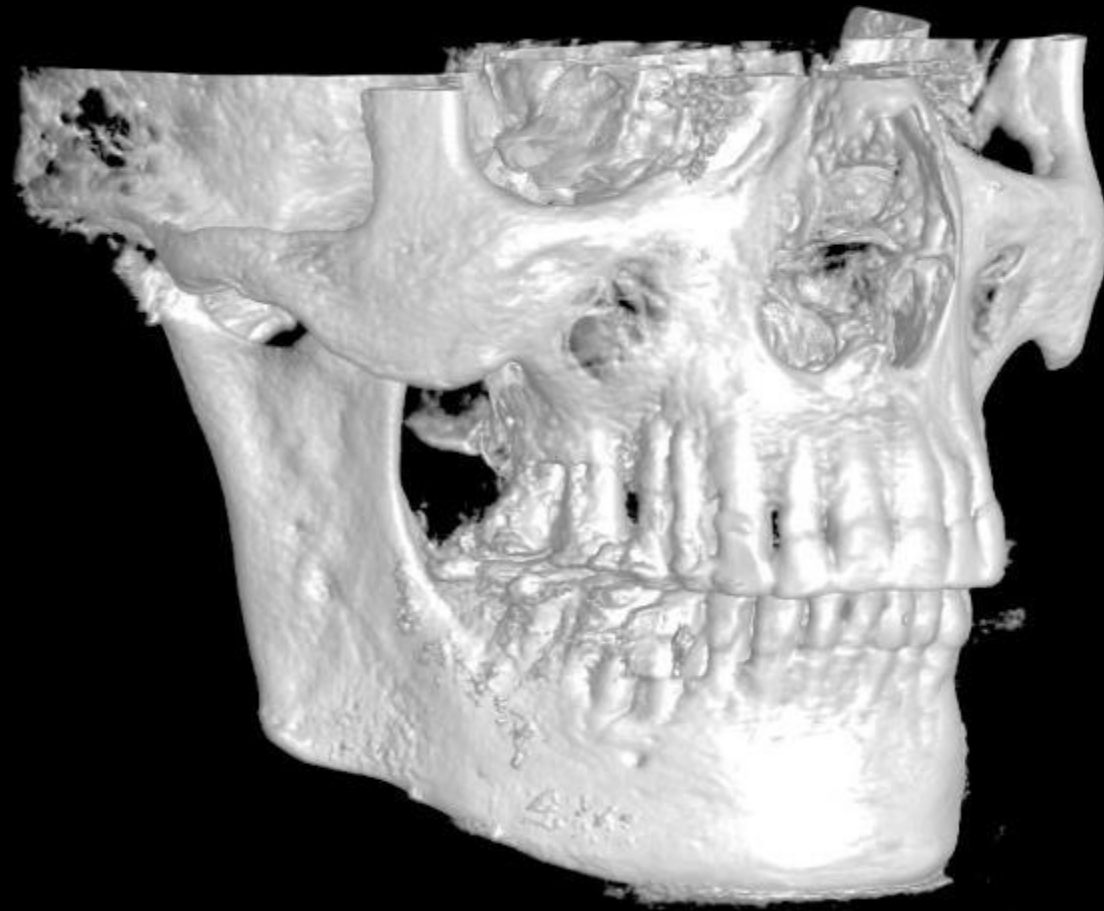


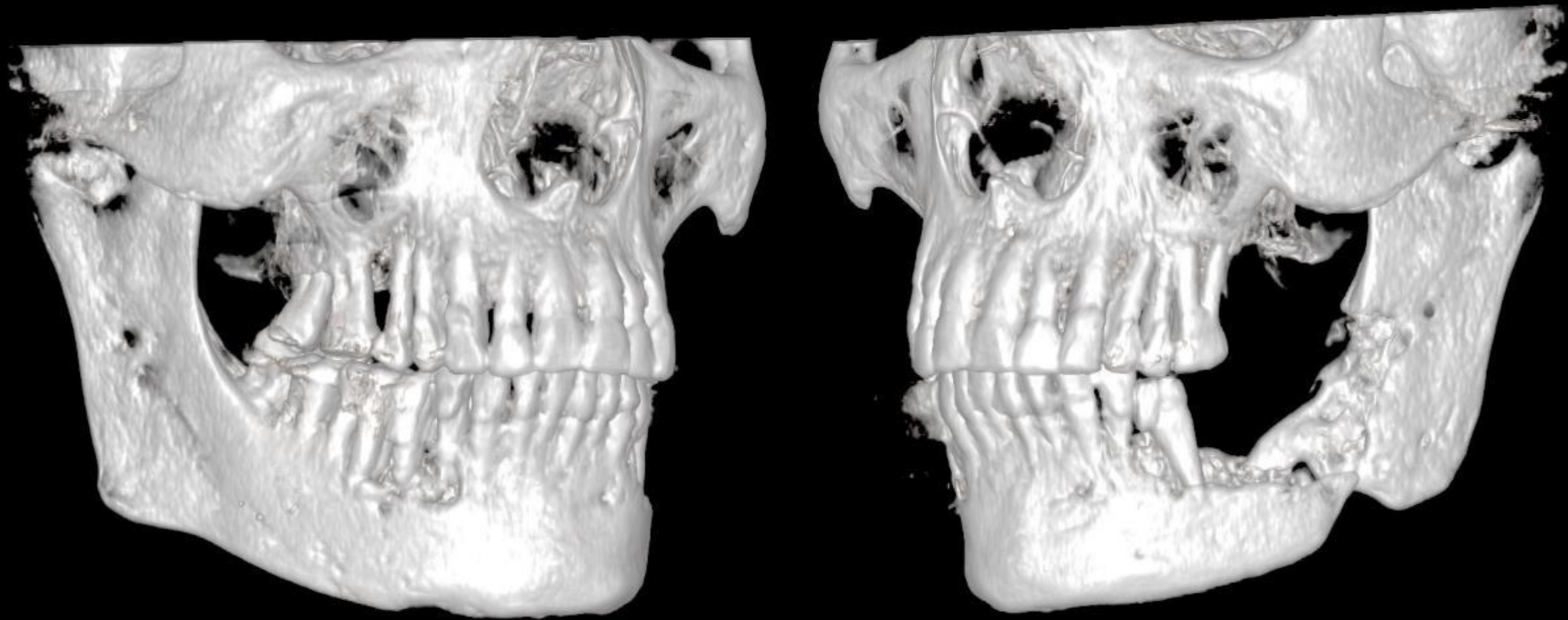
- Aktuellt fall från denna veckas operationsprogram

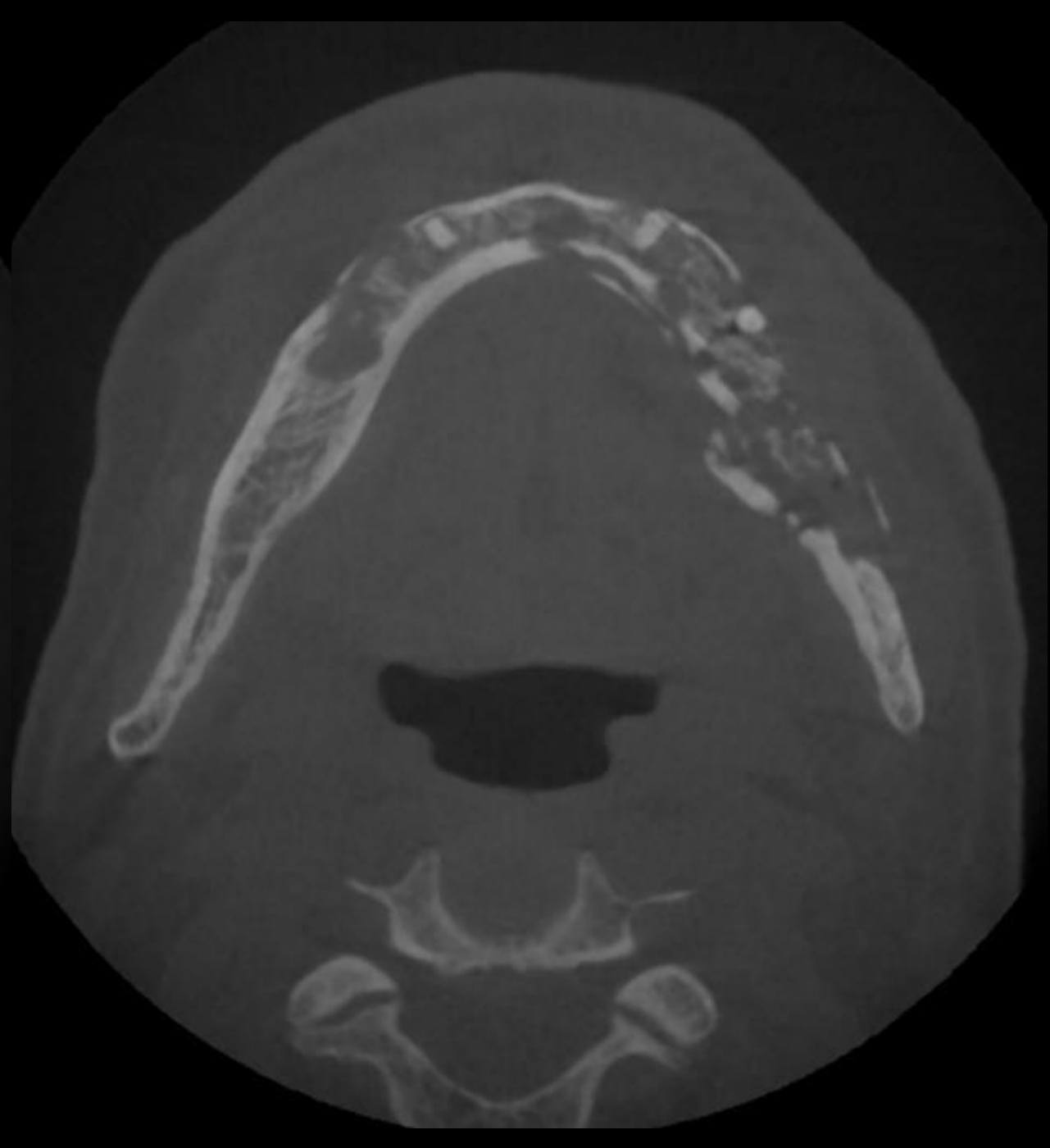


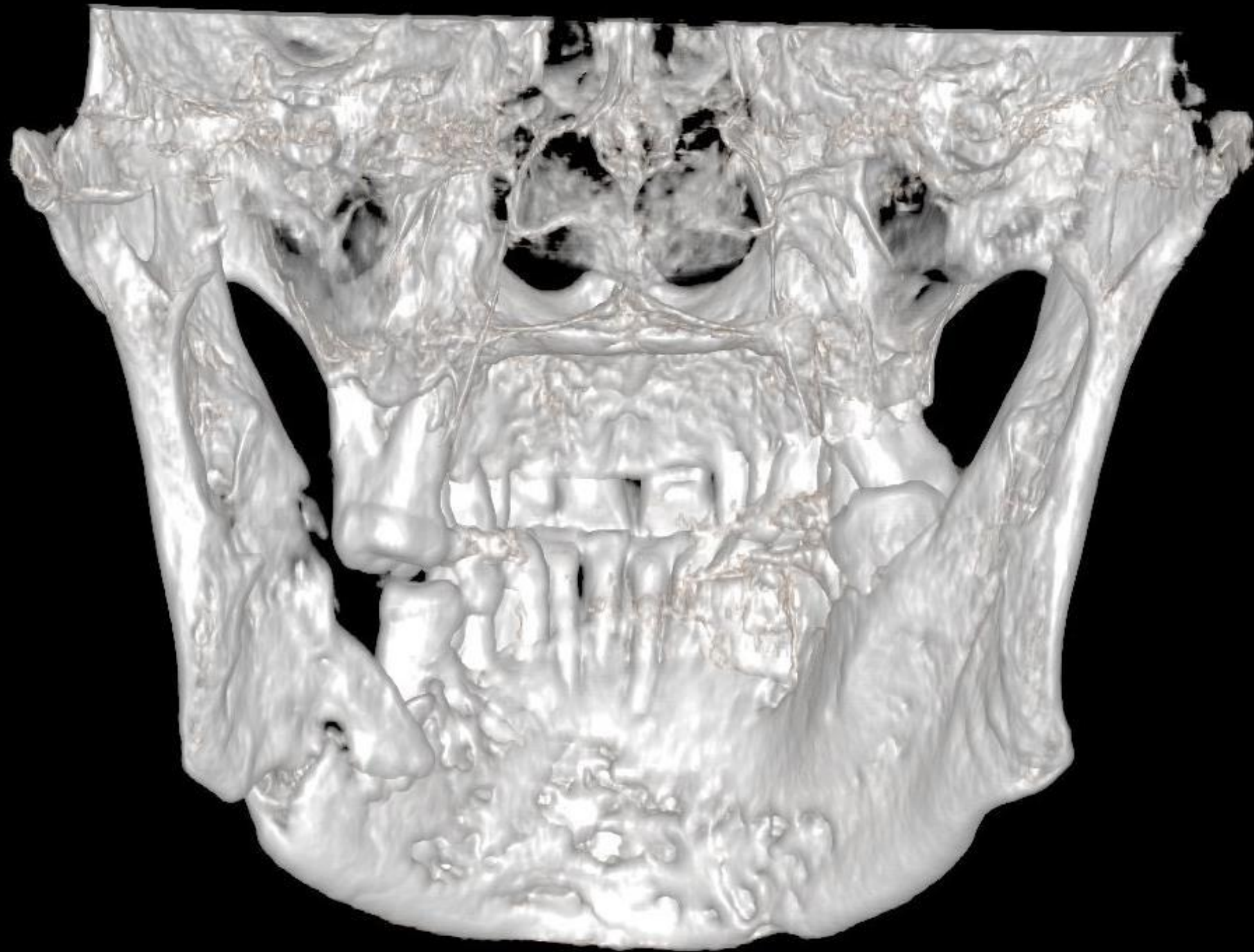
2012, Tungcancer: T1N0M0. Operation + Strålbehandling, 66 Gy.
Osteoradionekros utvecklas snabbt i över- och ffa underkäke...

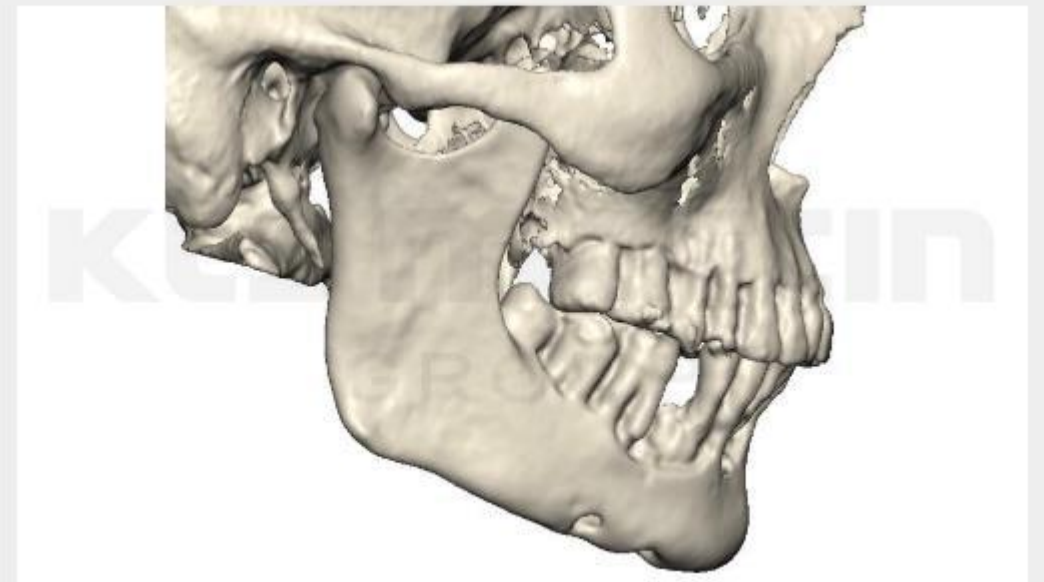
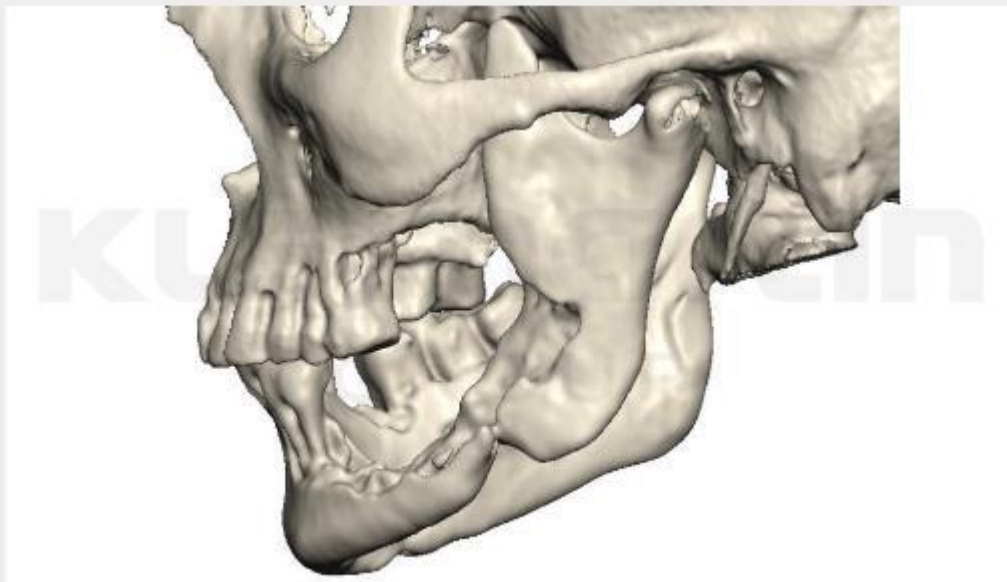
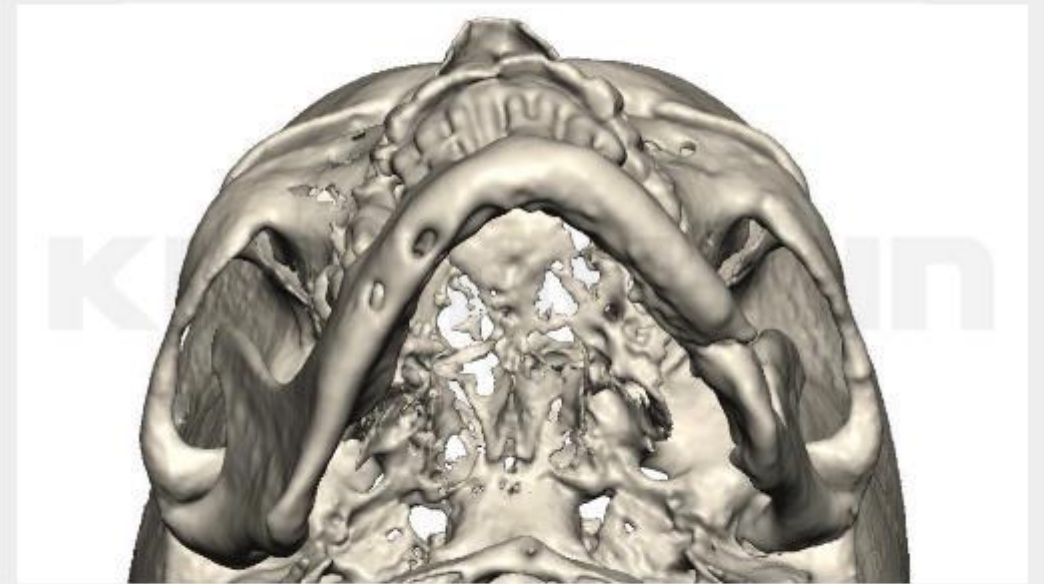


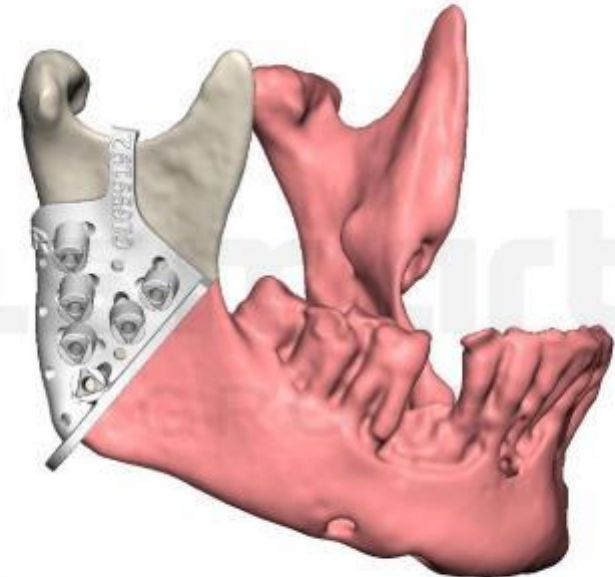
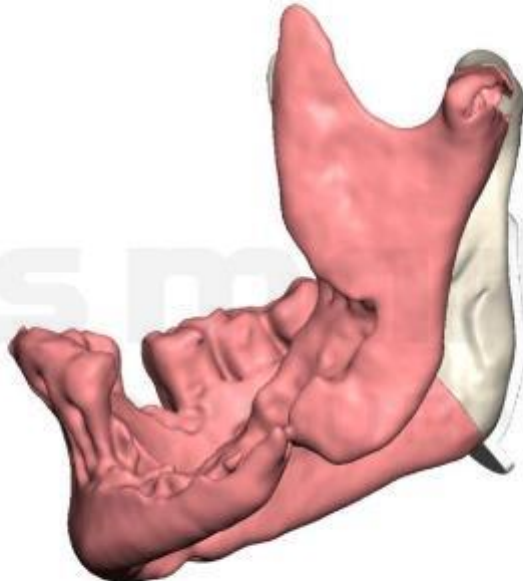
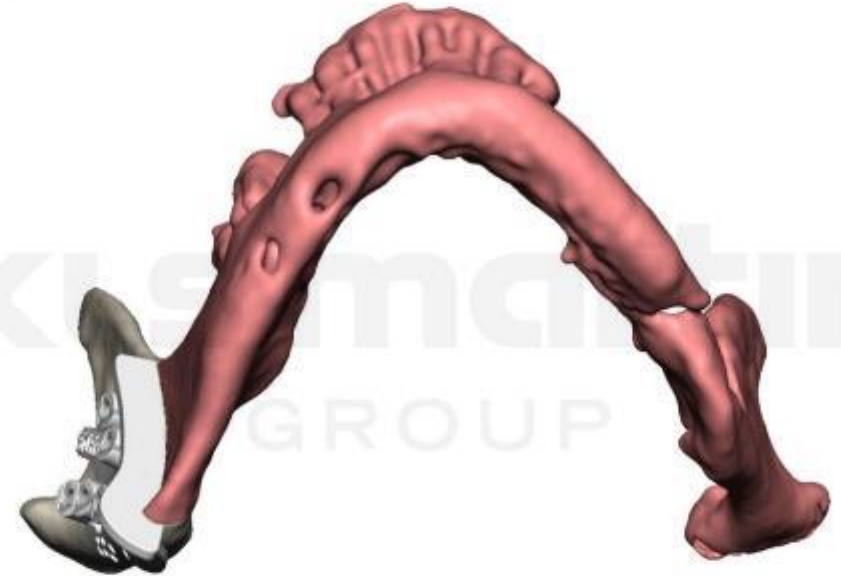
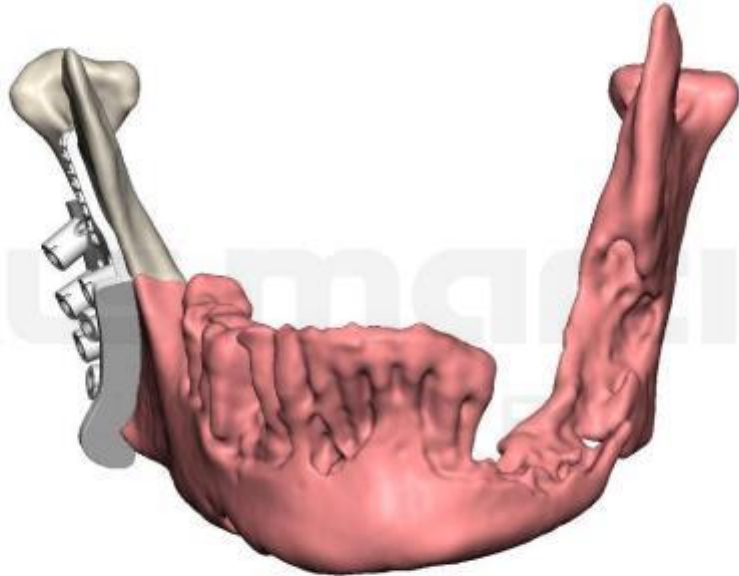




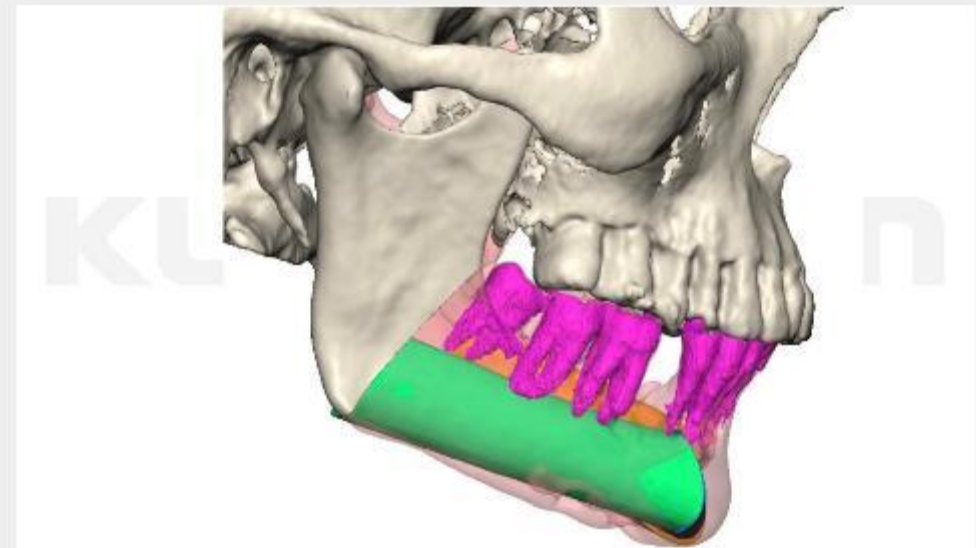
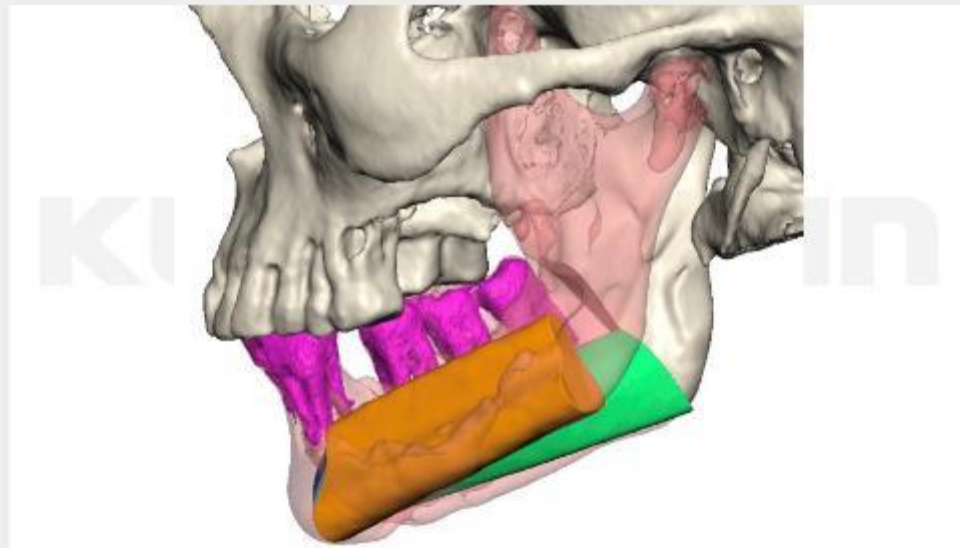
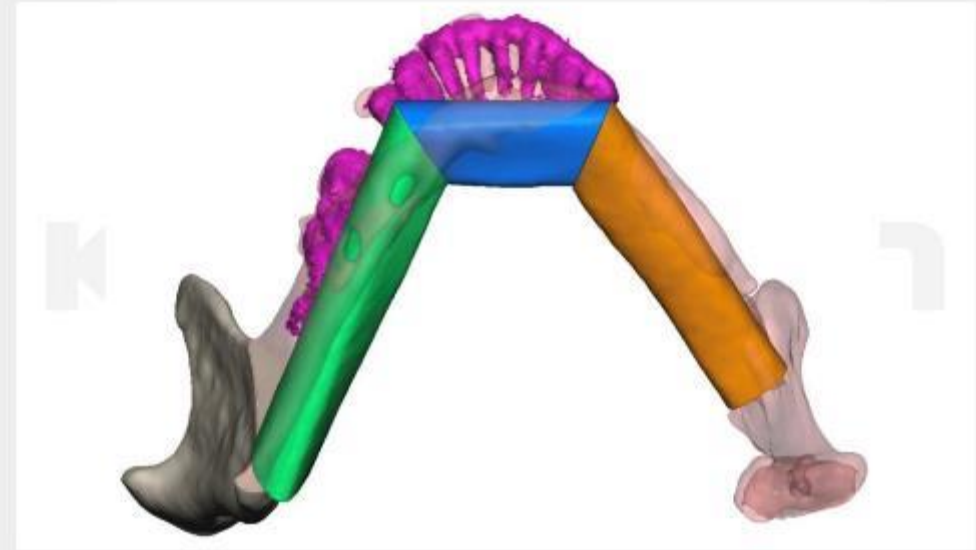
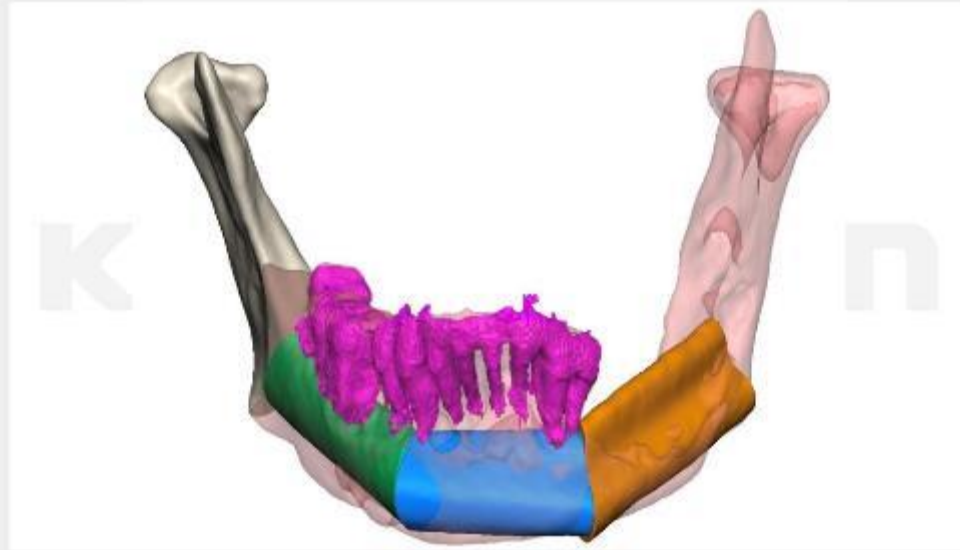




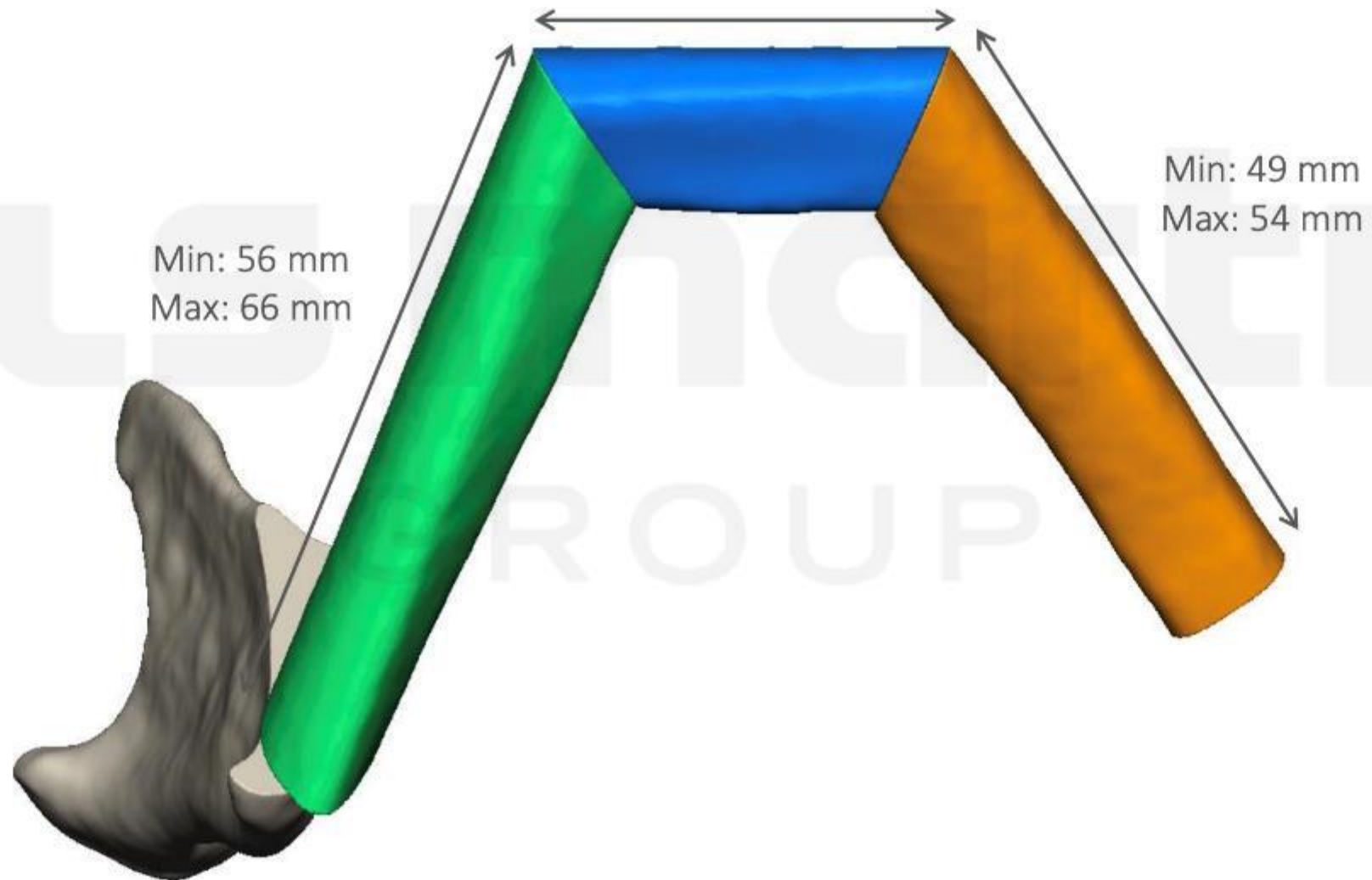




predictive plate hole
screw $\varnothing$ 2.7 mm
drill $\varnothing$ 2.2 mm

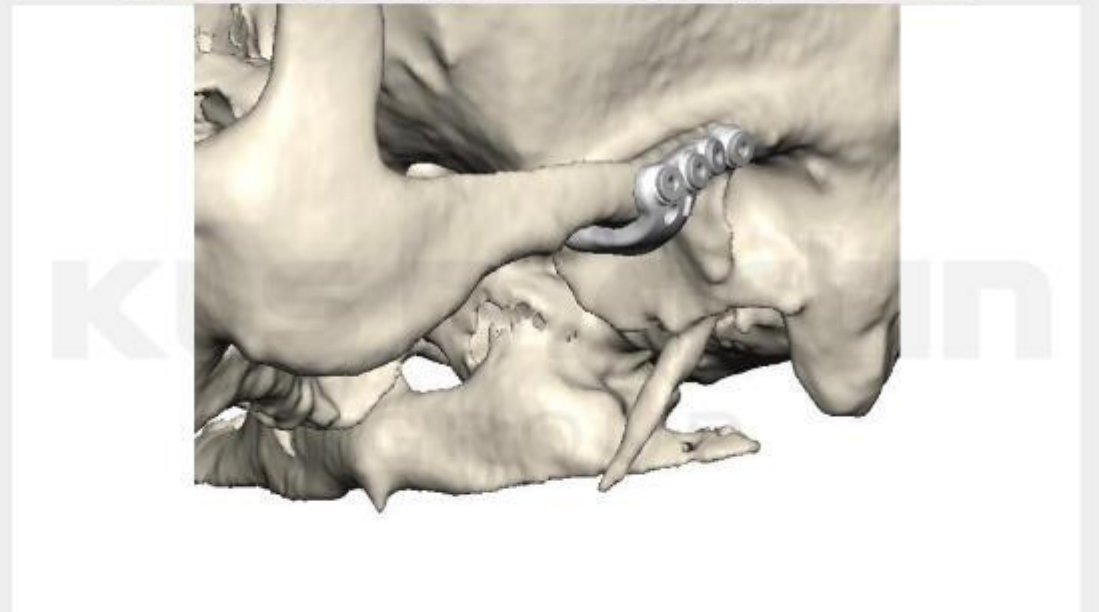
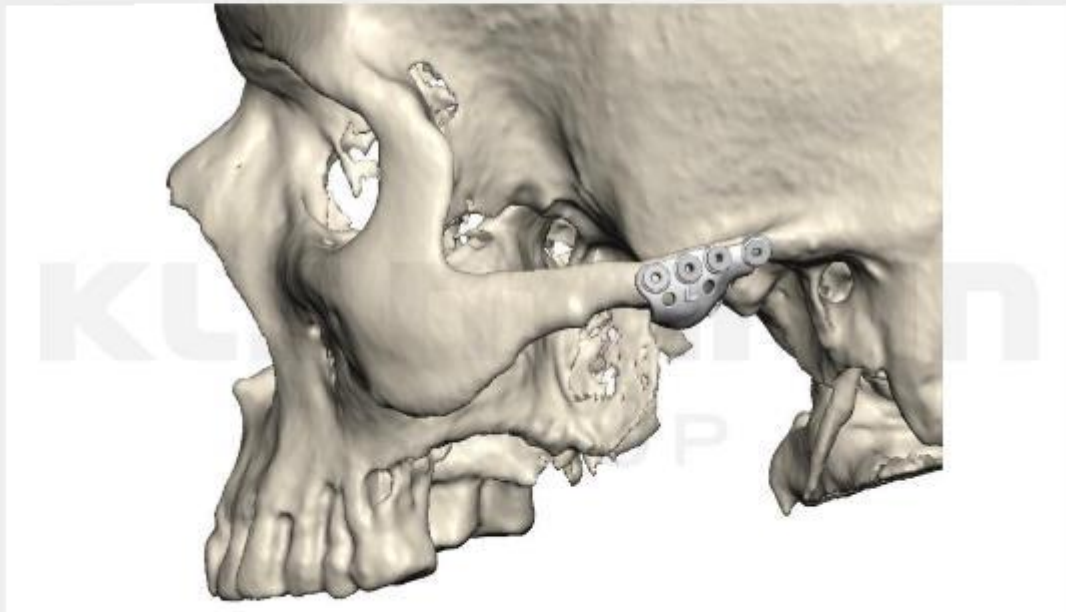
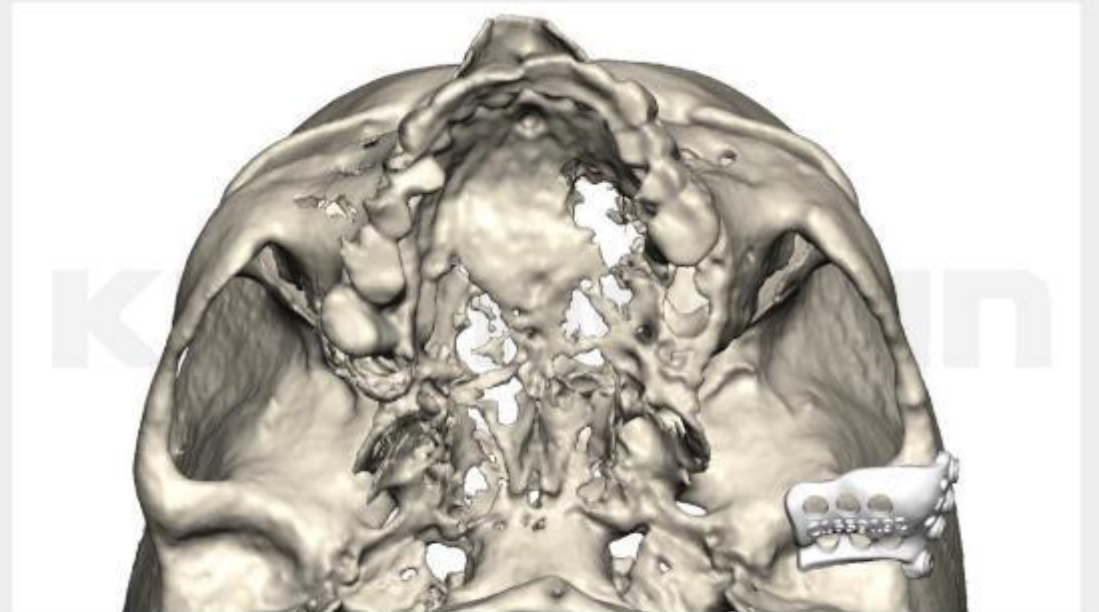


Min: 21 mm
Max: 35 mm



Min: 49 mm
Max: 54 mm

Min: 56 mm
Max: 66 mm





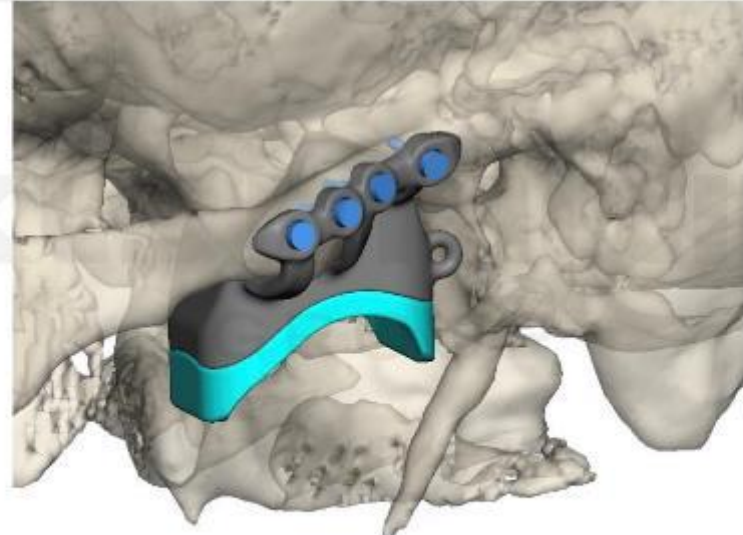
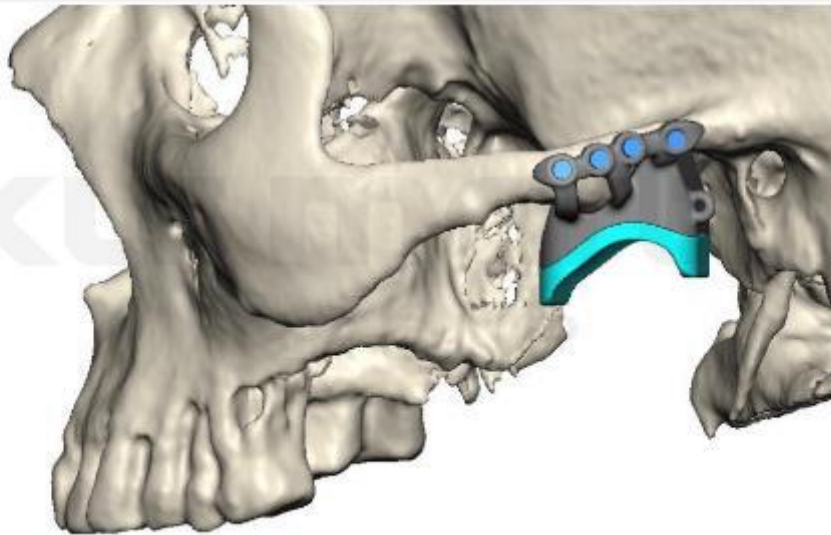
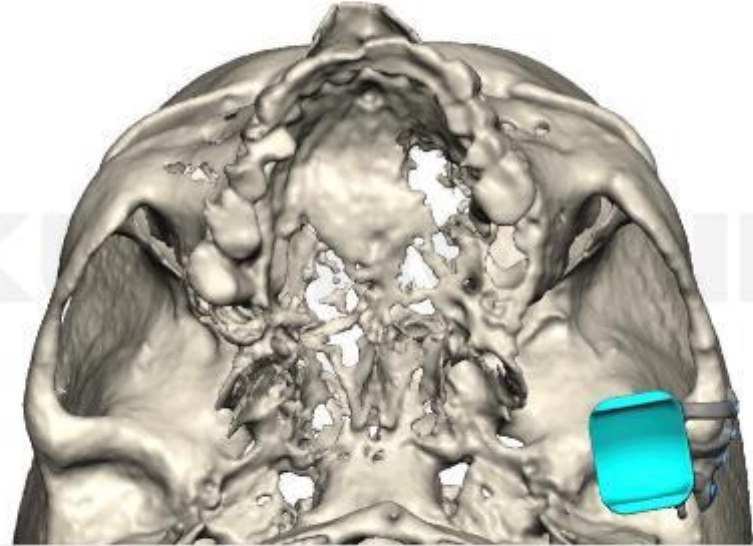
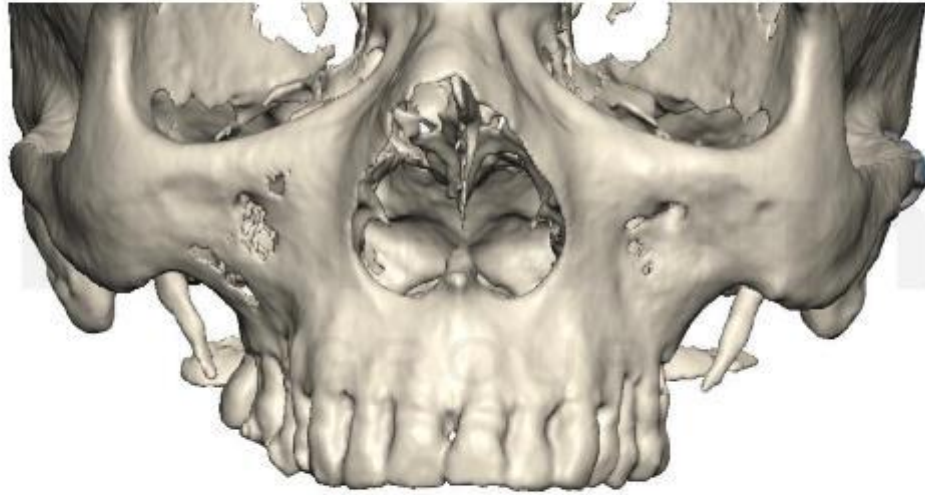
Fossa

Implant(s)

Plate Thickness: 1.5mm / Screw System: 1.5 mm Non- Locking

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Material: Titanium & PE





Implant(s)

Condyle

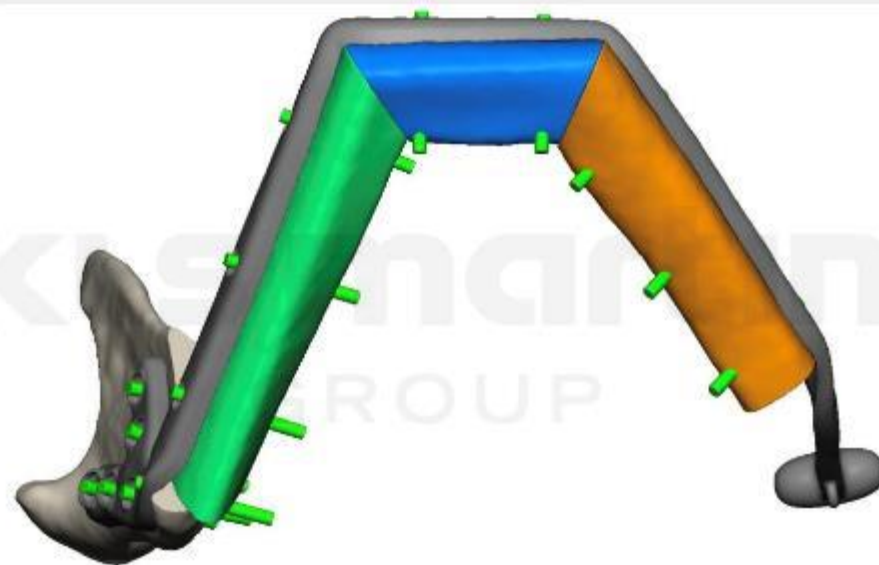
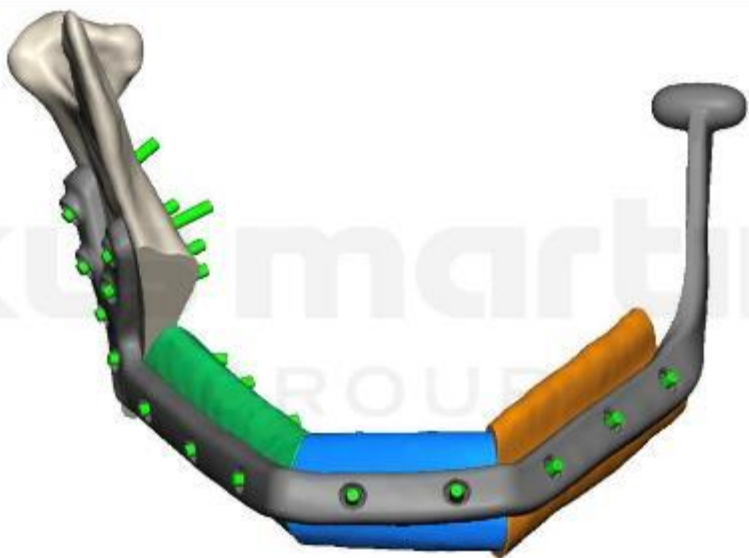
Plate Thickness: 3.0 mm

Screw System: Native Bone : 2.7 mm

Transplant: 2.0 mm

Material: Titanium

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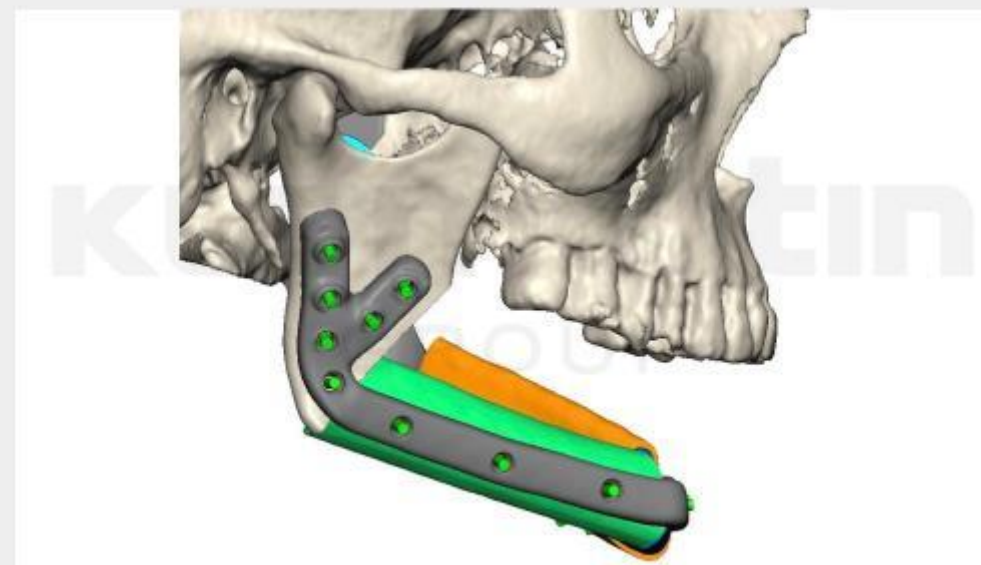
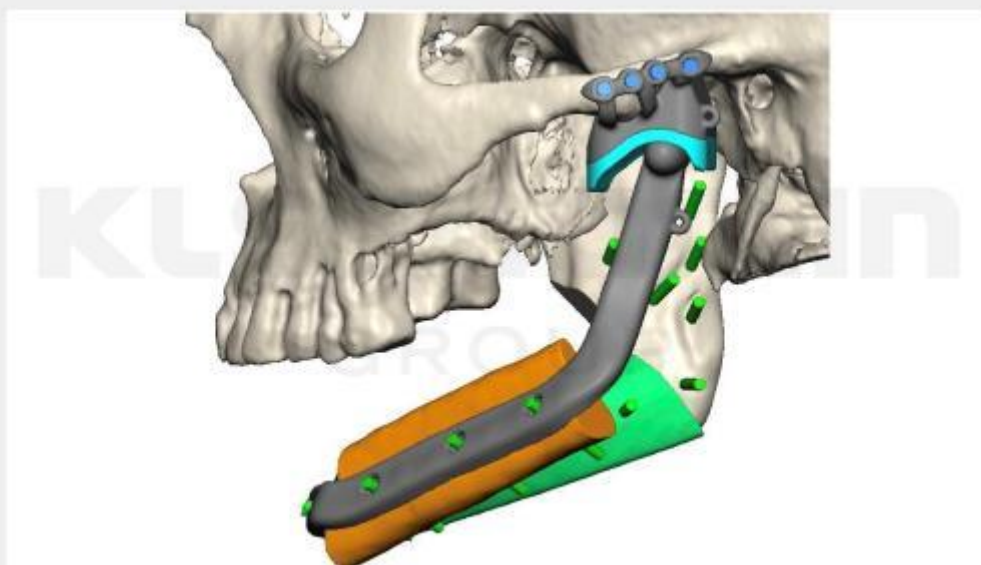
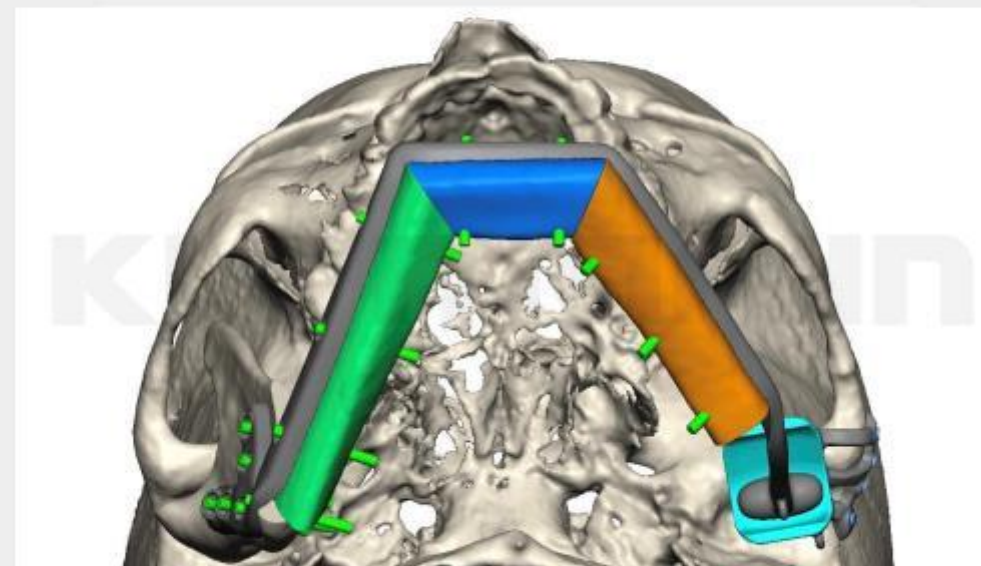
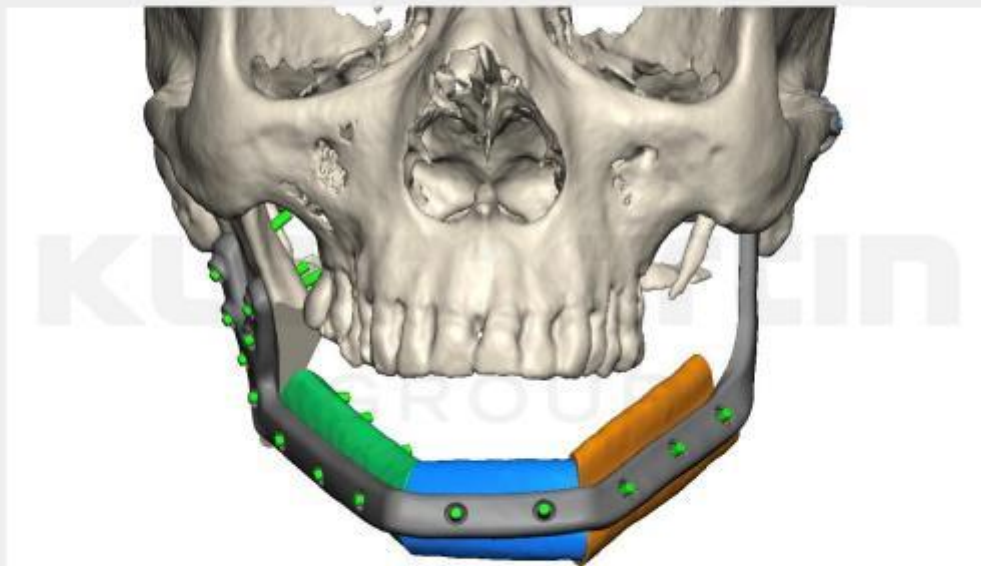


Implant(s)

Overview

Fossa: Plate Thickness: 1.5 mm / Screw System: 1.5 mm Non- Locking
Condyle: Plate Thickness: 3.0 mm / Screw System: 2.0 / 2.7 mm Locking

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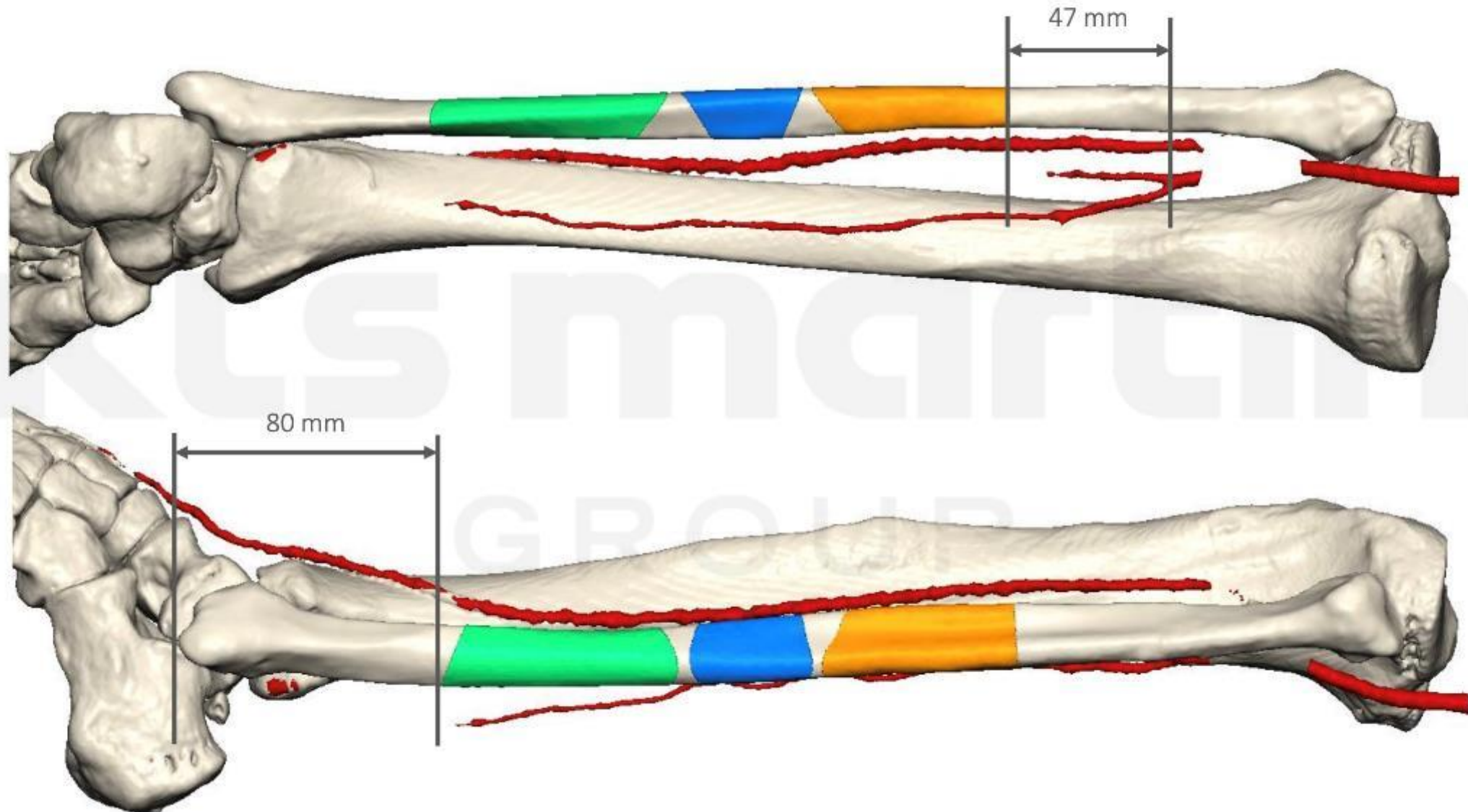
● Dental vector planning $\varnothing = 4.2$ mm



Transplant

fibula left

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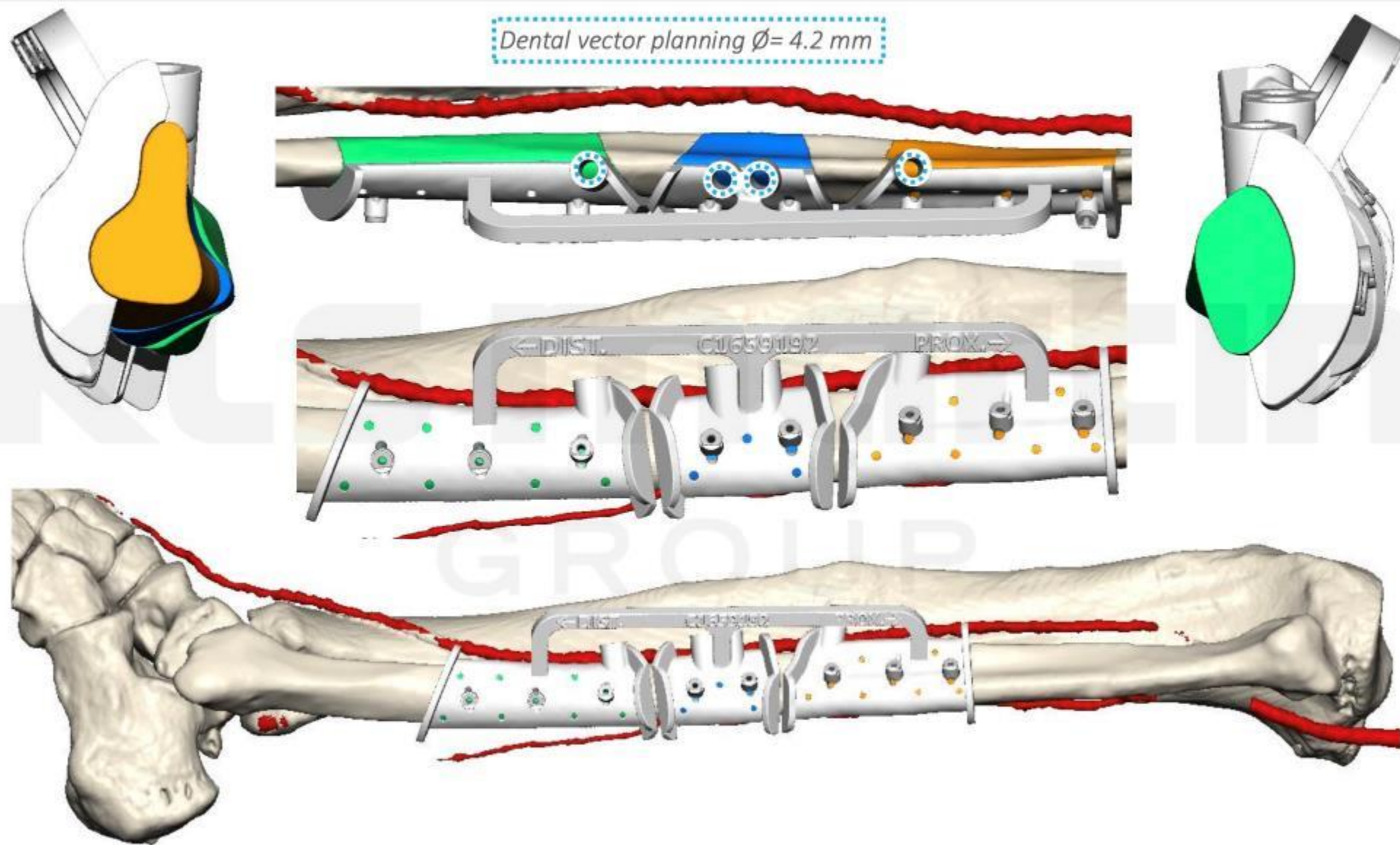


use drill without stop,
irrigate drill

screw $\varnothing$: 2.0 mm
drill $\varnothing$: 1.5 mm



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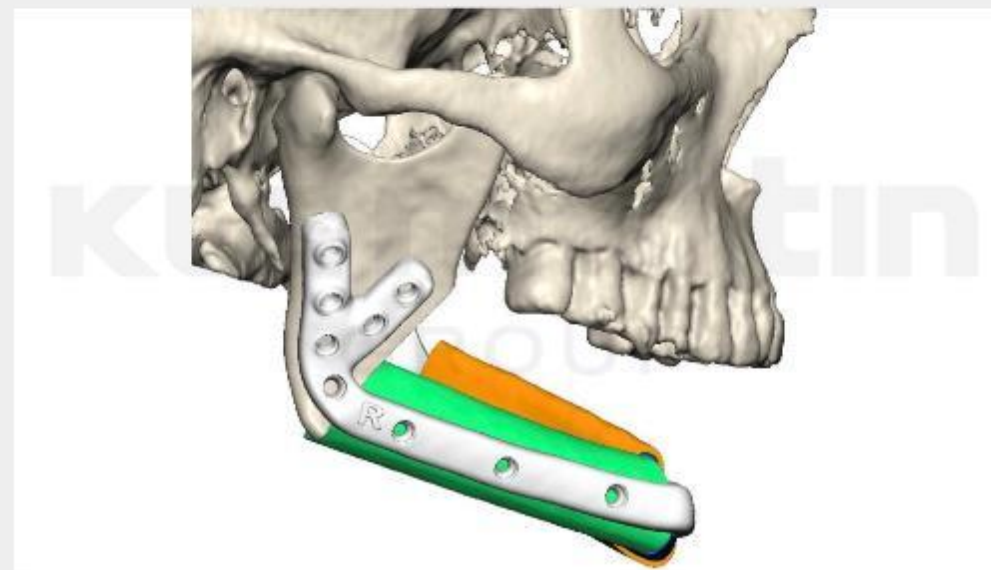
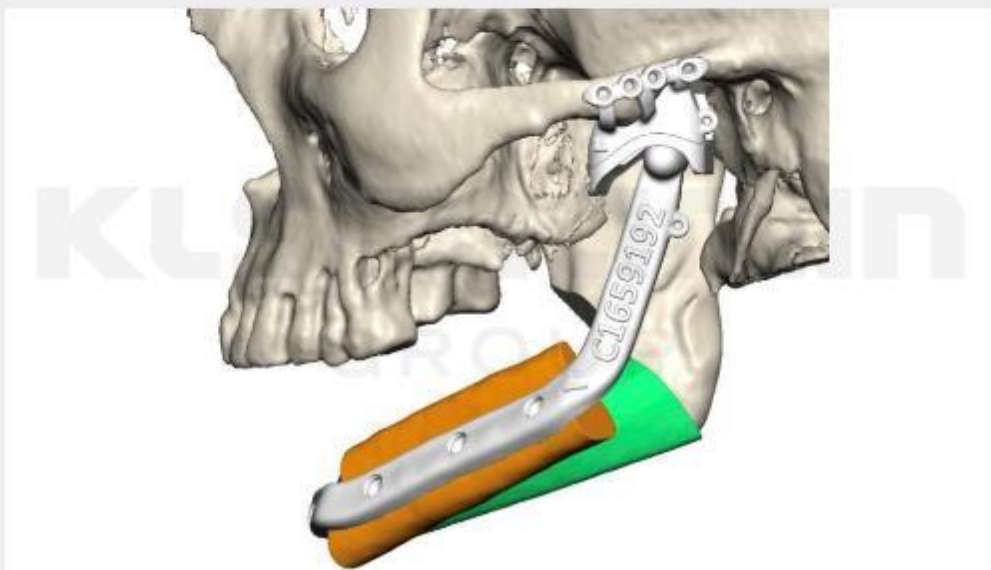
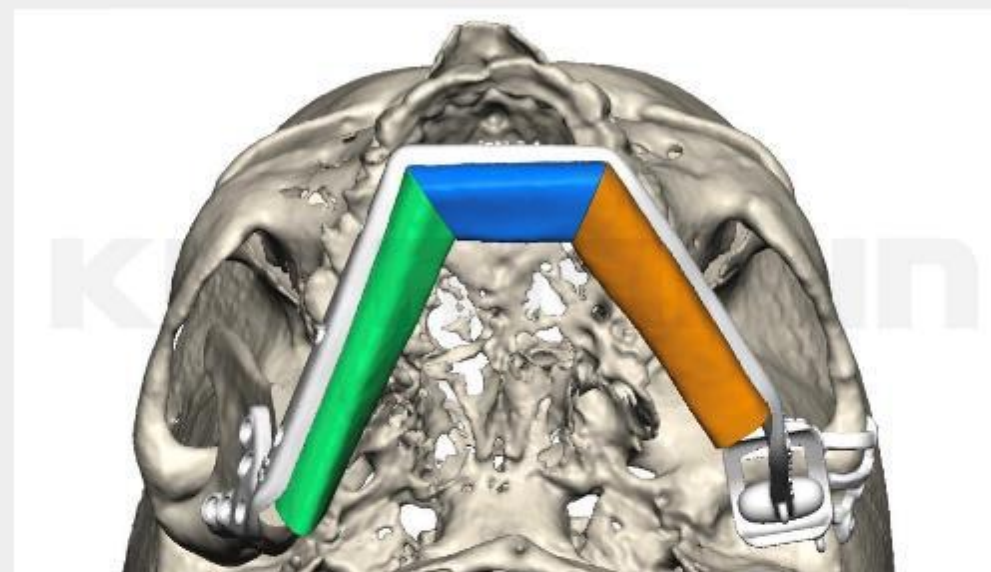
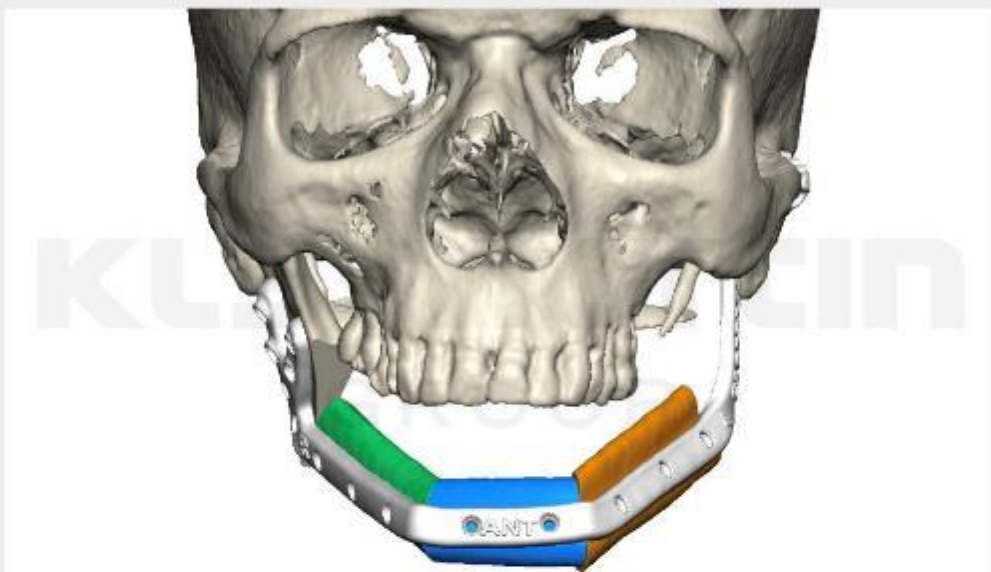


Planning aid(s)

No fixation holes

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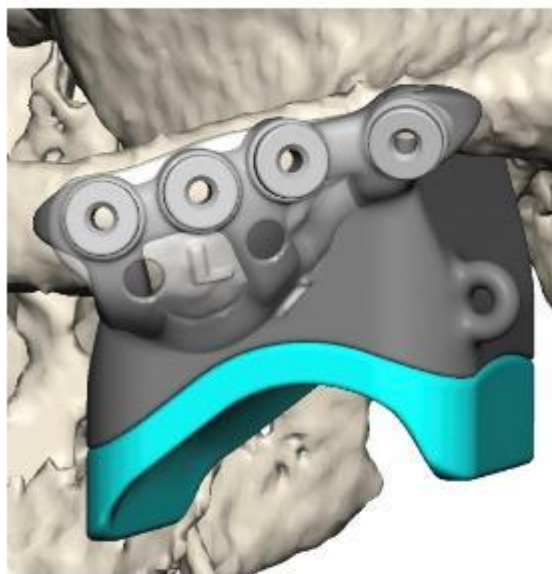
Material: PA



Screws- plate thickness: 1.5 mm

Screw Type	Pos.	Theoretical Screw Length*	Suggested Screw Length
Ø 1.5 NON-Locking (bicort.)	1	12,0	11
Ø 1.5 NON-Locking (bicort.)	2	6,0	5
Ø 1.5 NON-Locking (bicort.)	3	7,0	7
Ø 1.5 NON-Locking (bicort.)	4	7,0	7

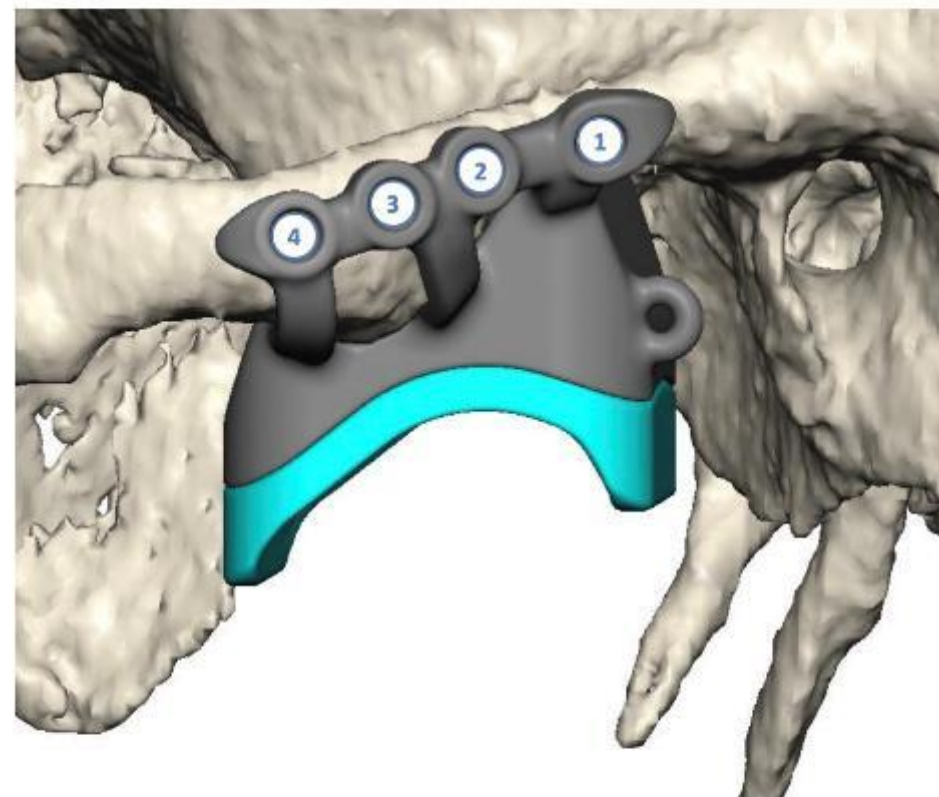
Guide & implant together:



**For 1.5 mm screws:
due to restricted area no lasermarkings possible**

- Theoretical screw length = plate profile plus bone profile

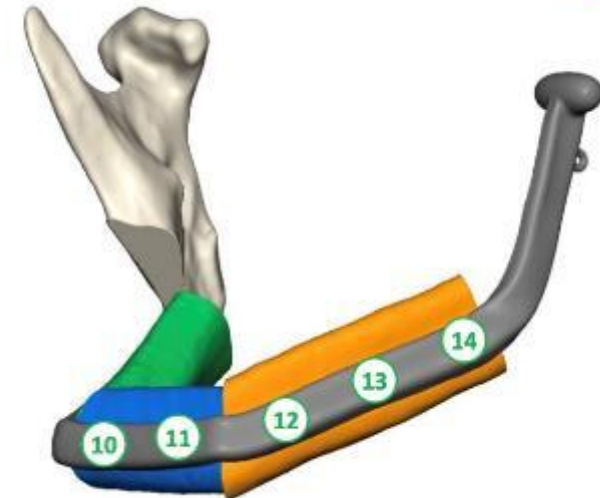
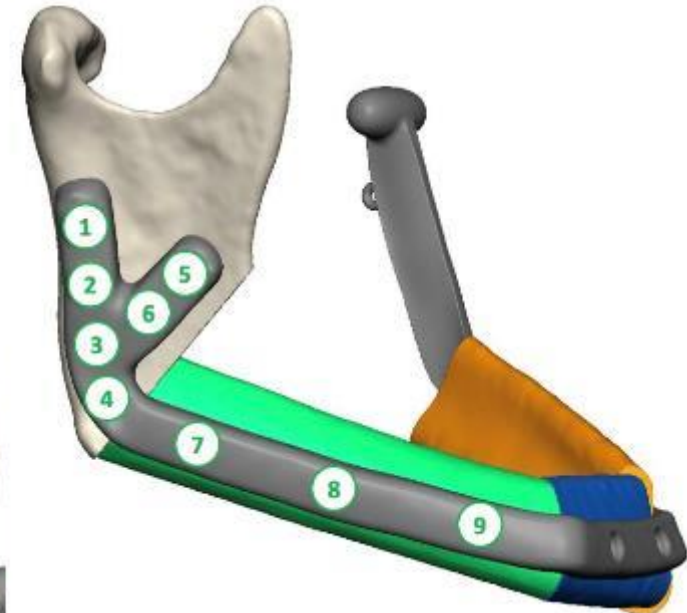
Measurements based on digital planning only. Final decision to be made at surgeon's discretion.



Screws- plate thickness: 3.0 mm

Screw Type	Pos.	Theoretical Screw Length*	Suggested Screw Length
Ø 2.7 Locking (bicort.)	1	9,9	9
Ø 2.7 Locking (bicort.)	2	11,1	11
Ø 2.7 Locking (bicort.)	3	11,7	11
Ø 2.7 Locking (bicort.)	4	9,3	9
Ø 2.7 Locking (bicort.)	5	12,2	11
Ø 2.7 Locking (bicort.)	6	9,7	9
Ø 2.0 Locking (monocort.)	7	-	(7-9)
Ø 2.0 Locking (monocort.)	8	-	(7-9)
Ø 2.0 Locking (monocort.)	9	-	(7-9)
Ø 2.0 Locking (monocort.)	10	-	(7-9)
Ø 2.0 Locking (monocort.)	11	-	(7-9)
Ø 2.0 Locking (monocort.)	12	-	(7-9)
Ø 2.0 Locking (monocort.)	13	-	(7-9)
Ø 2.0 Locking (monocort.)	14	-	(7-9)

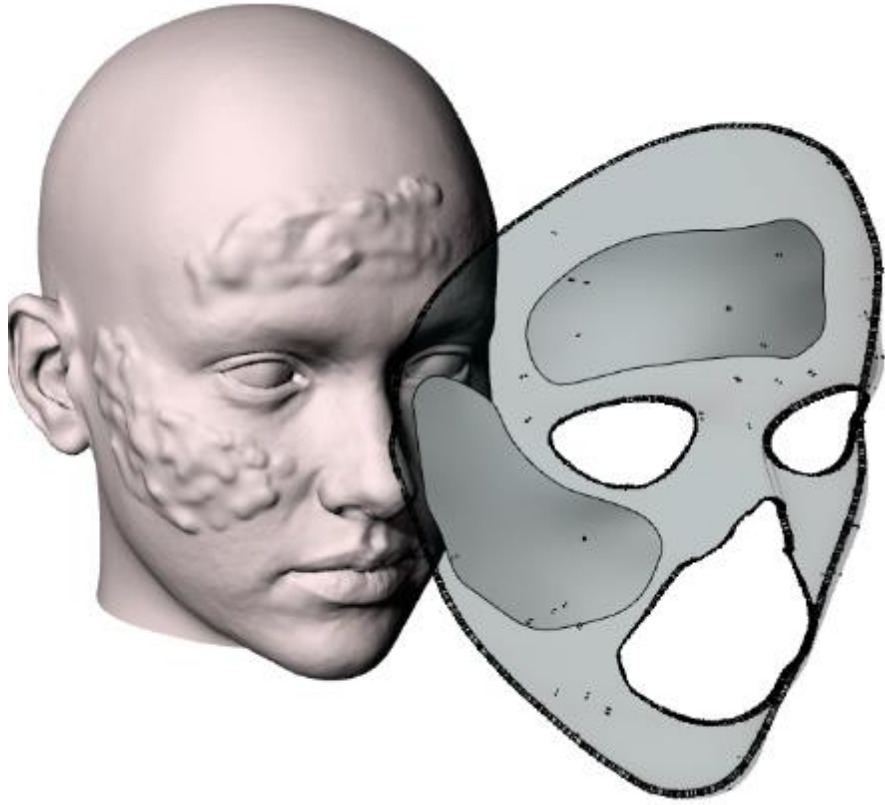
Guide & implant together:



- Theoretical screw length = plate profile plus bone profile

Measurements based on digital planning only. Final decision to be made at surgeon's discretion.

Postoperativa hjälpmedel



Patientspecifika ortoser/skenor
för rehabilitering



Teknik-skutt i Etiopien!

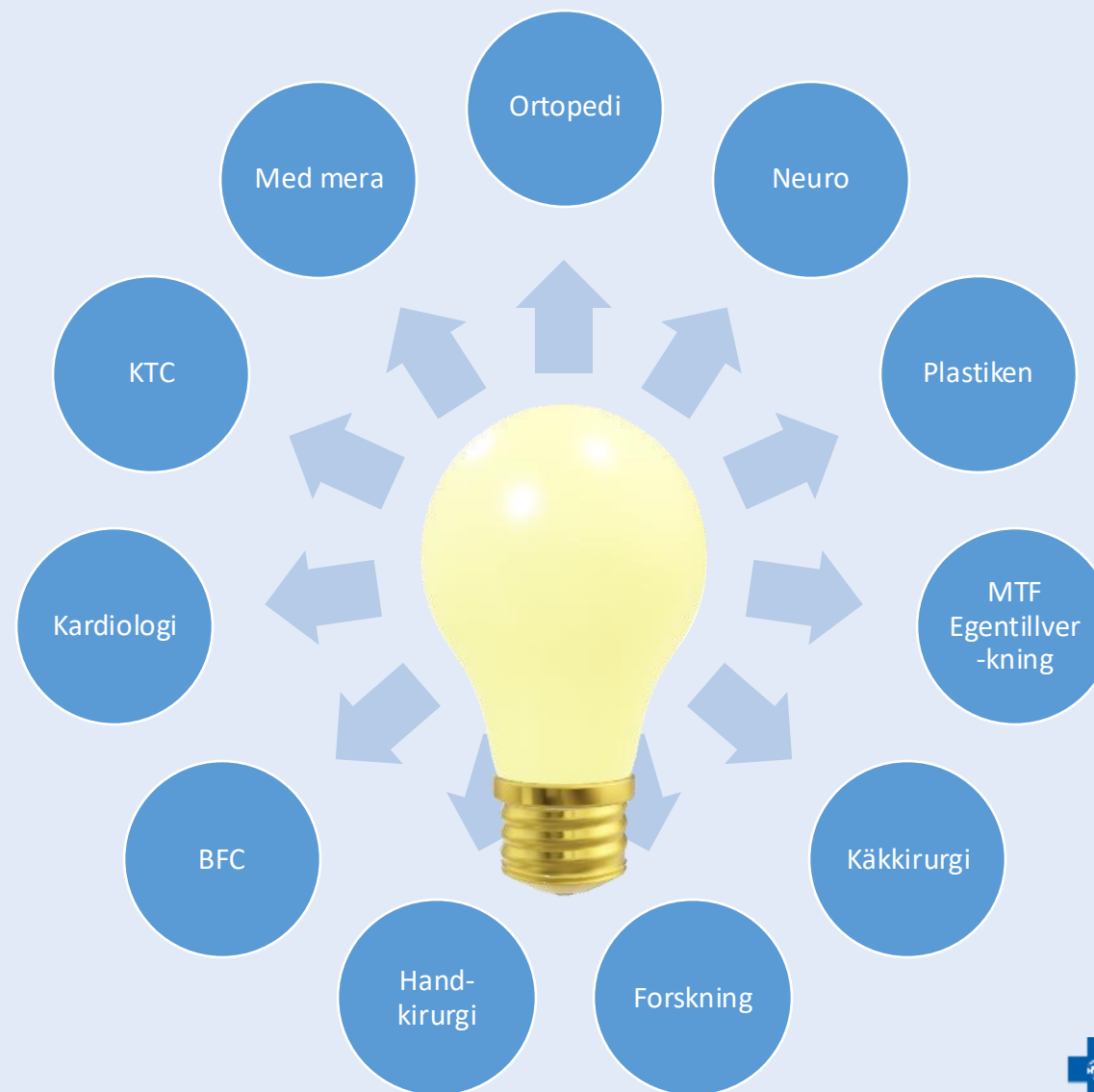


Skräddarsydda tillägg till olika
stativ och andra instrument

3D-printfacilitetens Uppdrag & implementering

Hela sjukhusets center

- **Alla VO har access**
- **Alla inom VO har access**
- **Patientvård**
- **Forskningsstöd**
- **Utbildningsstöd**
- **MTF stöd**





**AKADEMISKA
SJUKHUSET**



Tack för er tid!

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