



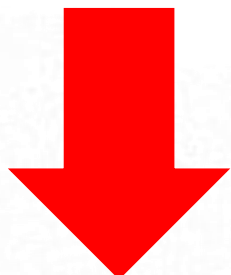
Digital Implant guided surgery

Dr. ali jameel

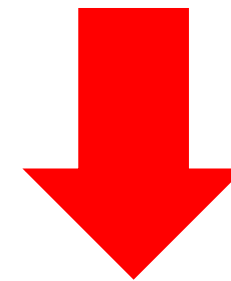
Implant guided surgery classification

Static guided surgery

Dynamic guided surgery



**Implant surgical guide
(guided implant surgery)**



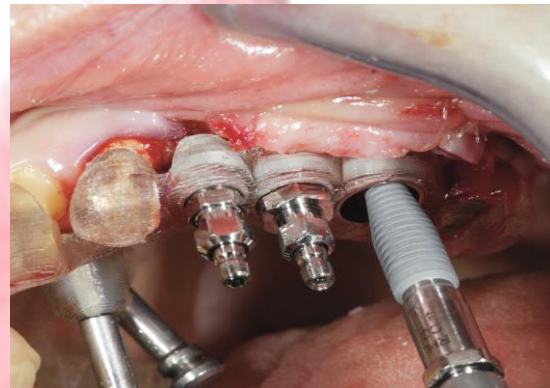
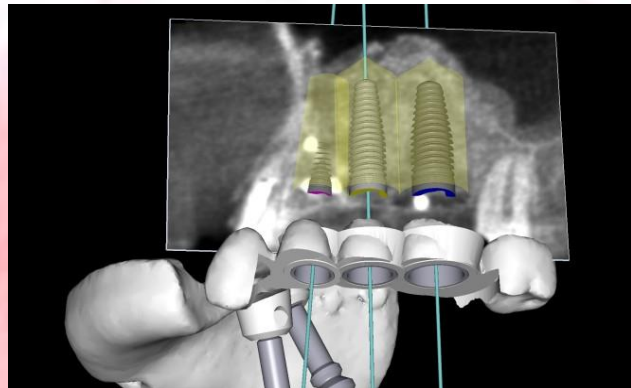
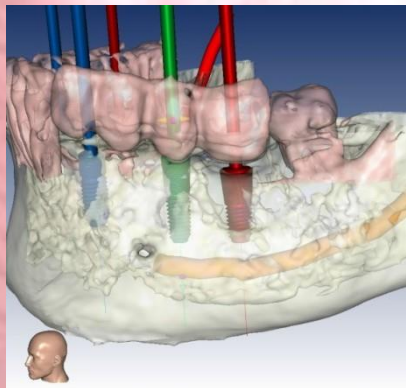
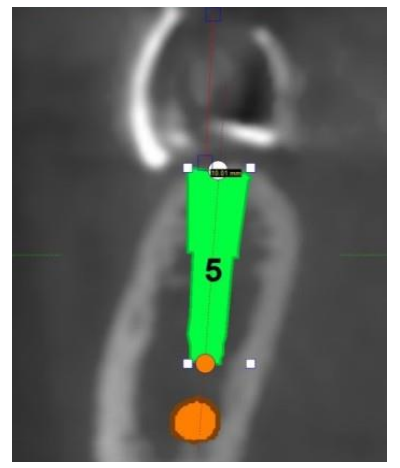
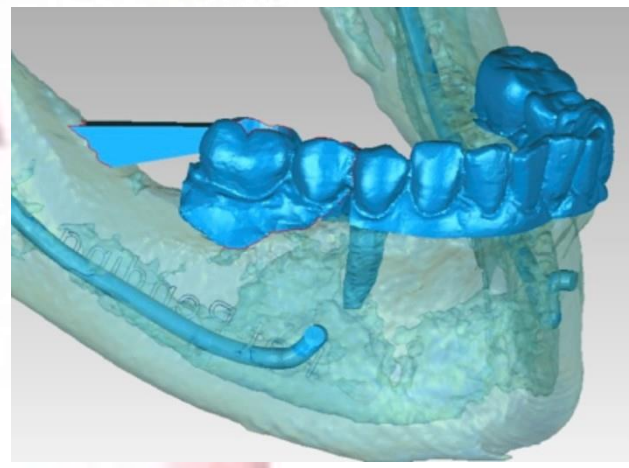
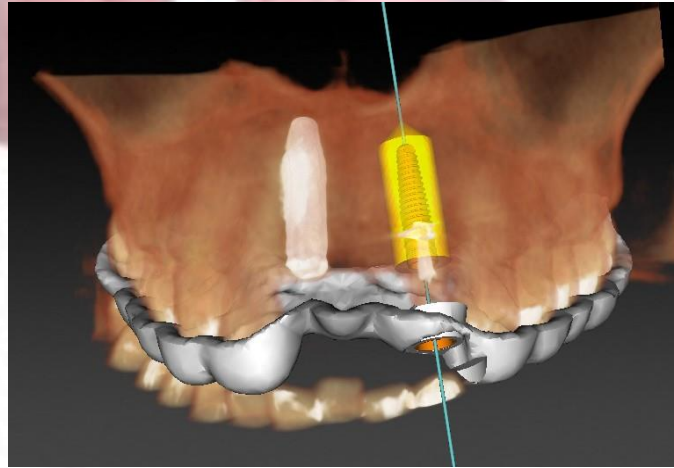
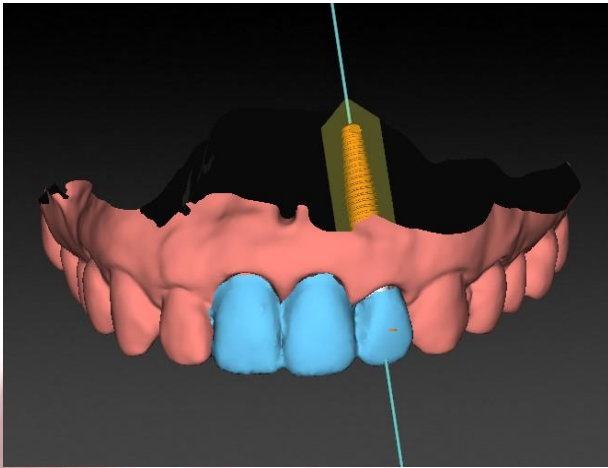
implant Navigation surgery

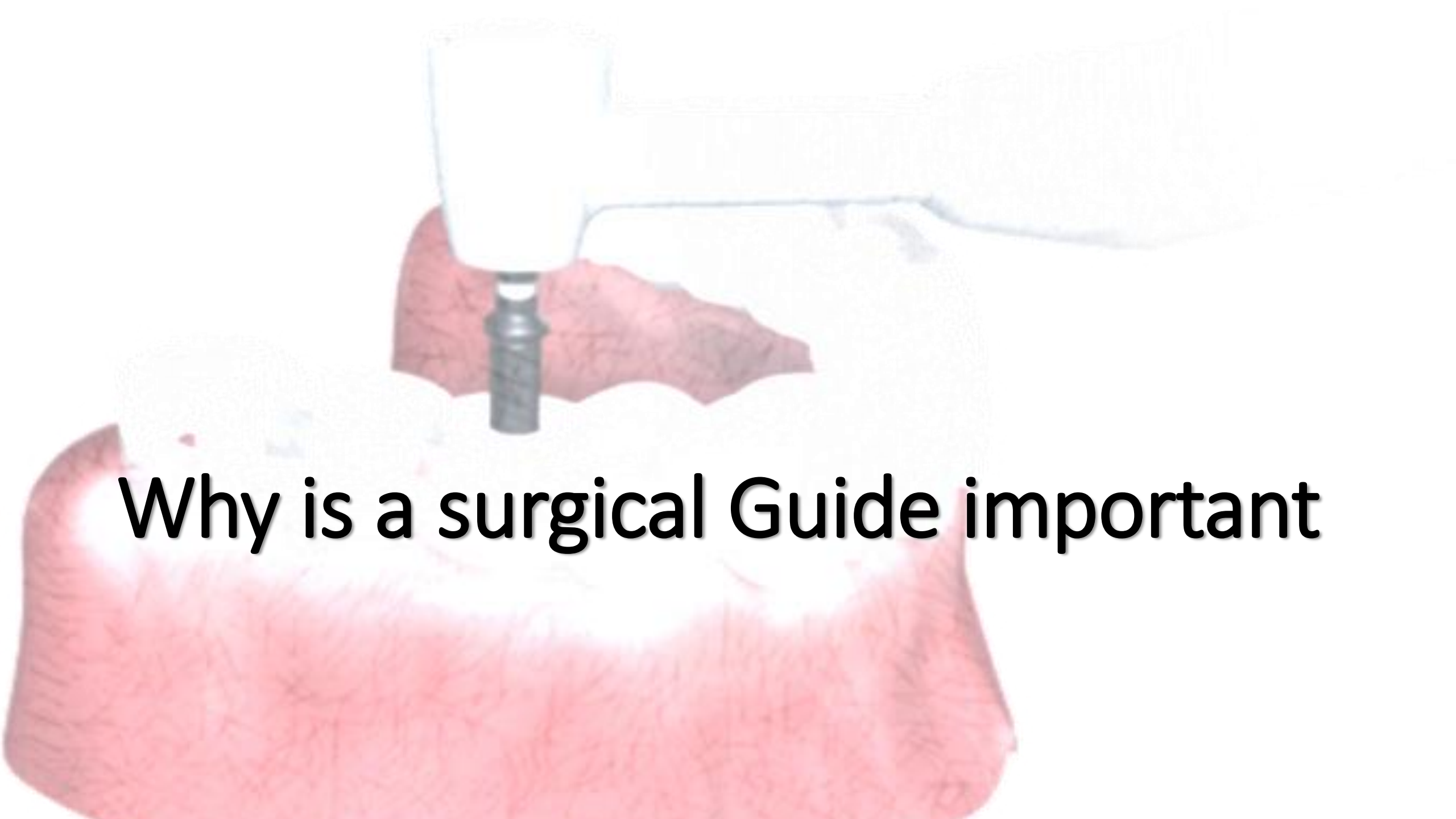
Guided implant surgery

- During the last decade, special attention was given to a **prosthesis driven implant placement** to optimize the **aesthetic outcome** of the final restoration with optimal loading condition and good access for cleaning.
- Three dimension imaging (showing the alveolar bone in relation to the ideal tooth position.) obtainable with relative low radiation dosage especially when **CBCT** are used (**Loubele et al. 2009; Pauwels et al. 2012**) in combination **with planning software** opened the possibility for **preoperative planning** and **proper communication** among the patient, the surgeon and the Prosthodontists.

What is a surgical guide?

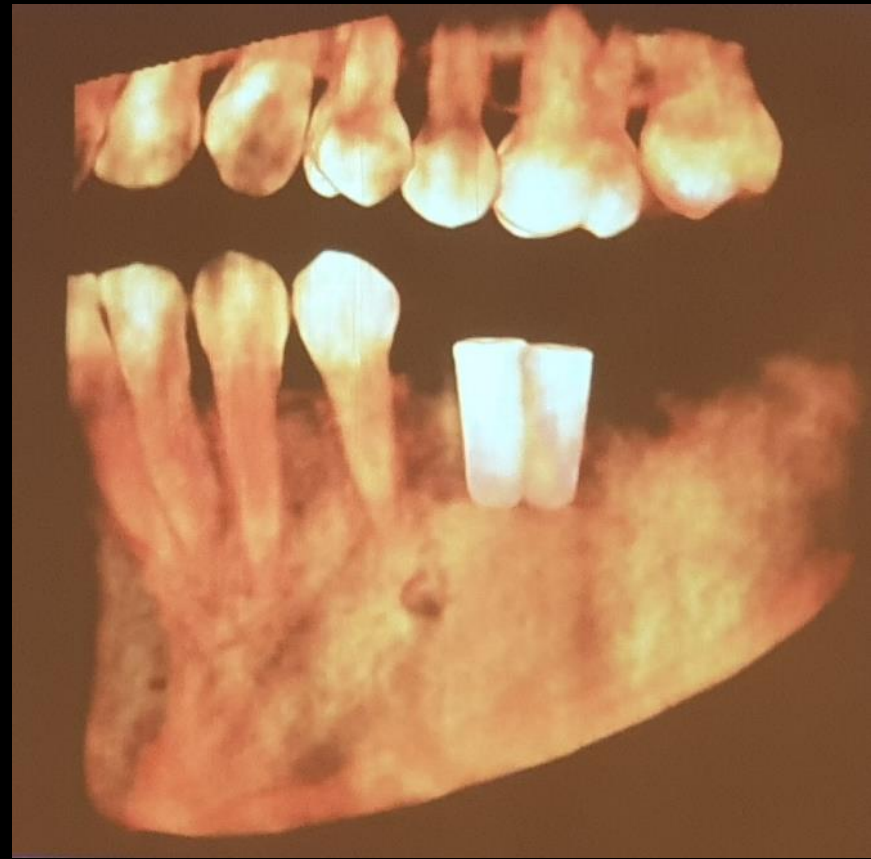
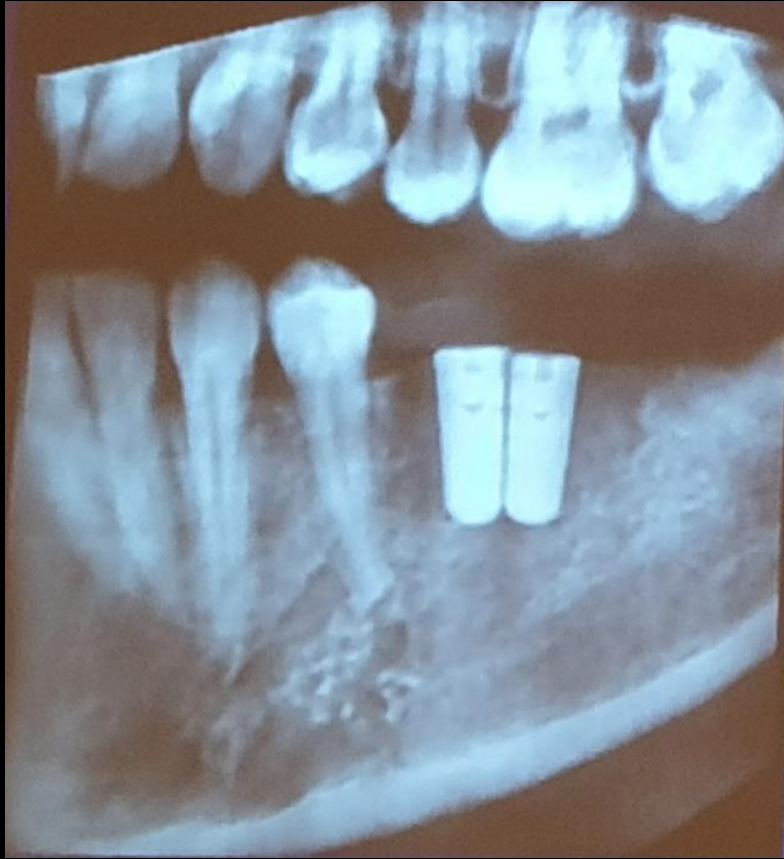
A computer generated implant surgical guide is supposed to accurately transfer the virtual pre planned site into the real surgical position (position ,direction and depth).





Why is a surgical Guide important

1-Position of the implant

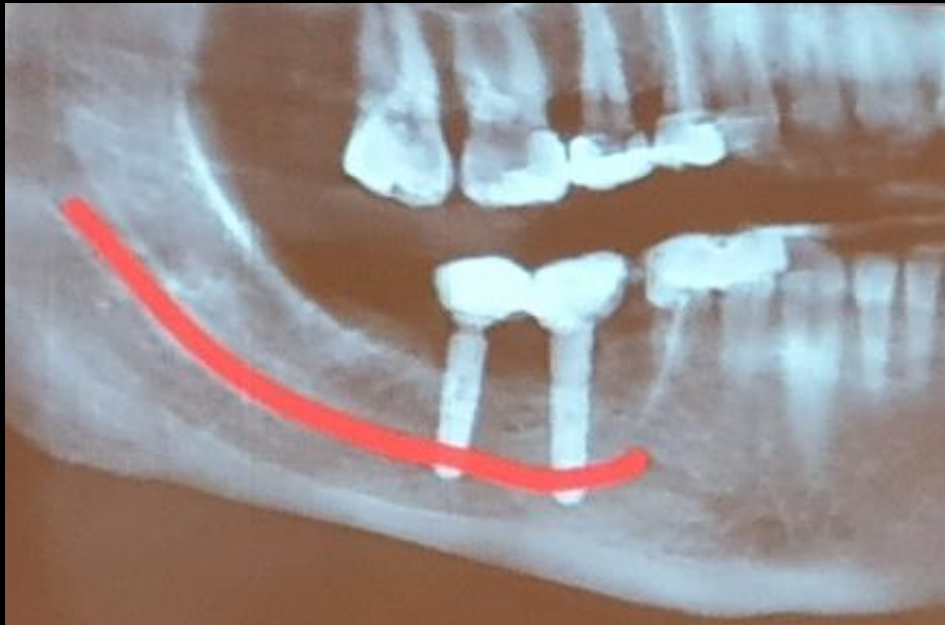


2-Direction of drilling

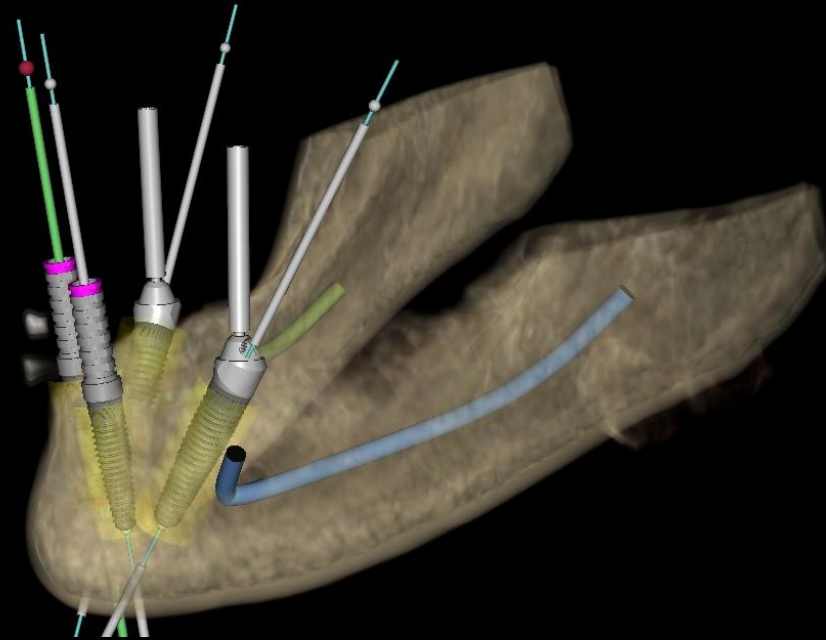
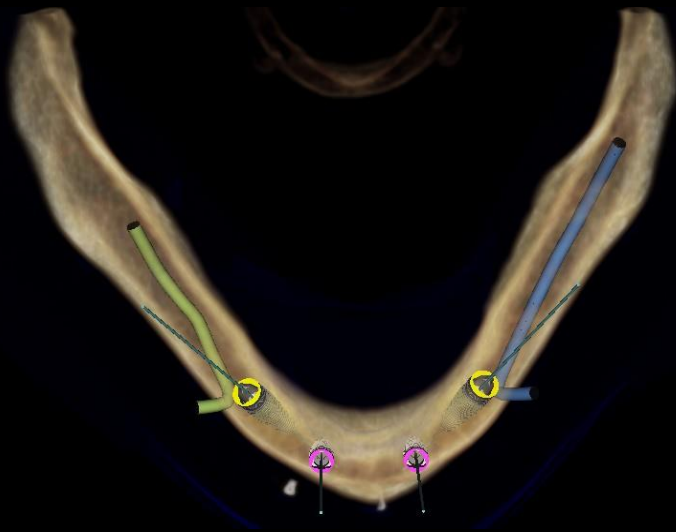
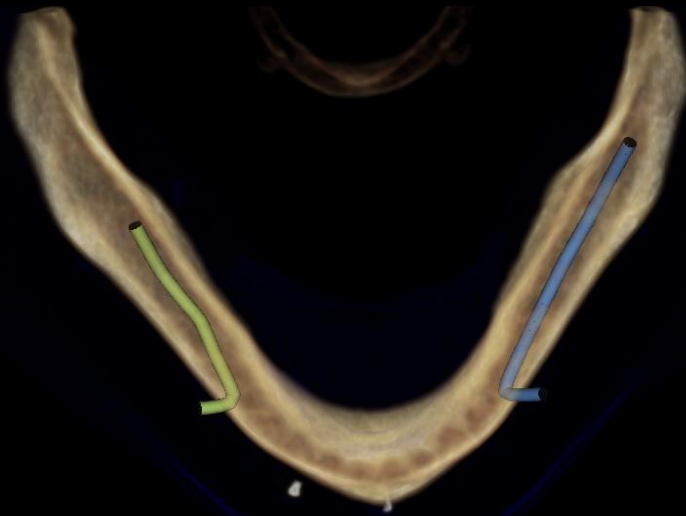


3-Control depth of drilling

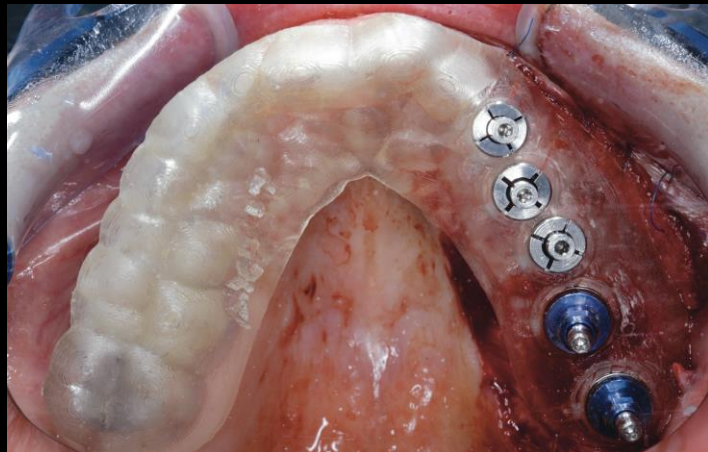
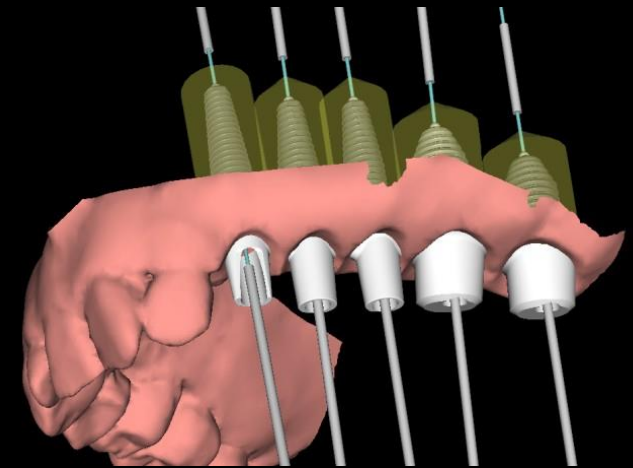
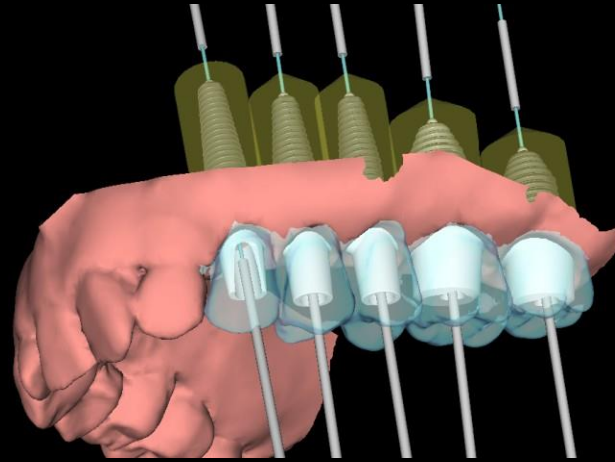
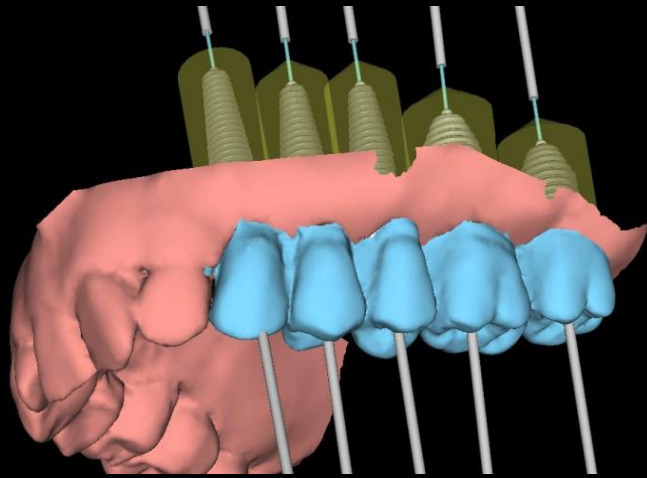
Less risk of compromising adjacent vital structures



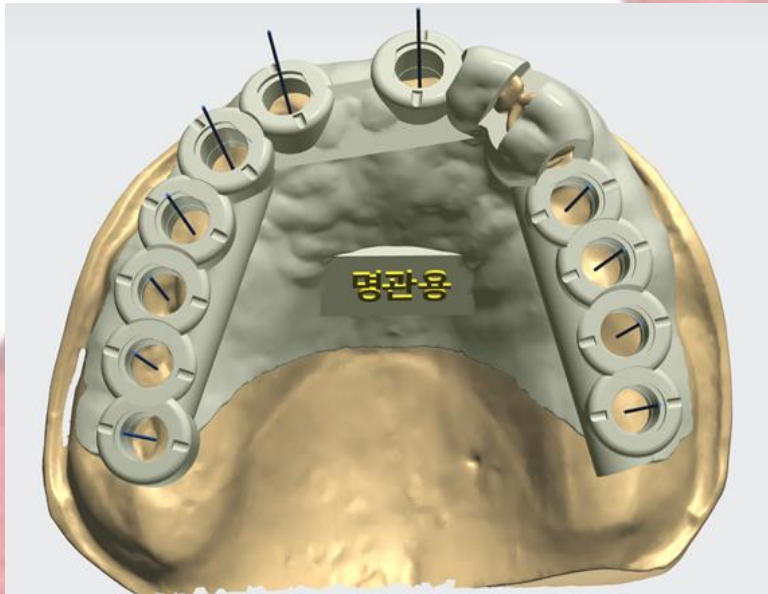
4- better implant distribution pattern for more favorable biomechanics



5-Prefabrication of the abutments, prostheses



Is it a complex procedure to fabricate a computer generated surgical guide?



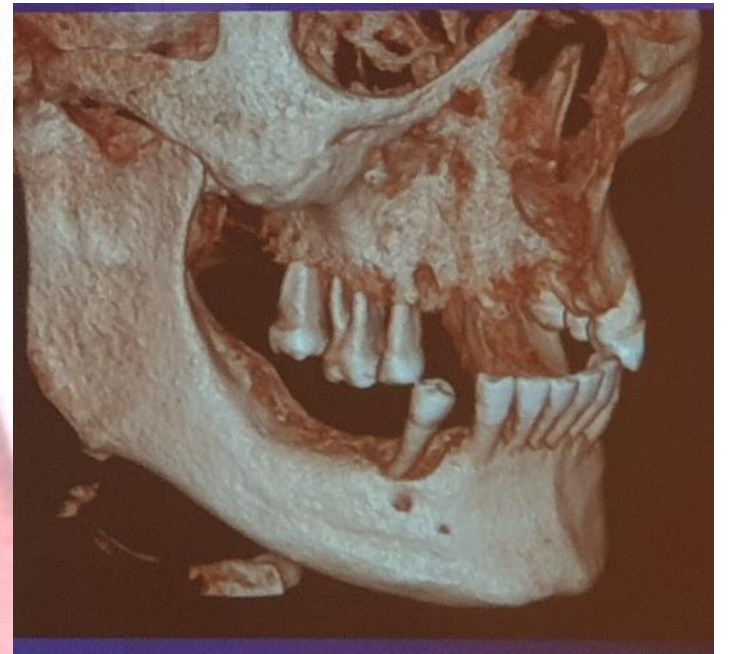
Structures involved in planning procedures

- Bone
- Teeth
- Mucosa



bone

Obtained by
CBCT scan of the patient (DICOM)
digital imaging and communication in
medicine DICOM



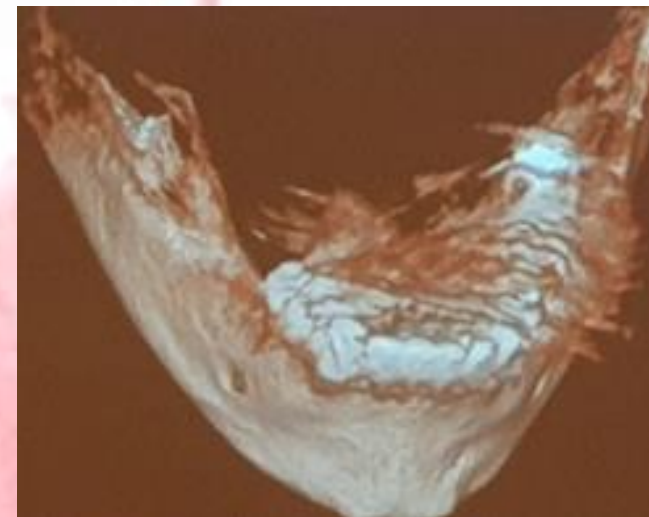
CBCT as diagnostic tool

- The only tool that can be used to assess the inner & outer bone details
- Considered as the operator's 3rd eye

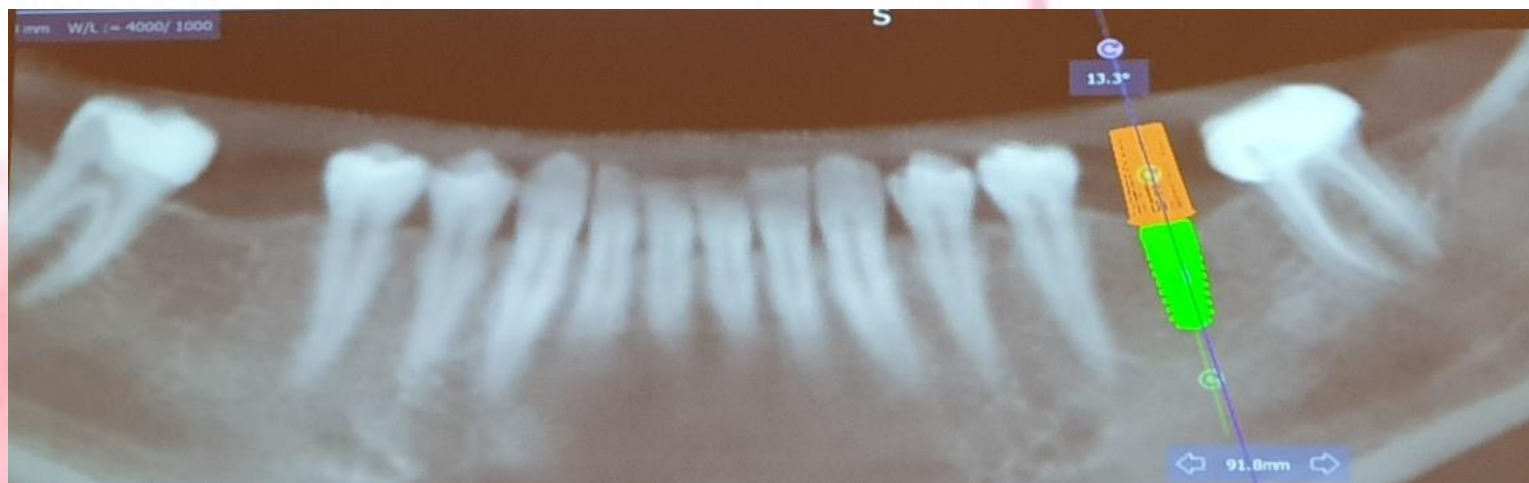
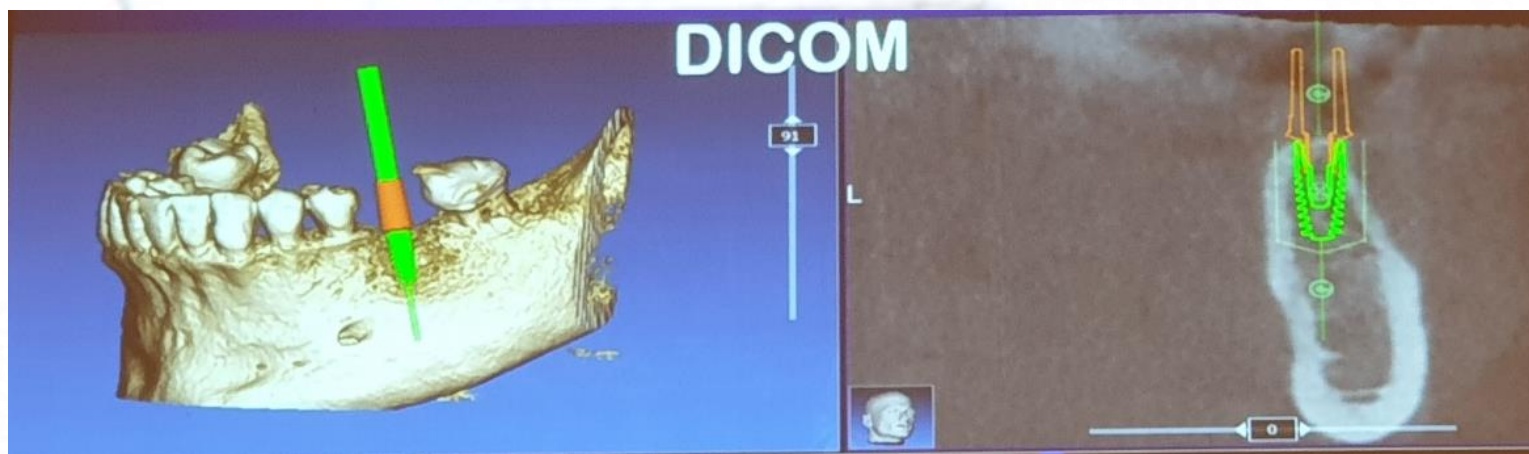
Limitation :

No soft tissue information

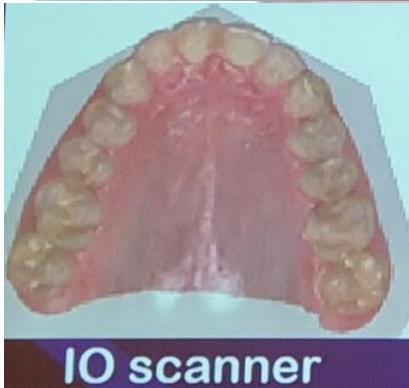
Inaccurate teeth data in case of metal artifacts



- **Bone** for implant planning



Optical scanning (the digital impression)

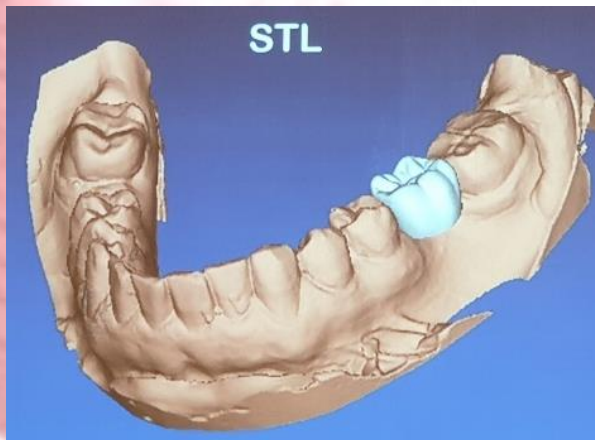


IO scanner

Optical scanning is used to obtain a digital impression or digital cast model



Ex.O scanner



STL

Teeth & mucosa as supporting structures for prosthetic planning

there is **NO** single modality that can show all these structures combined together accurately and appear in single view



Bone

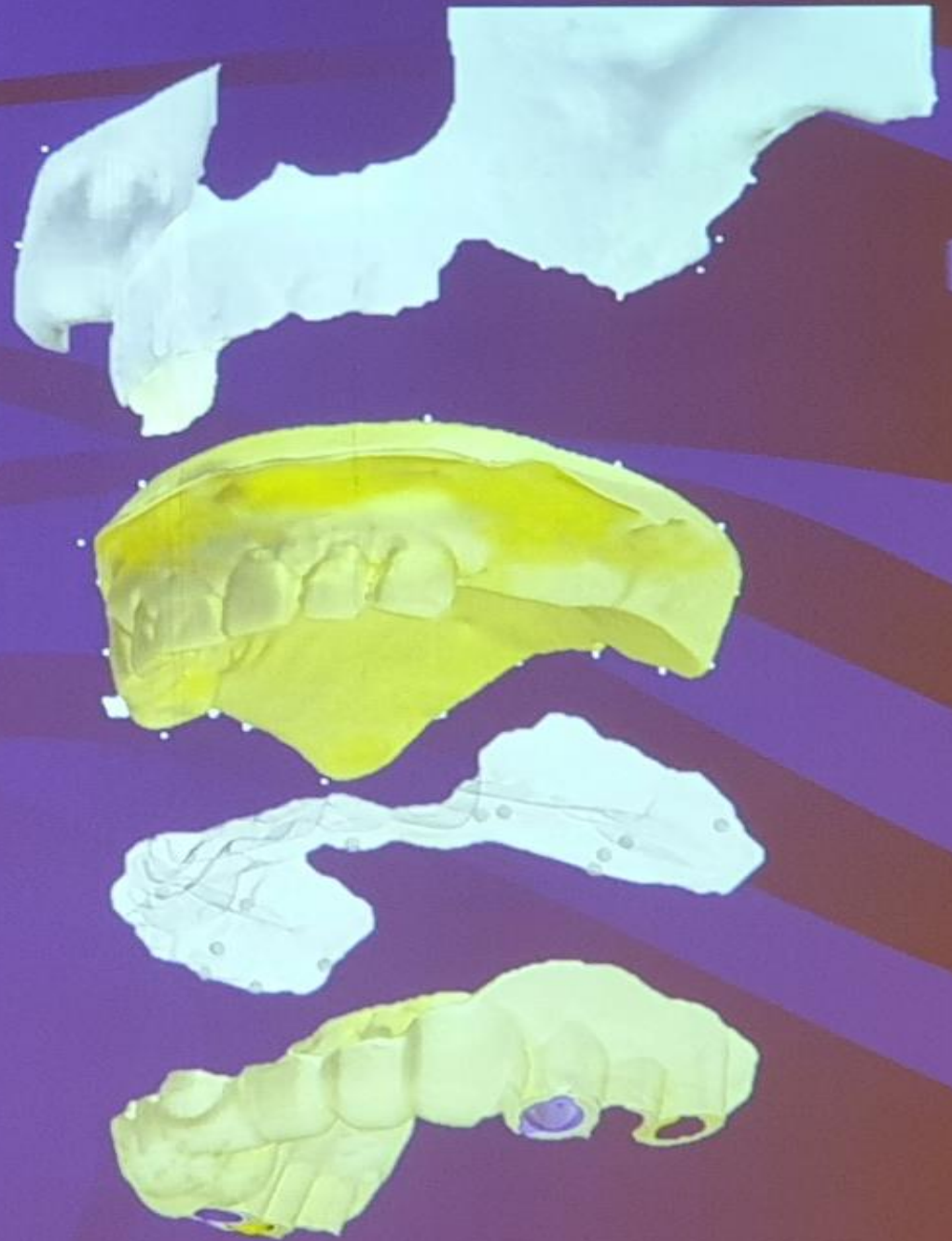


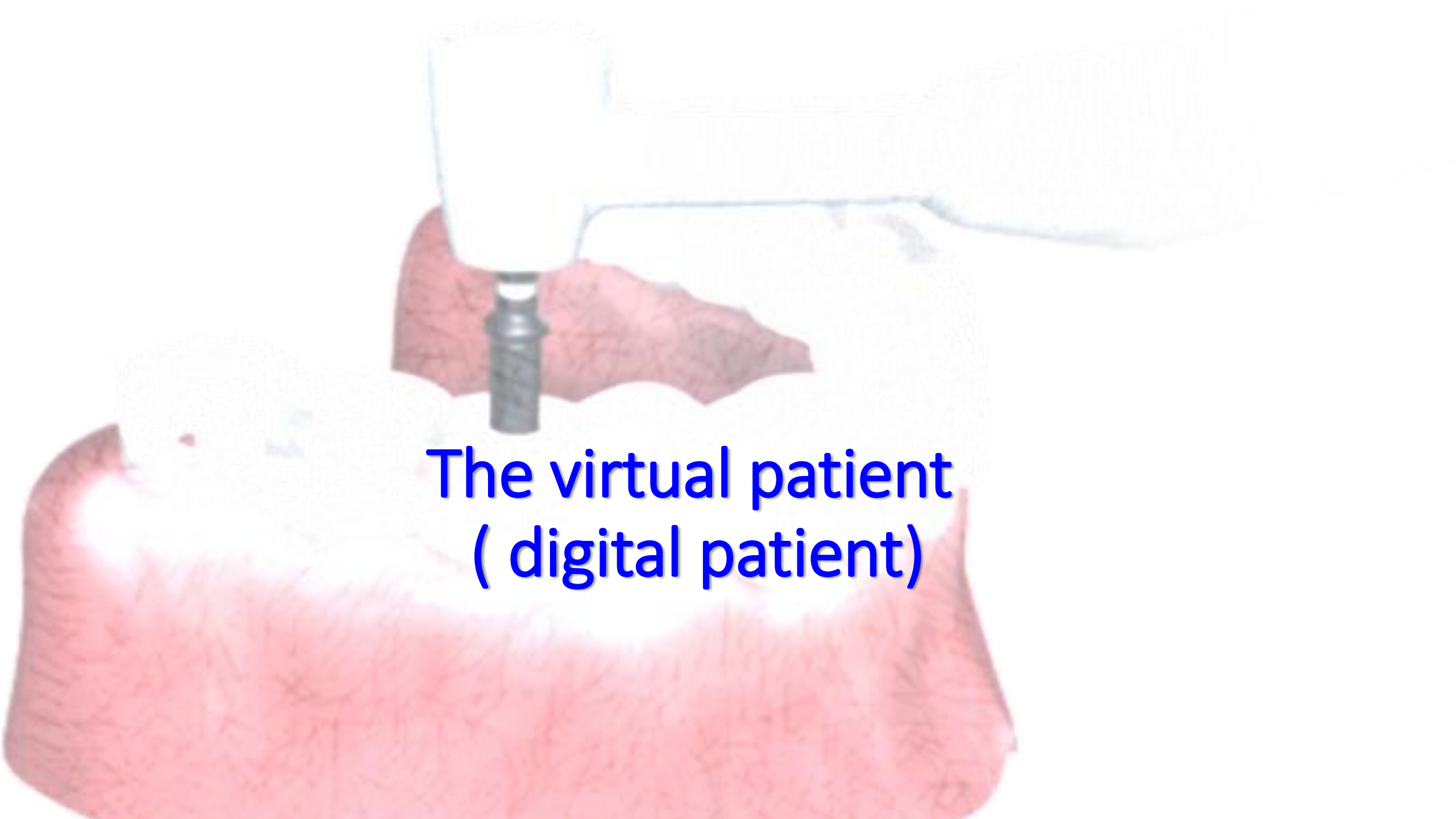
Soft tissues



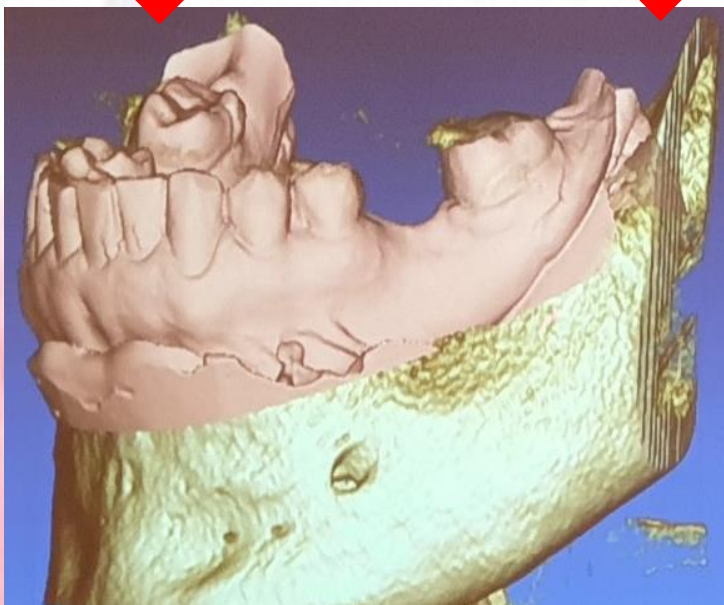
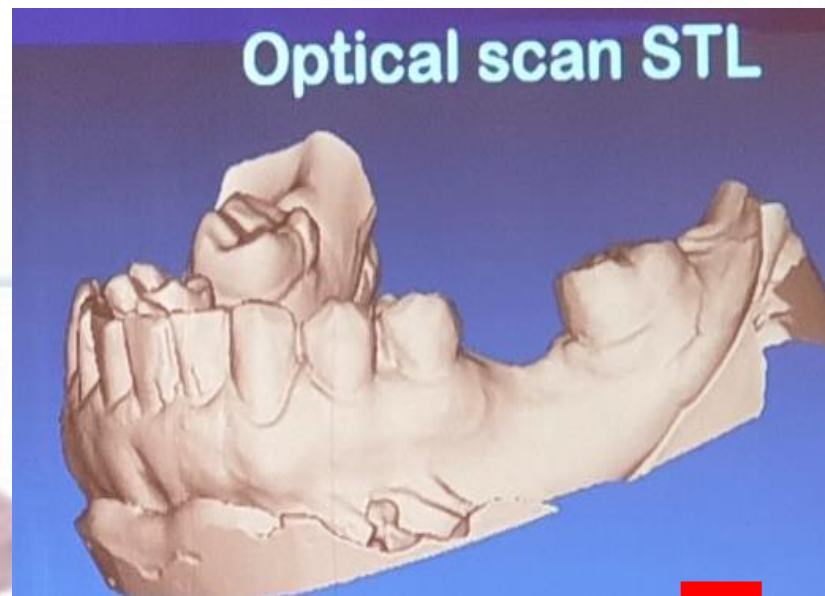
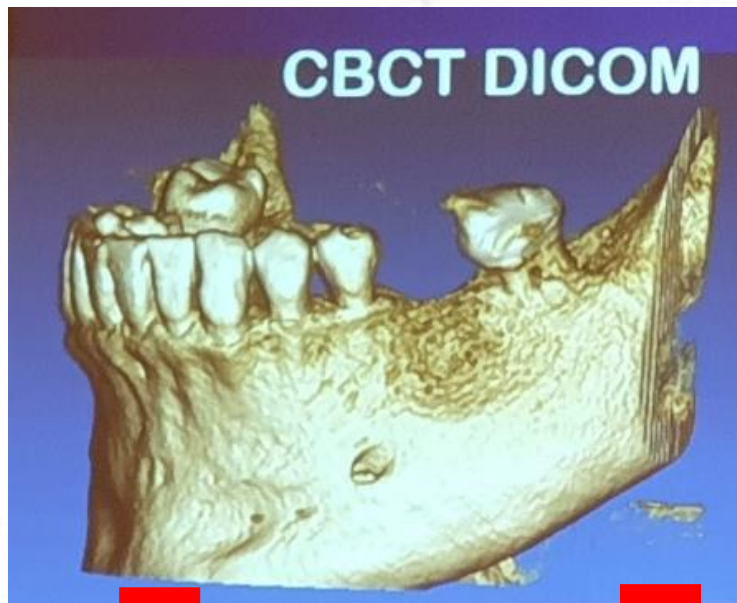
Teeth

The idea of the surgical guide is based on obtaining each structure separately then assembling all the structures together in their original relationship in addition to any appliances & planning on the computer.





**The virtual patient
(digital patient)**



Types of surgical guide



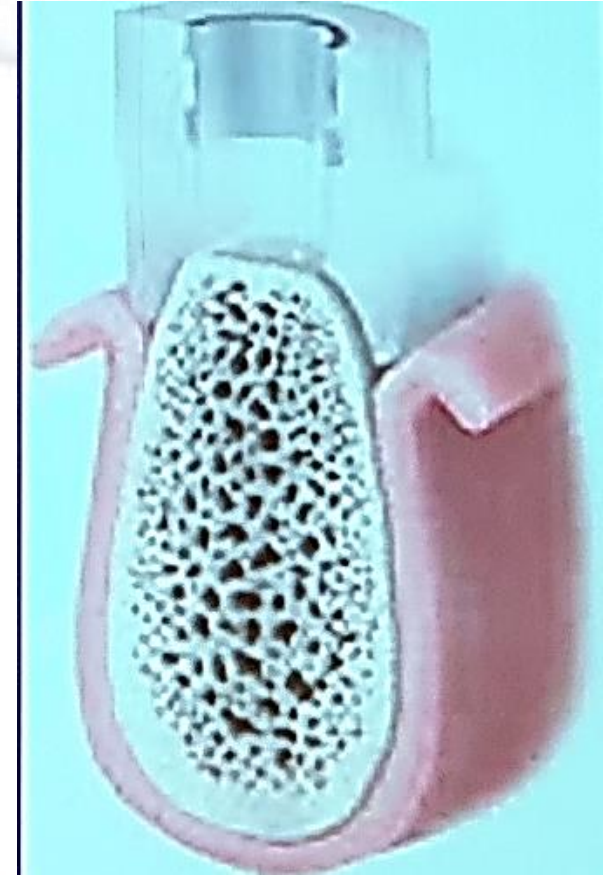
1. Bone supported surgical guide
2. Tooth supported surgical guide
3. Mucosa supported surgical guide
4. Tooth – mucosa supported surgical guide

Bone supported surgical guide

Planning performed on : bone
(teeth and mucosa are not required)

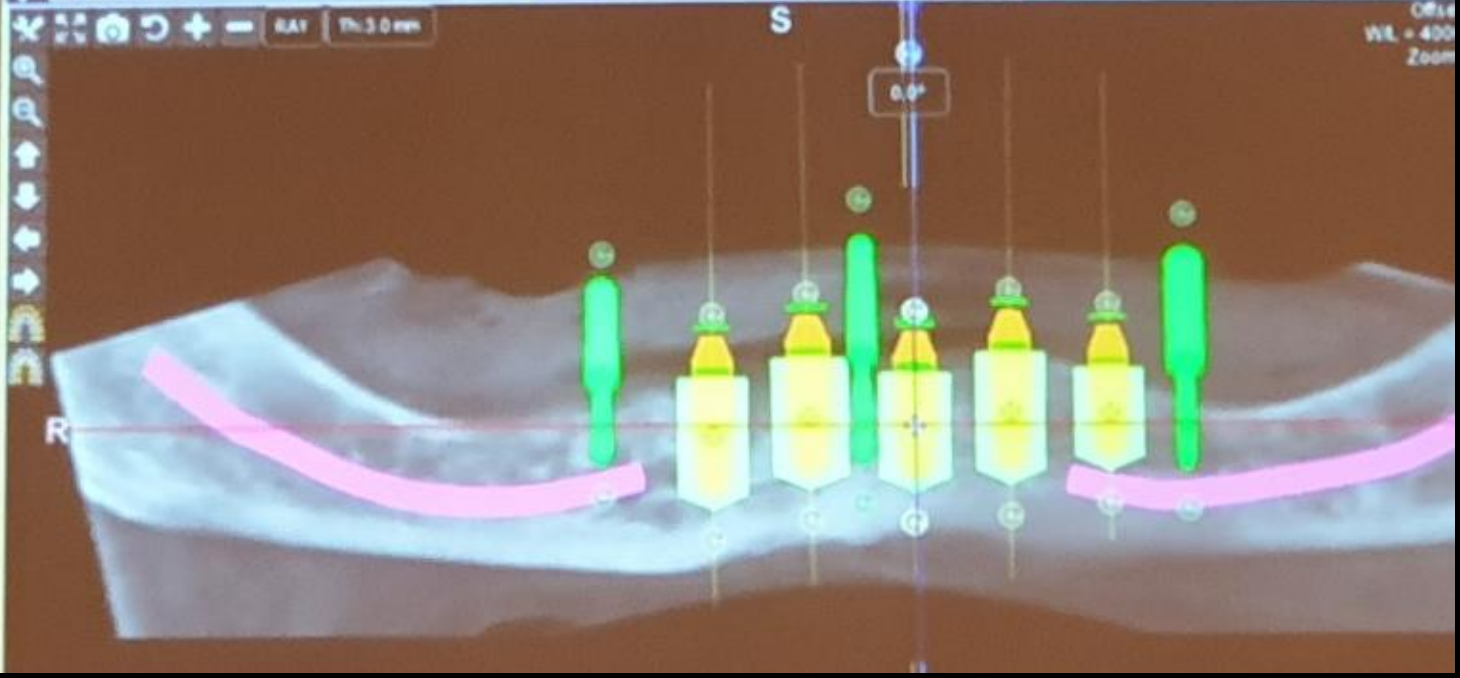
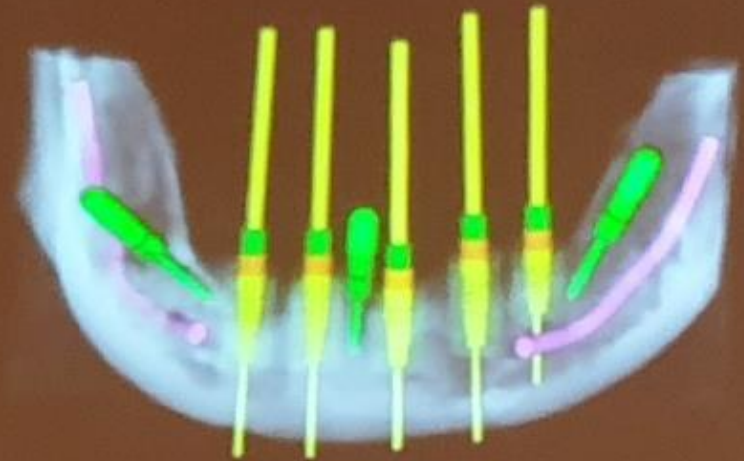
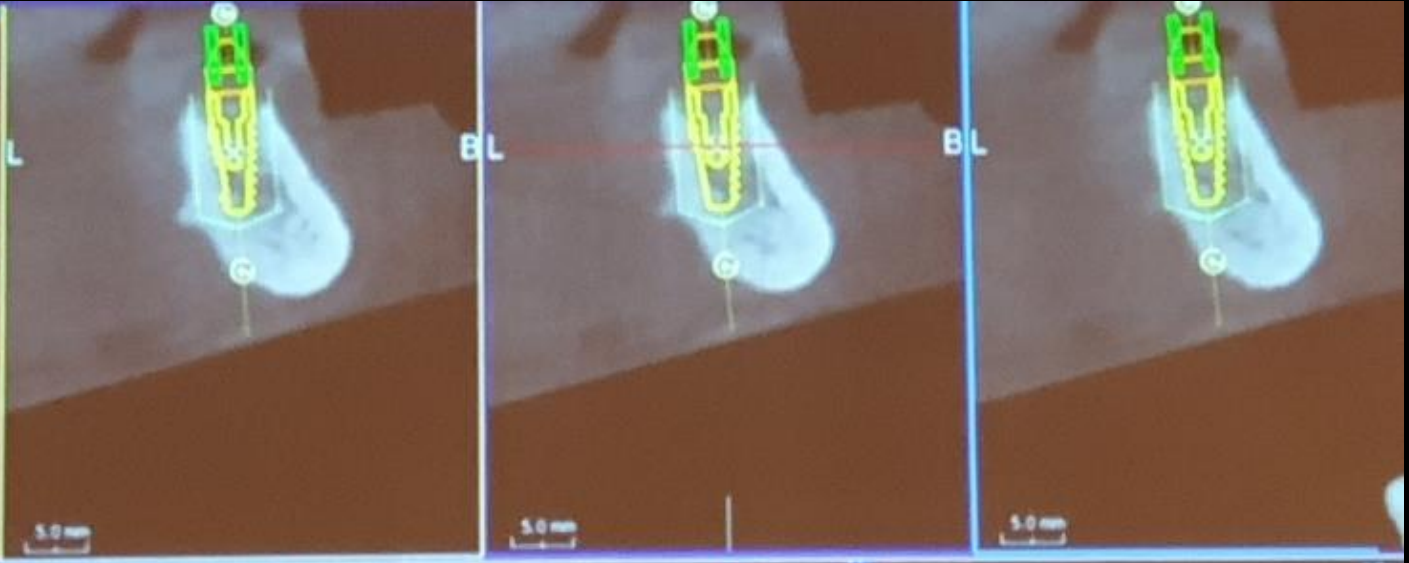
Registration : not required

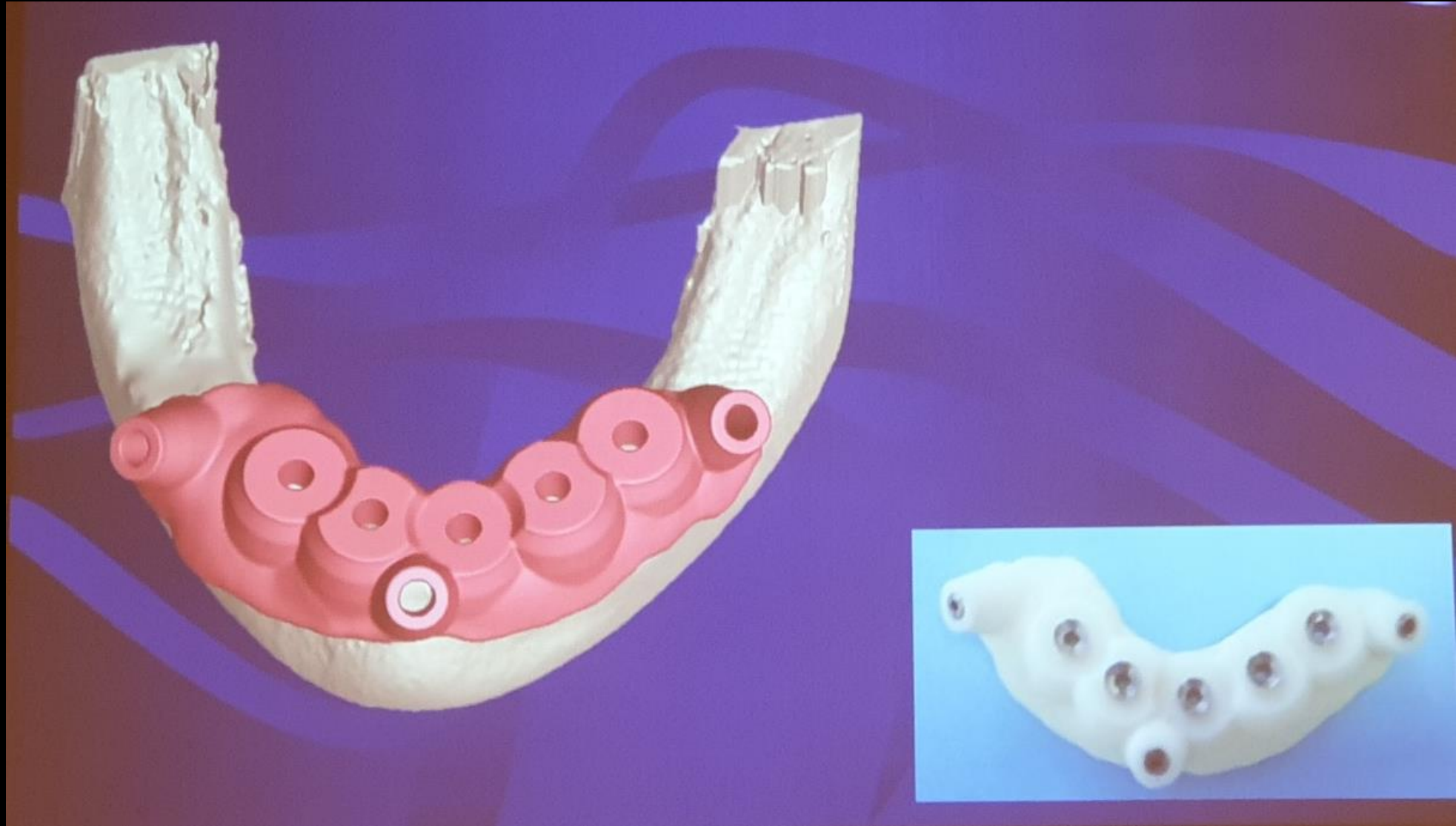
Only CBCT or CT is required



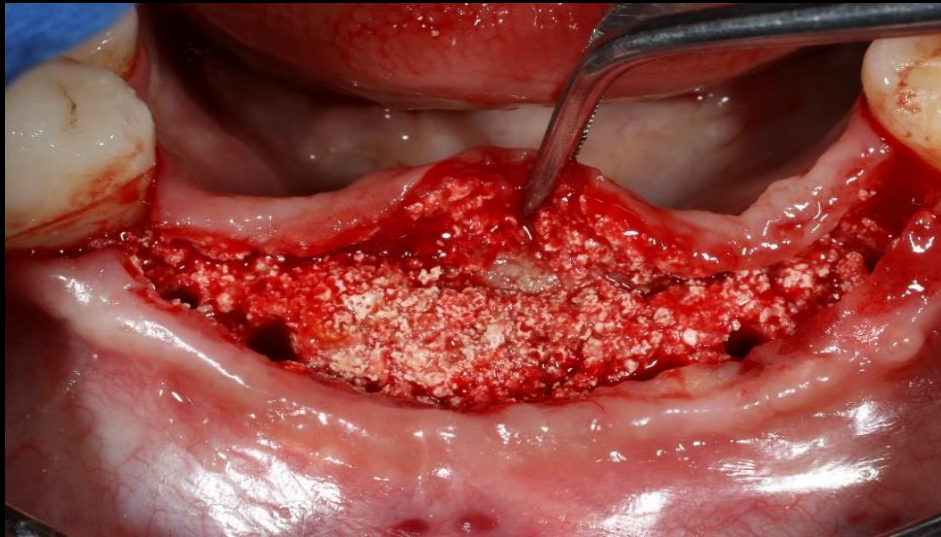
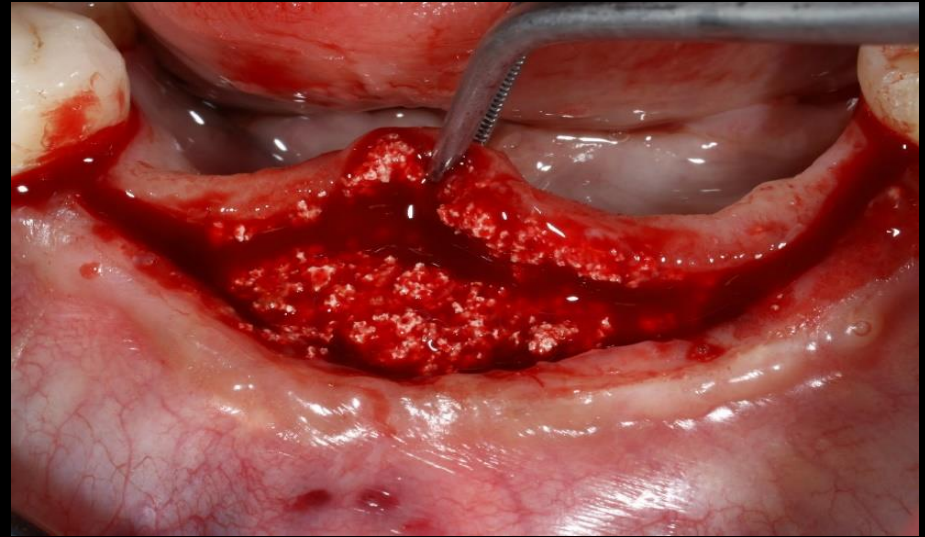
07

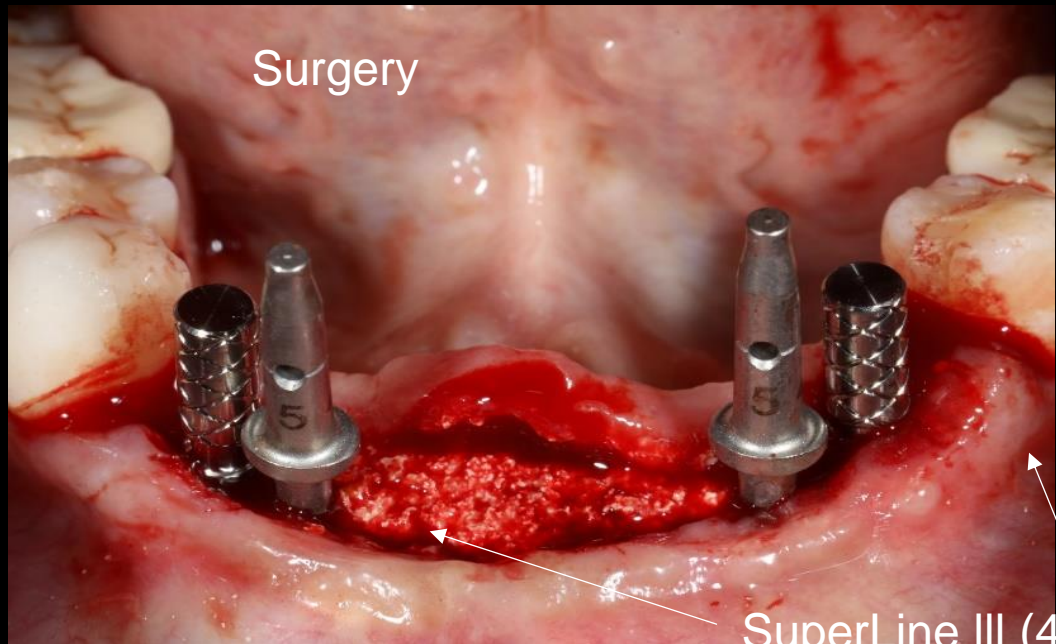
W/L = 734/494
Zoom: 181%



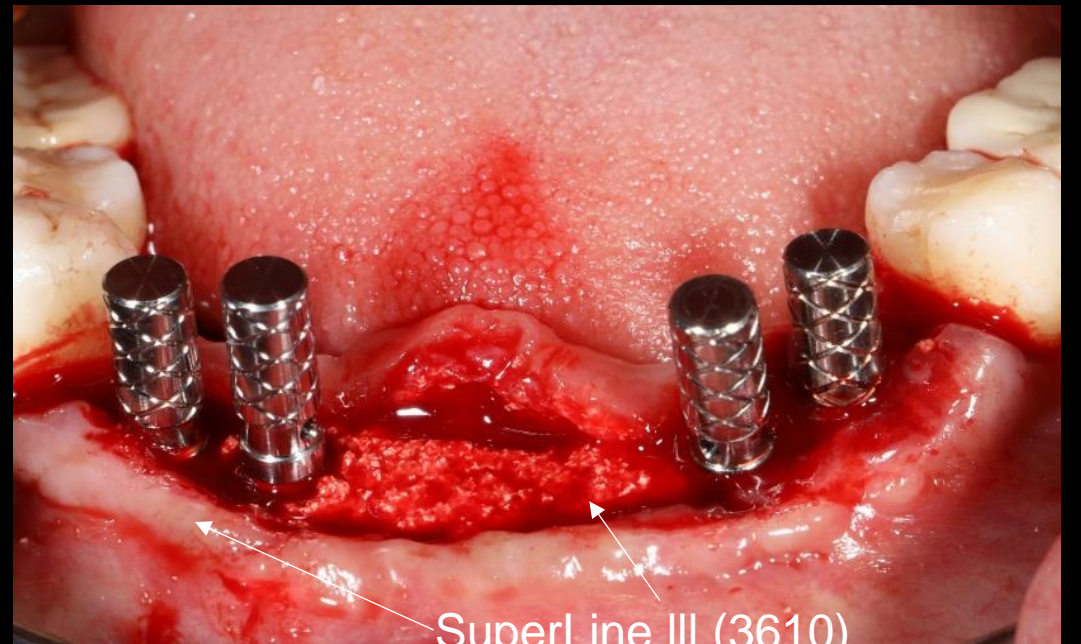


Bone supported surgical guide

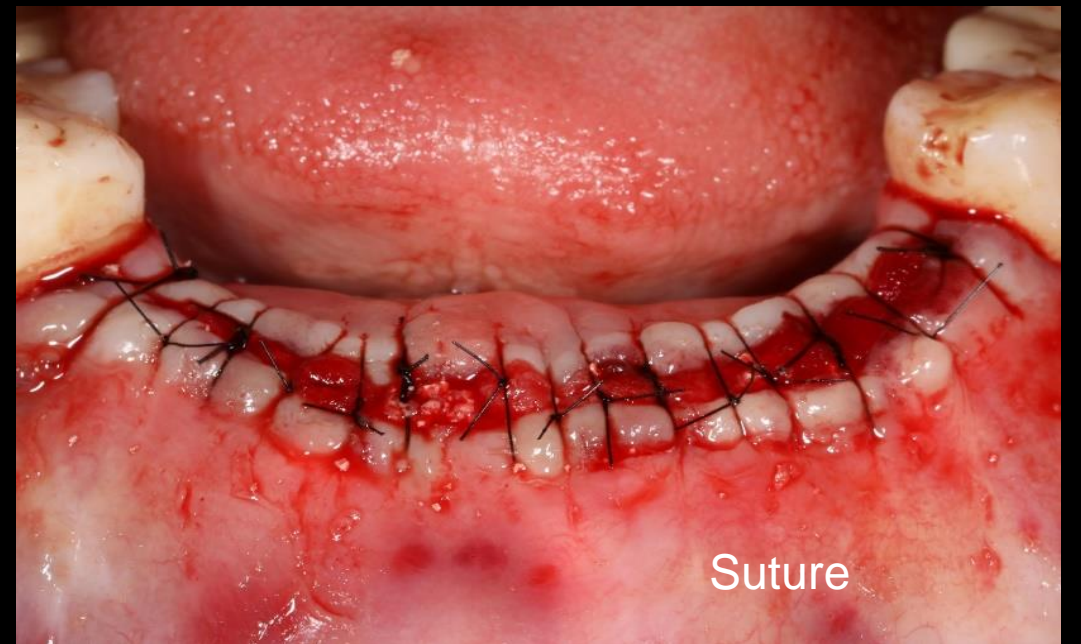




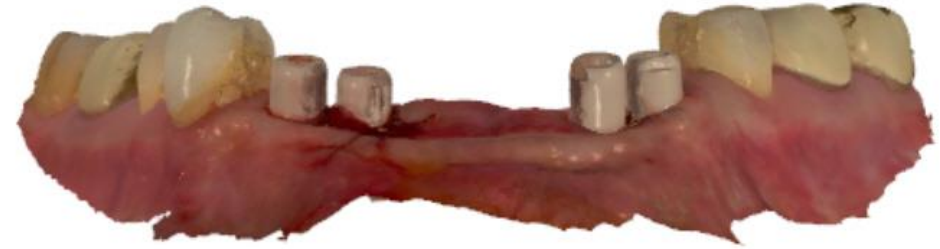
SuperLine III (4010)



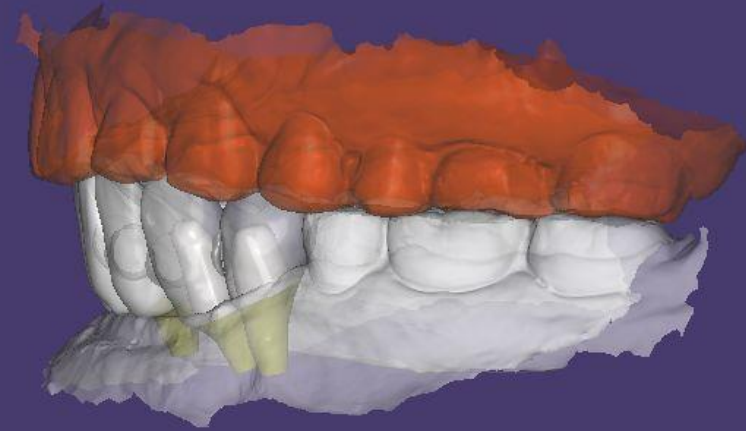
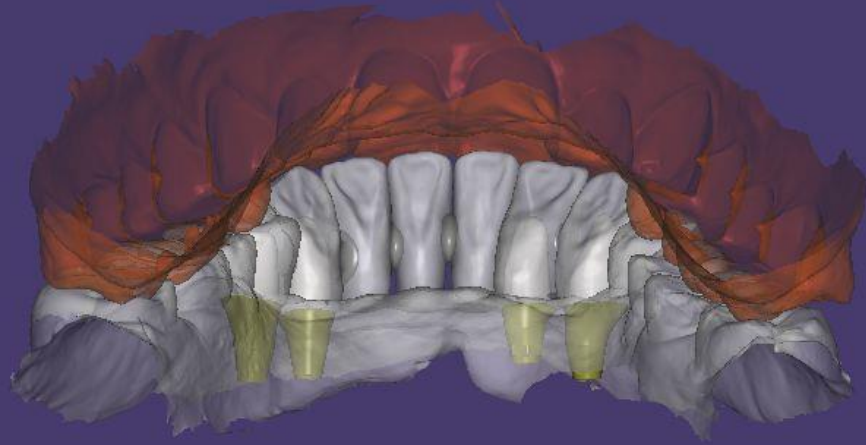
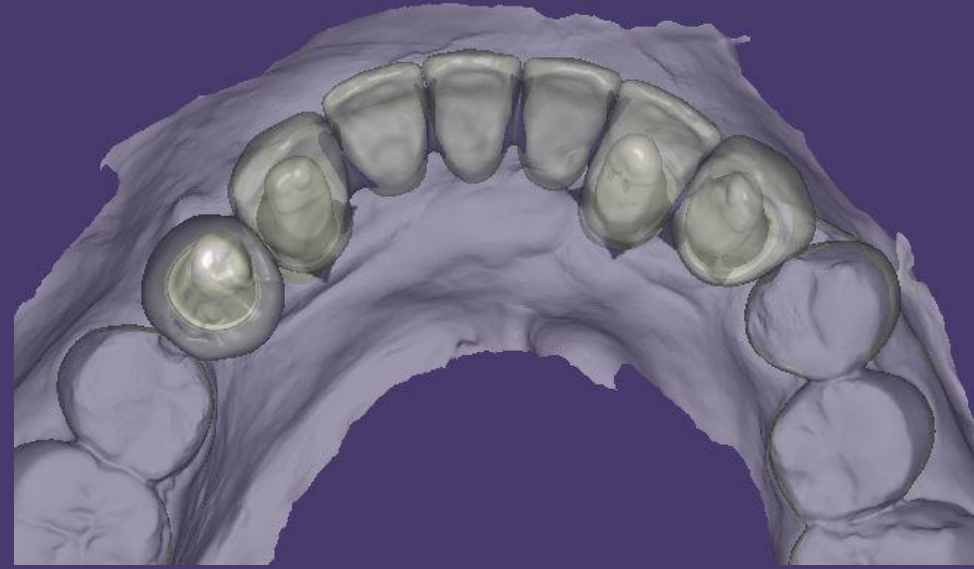
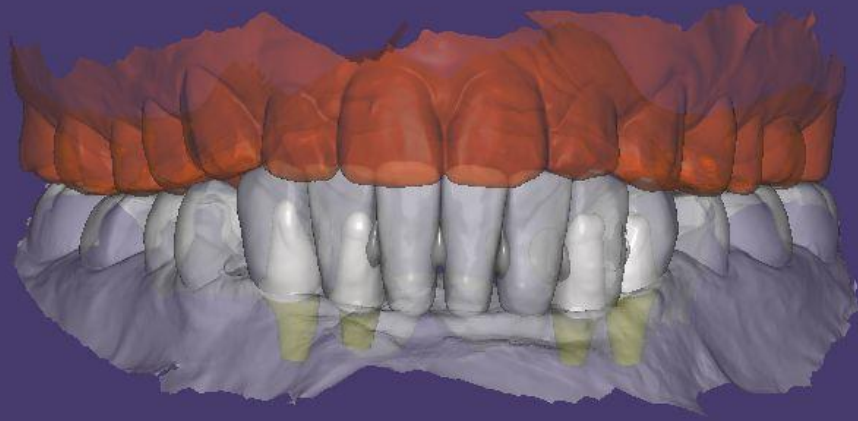
SuperLine III (3610)



Intra Oral Scanning



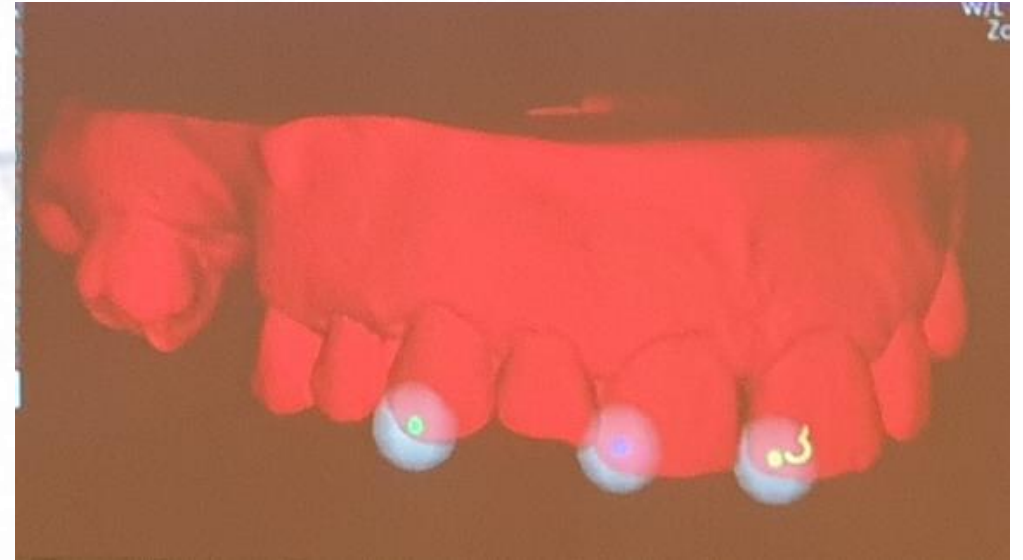
CAD Design (Customized abutment / Temporary)

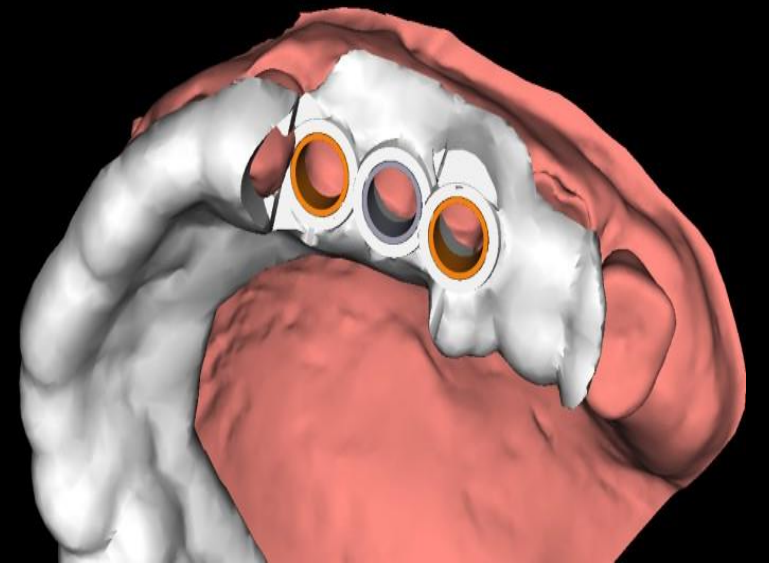
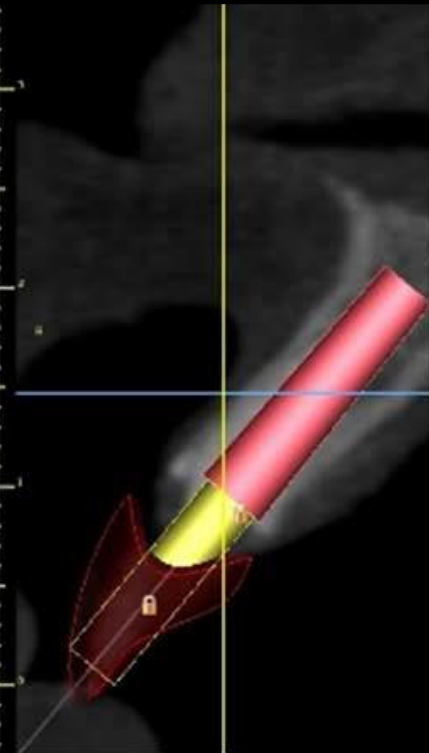
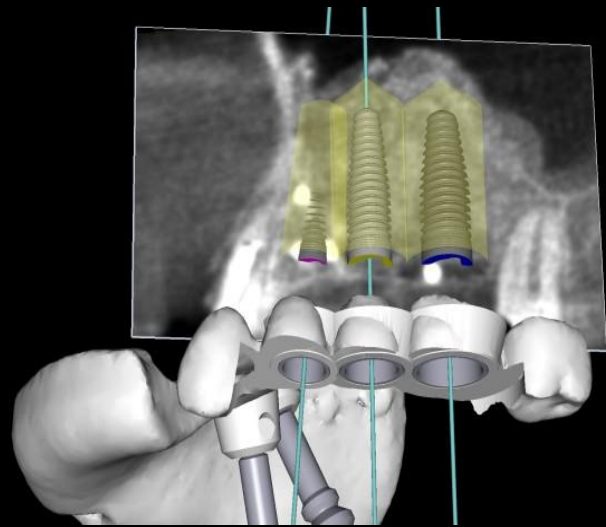
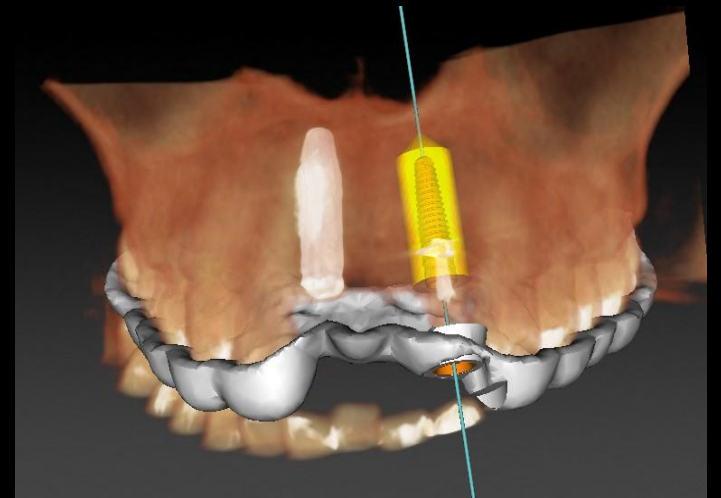
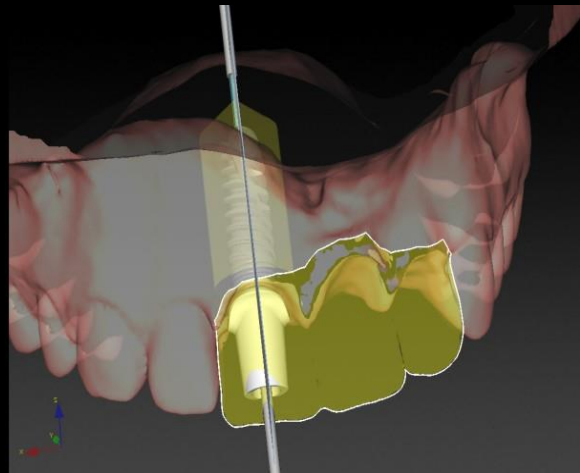
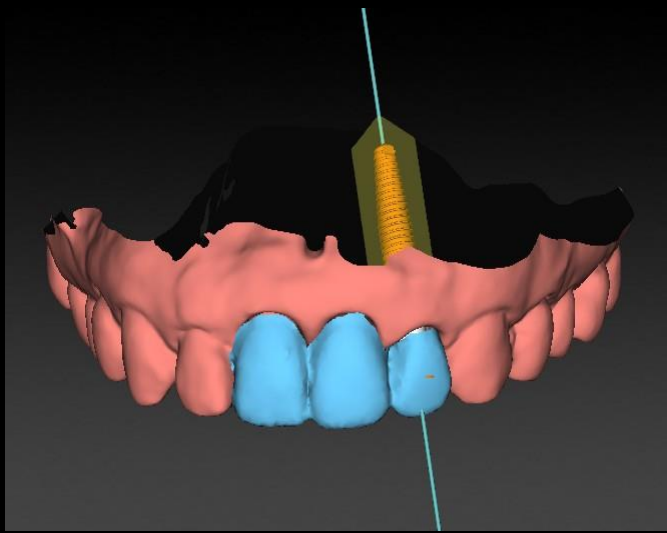




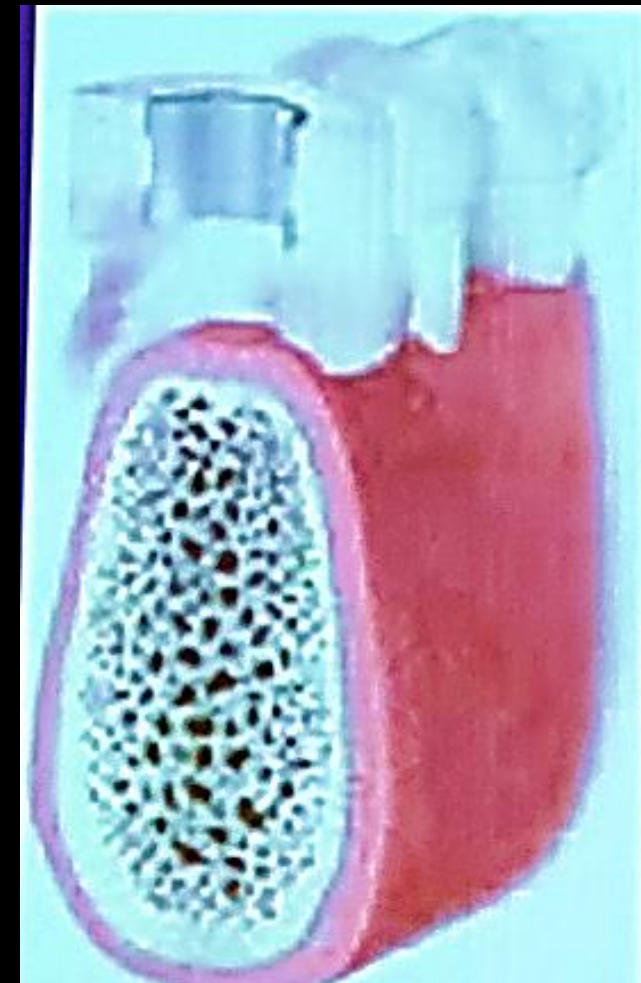
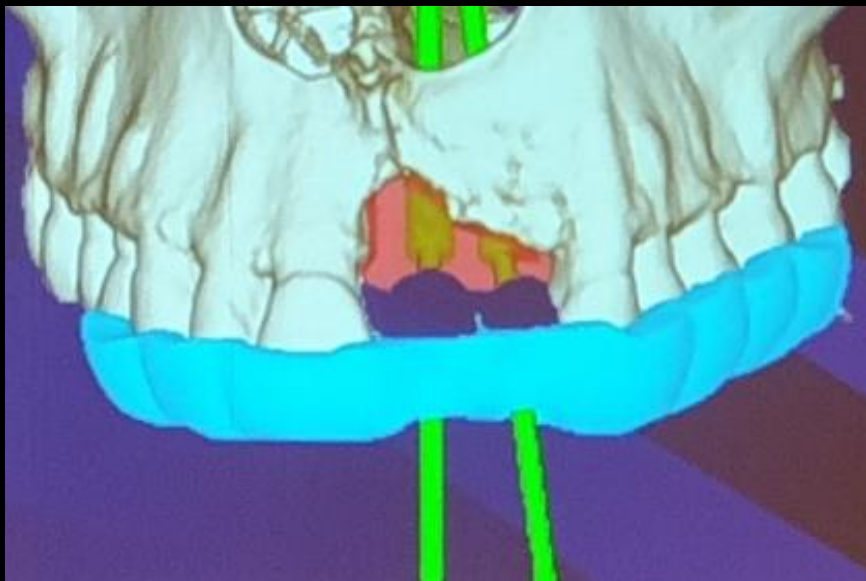
Tooth supported surgical guide workflow

- Planning performed on:
bone from (CBCT)
- Supporting structure :
teeth (from optical scan)
- Registration:
teeth as a common landmark
CBCT of patient + optical scan of the
cast





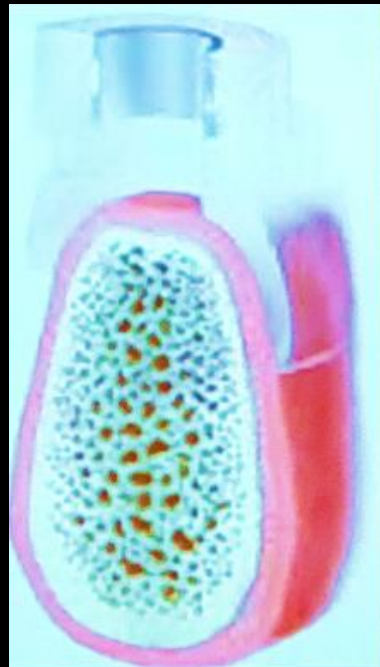
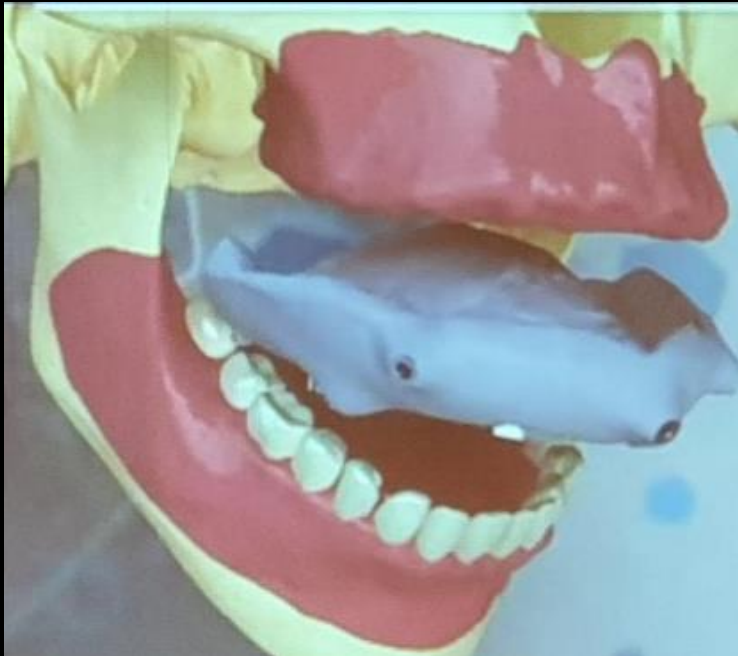
Tooth supported type

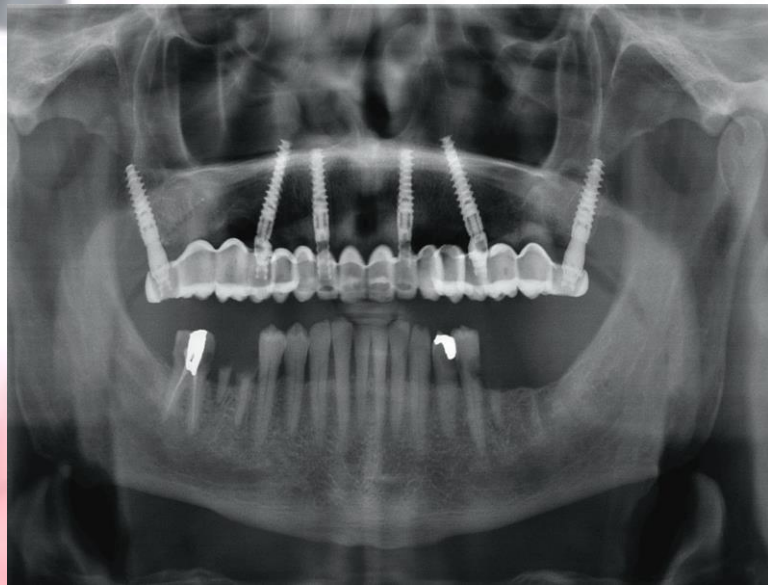
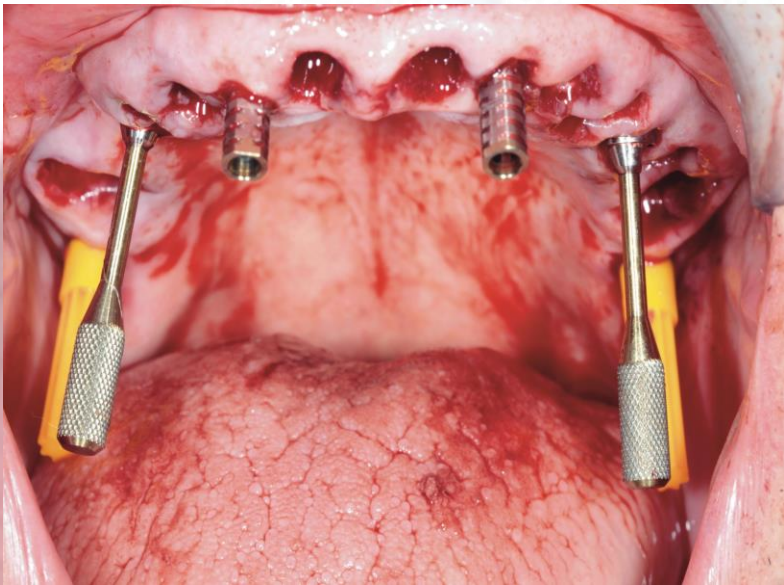
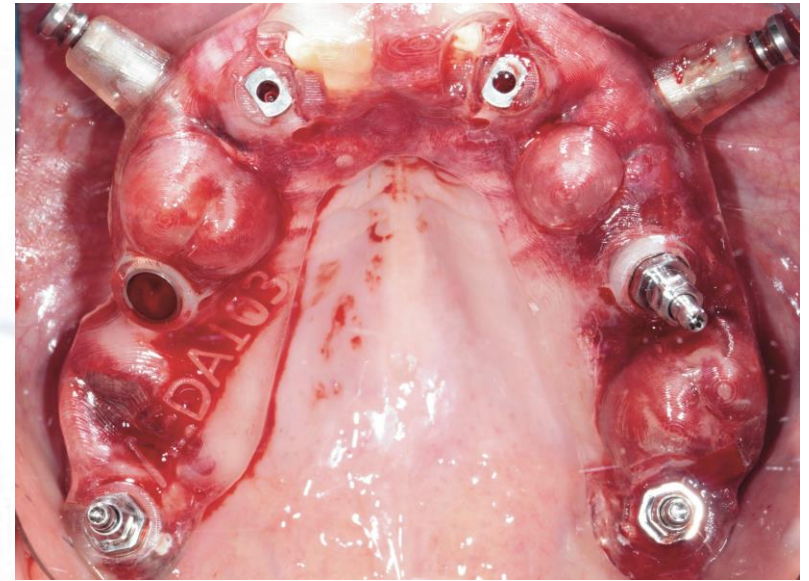
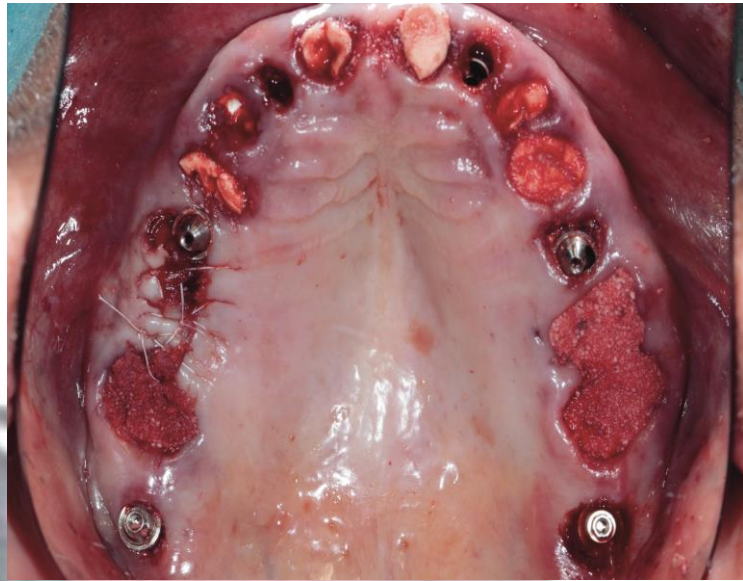
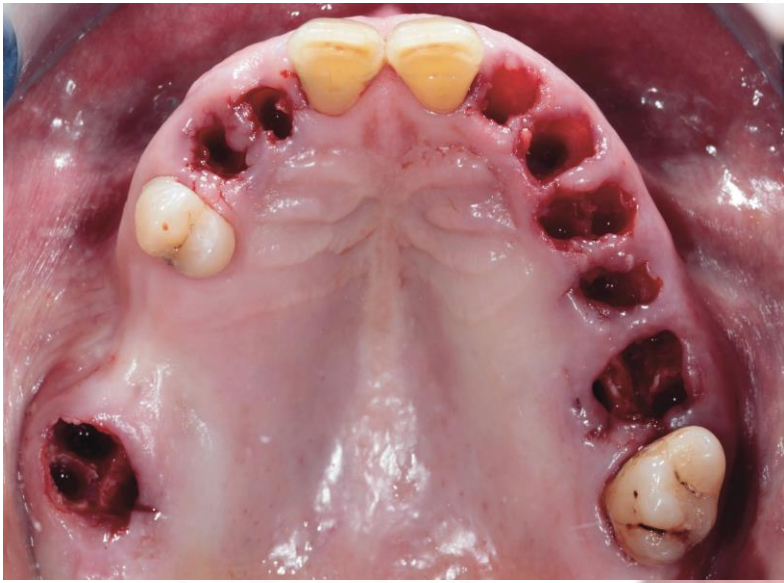


Mucosa supported surgical guide workflow

- Planning performed on: bone
- Supporting structure : mucosa
- **Registration No common landmarks so a Radiographic stent is required**

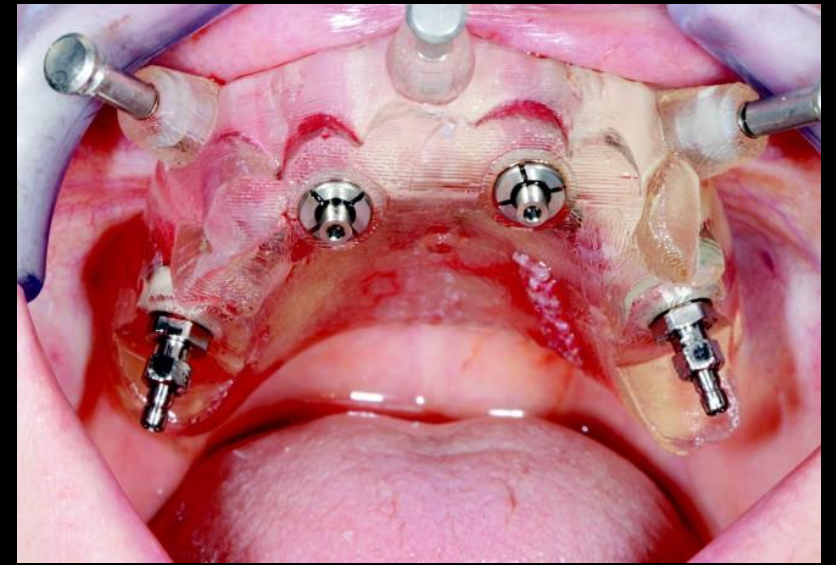
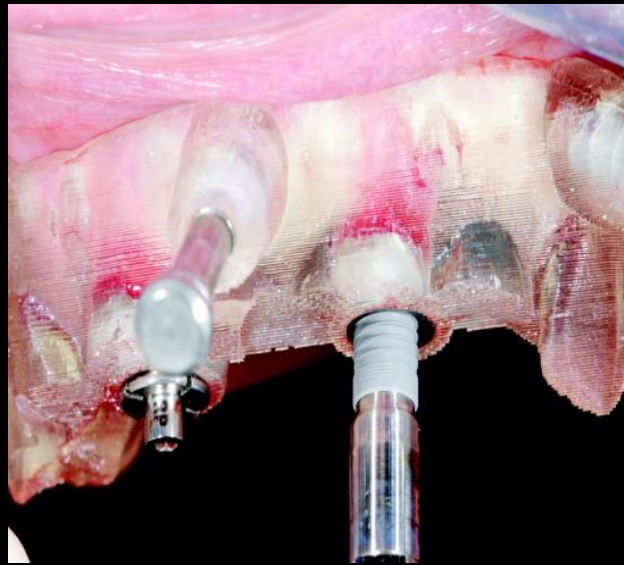
CBCT is required for registration





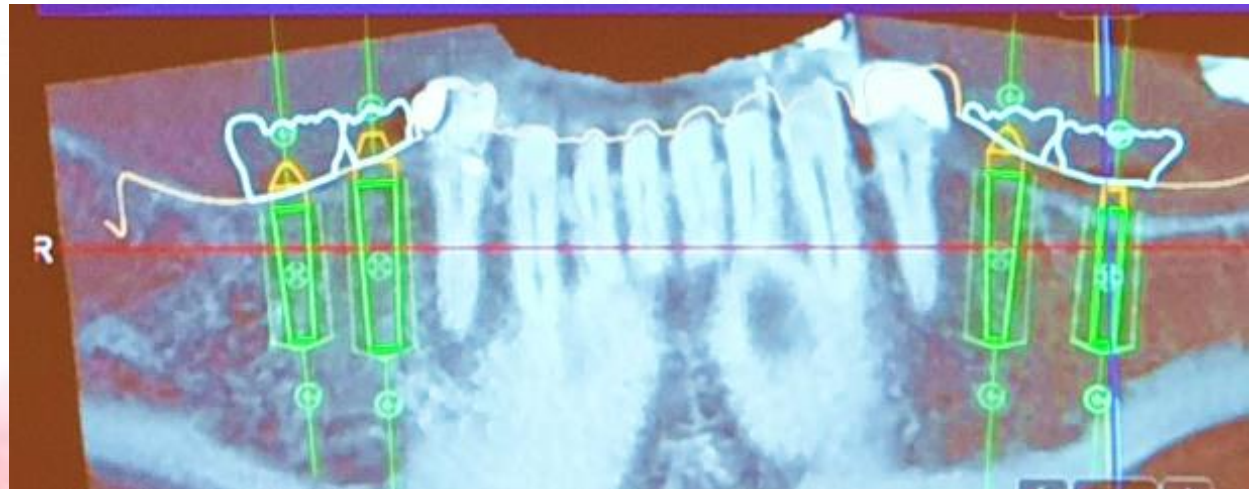
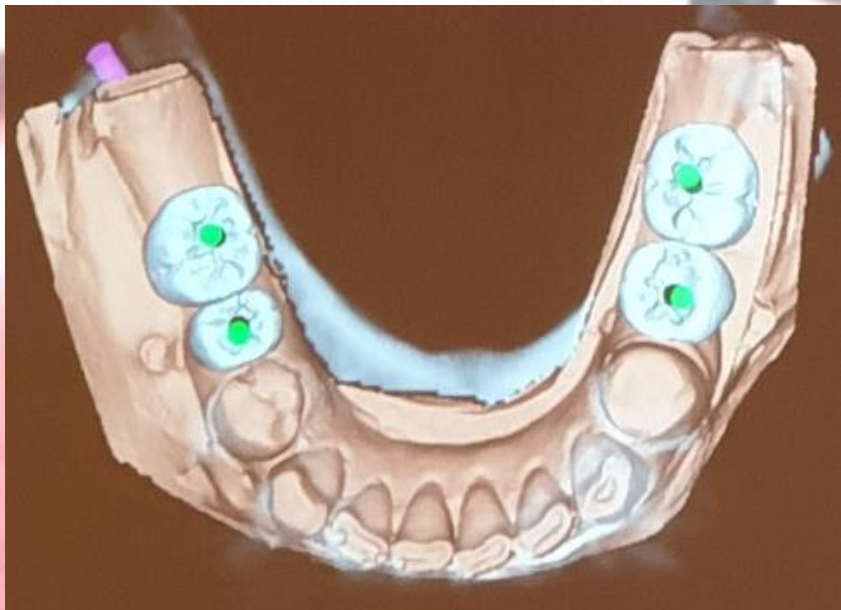
Tooth – mucosa supported surgical guide

Fully guided surgery implies that the surgical templates with their drill sleeves (bushings) control the position, angulation, diameter *as well as the depth* of the implant osteotomy sites

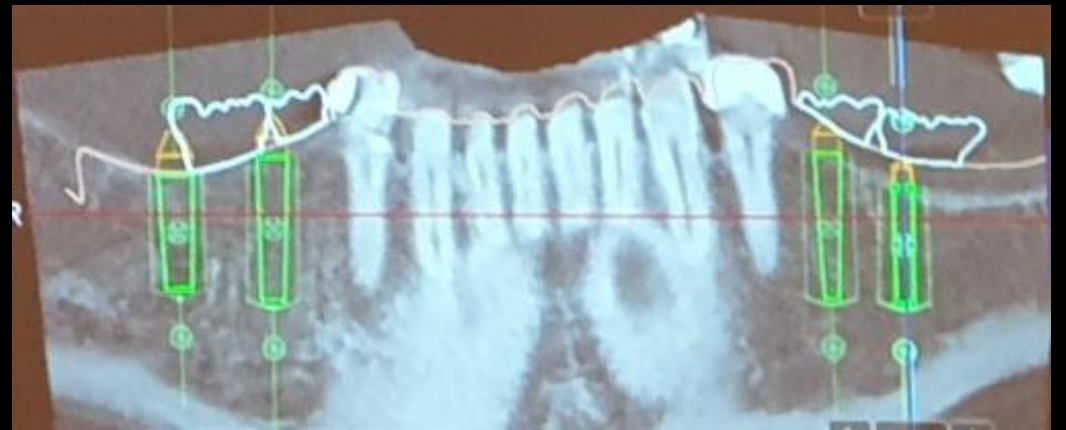
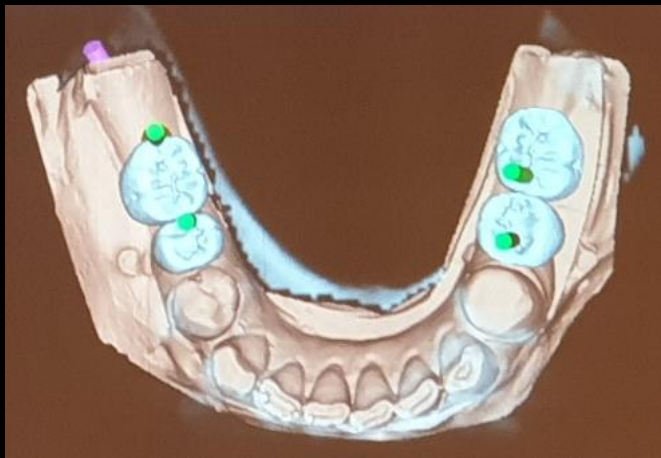


Planning concept

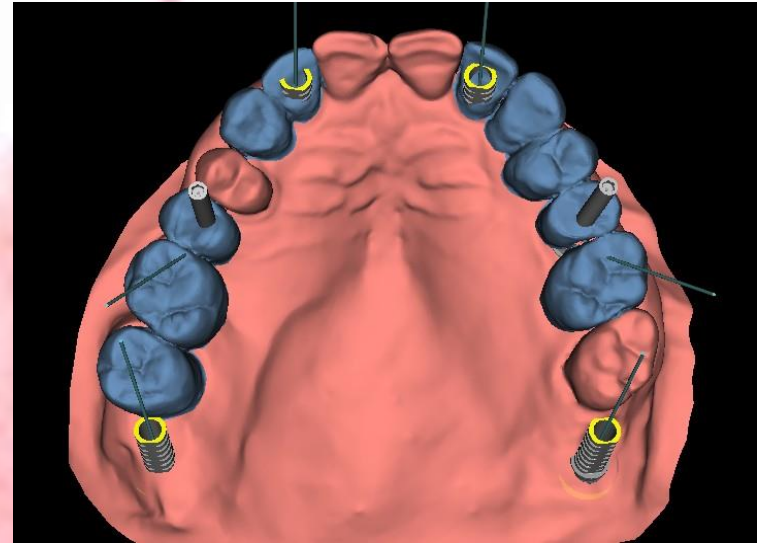
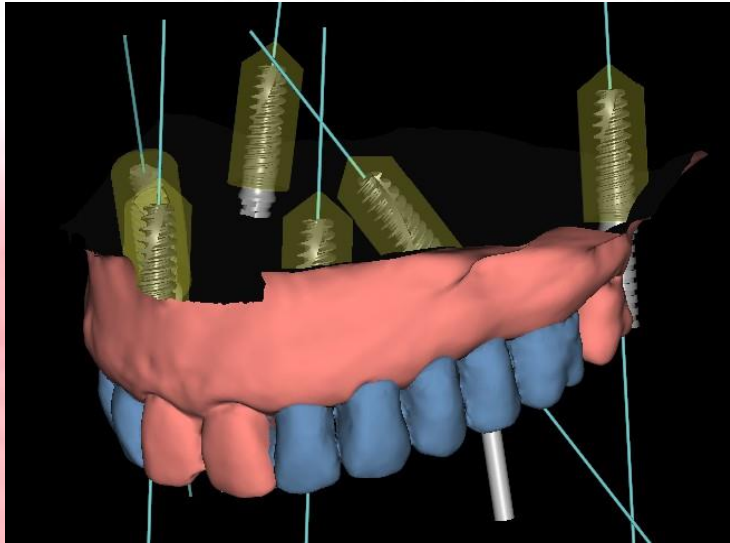
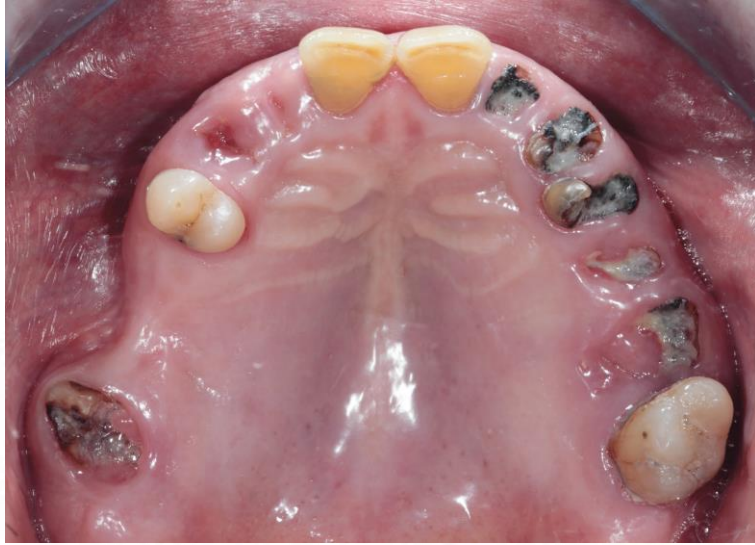
VIP- Protocol = **V**irtual **I**mpant **P**rosthetic protocol



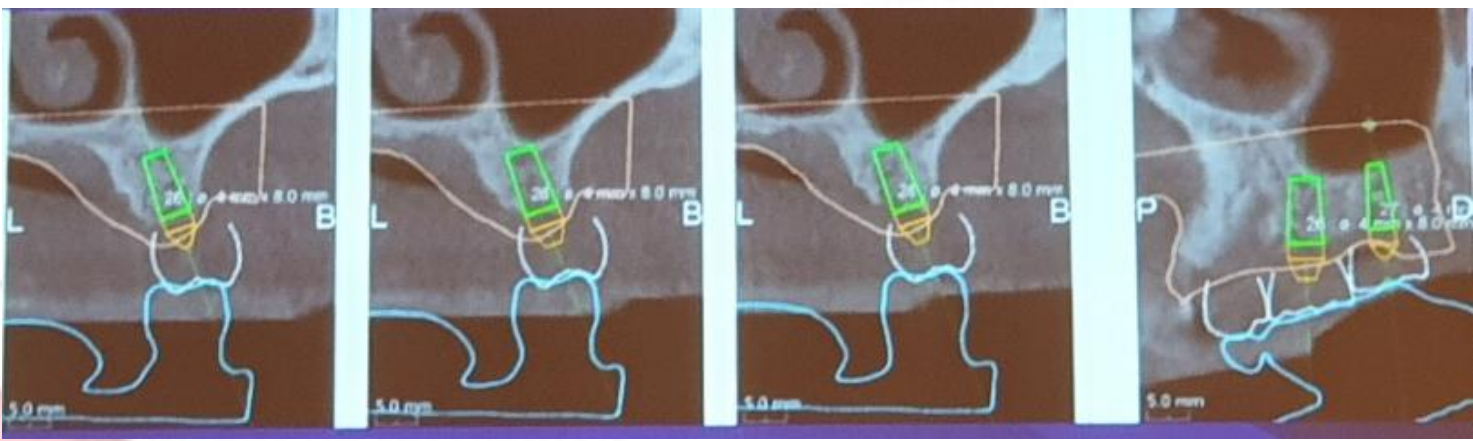
Prosthetic driven implant planning gives esthetic results and better implant position



Planning steps **Optical scanning + virtual waxup**



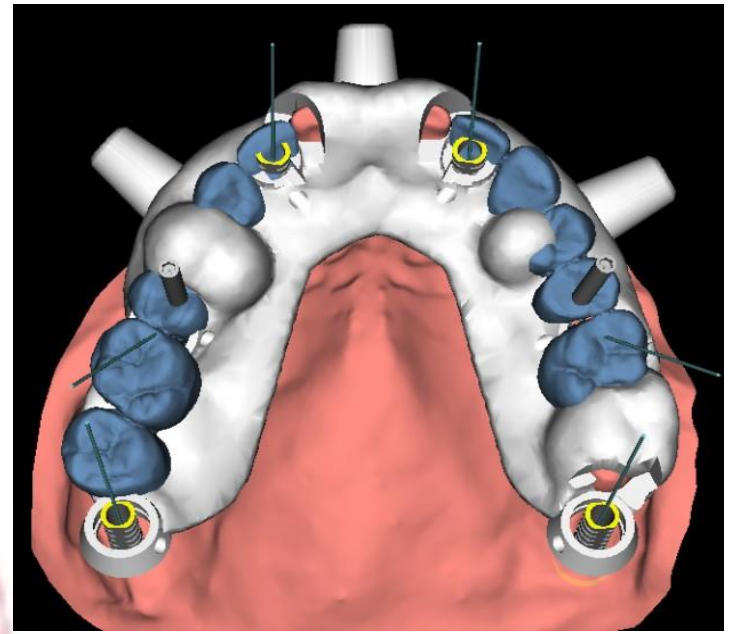
- Planning performed on: bone from (CBCT)
- Supporting structure : teeth (from optical scan)
- Registration teeth as a common landmark



CBCT of patient + optical scan of the cast

Registration :teeth as a common landmark
CBCT of patient+ optical scan of the cast

Setting of virtual teeth is based on occlusion



Computer guided implant surgery

A diagram illustrating the components of computer-guided implant surgery. The background shows a 3D model of a human jaw with a dental implant being placed. A central point from which four red arrows radiate downwards to four labels: 'Software', 'hardware', 'Surgical kit', and 'Surgical guide'.

Software

hardware

Surgical kit

Surgical guide

Components of a surgical guide

Sleeves for drills & pins



Surgical guide body



According to drilling & design

- 1- pilot drilling surgical guide
- 2- full sequence drilling guide

Pilot drilling guide

Only the pilot drill is directed using the surgical guide & the remainder of the osteotomy is completed by free hand method.



pilot drilling surgical guide



Advantage

Allows a room for a maneuverer in case of there is a need to change the angulation & direction of drilling during surgery.

Limitation

Accuracy is affected upon removal of the guide & utilization the free hand completion.

Digital Guide

Easy & Accurate System

Dentium
For Dentists By Dentists



Full sequence drilling guide

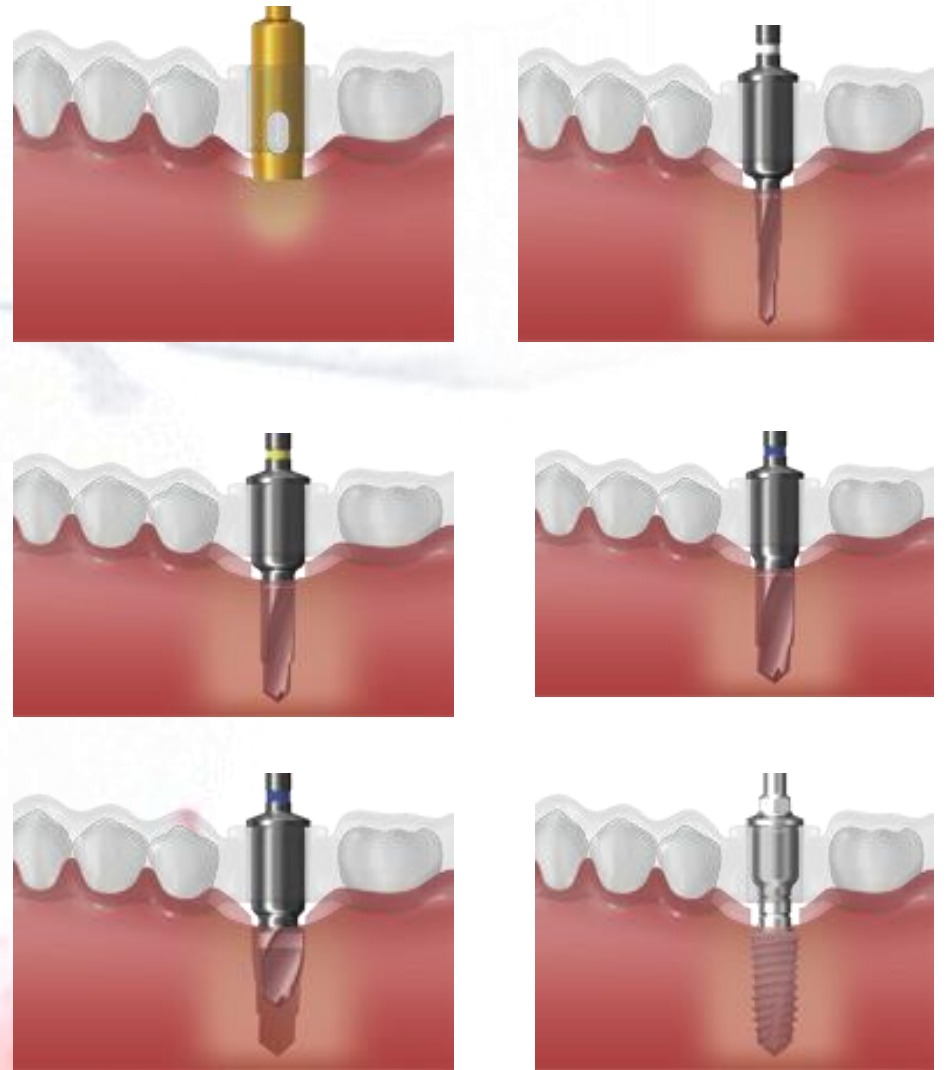
Allows direction control all over the full sequence of drilling

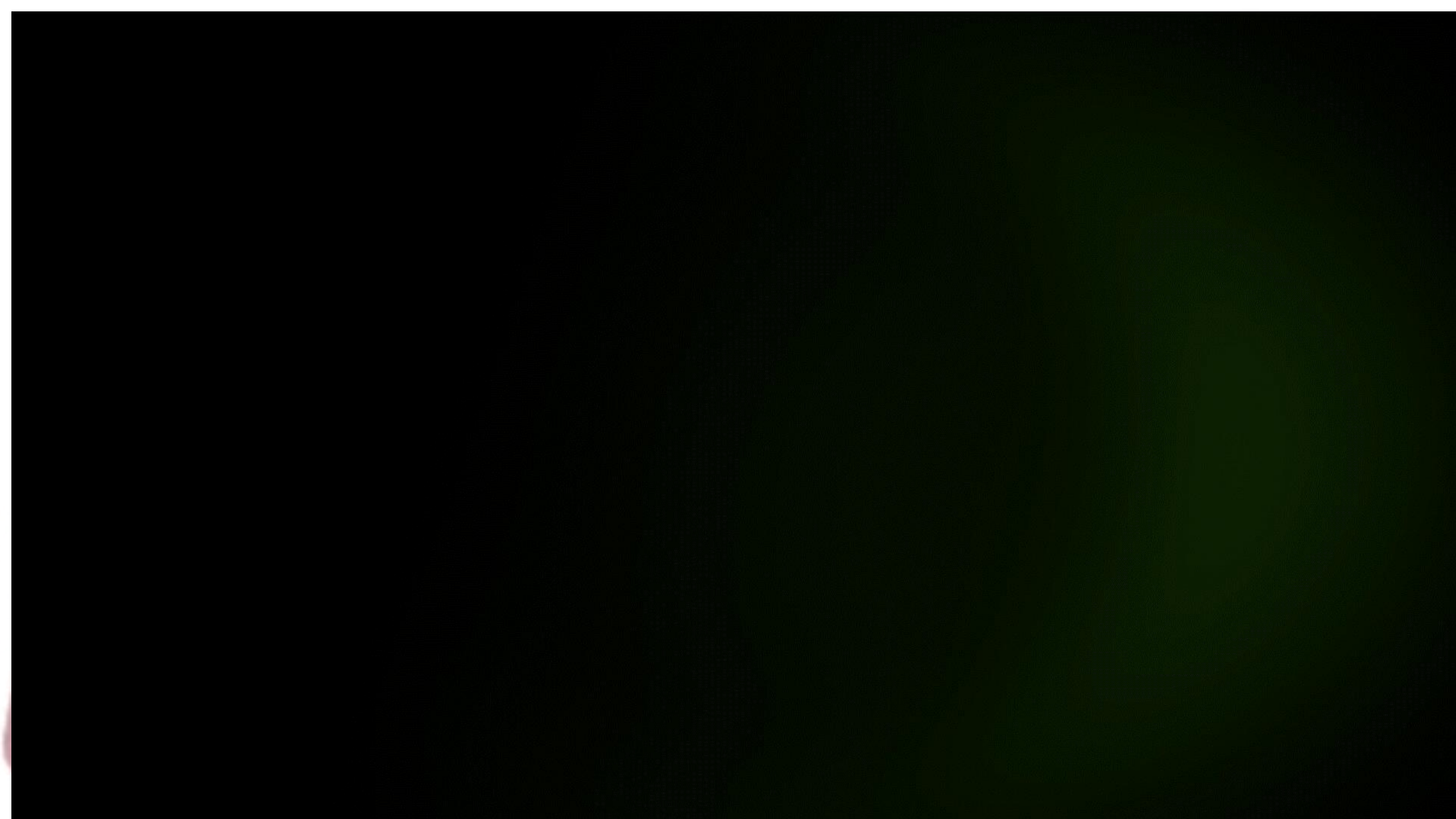
Advantage

Most accurate with least chances of errors during osteotomy .

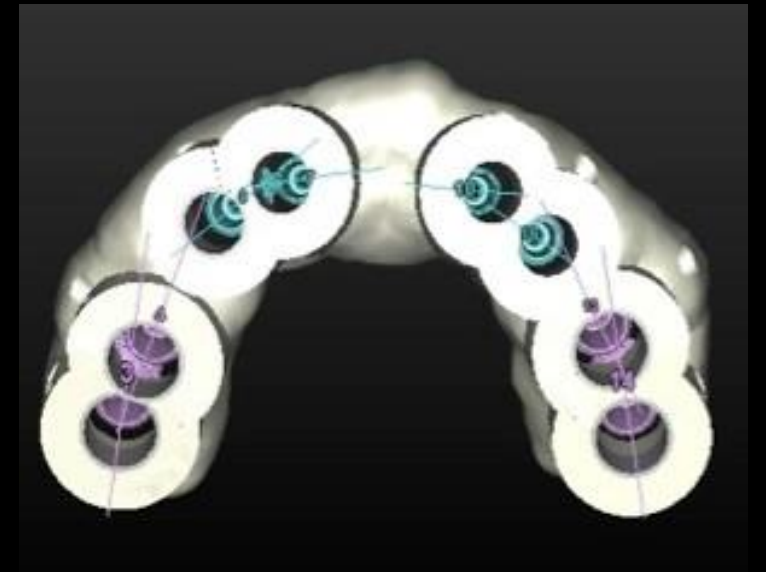
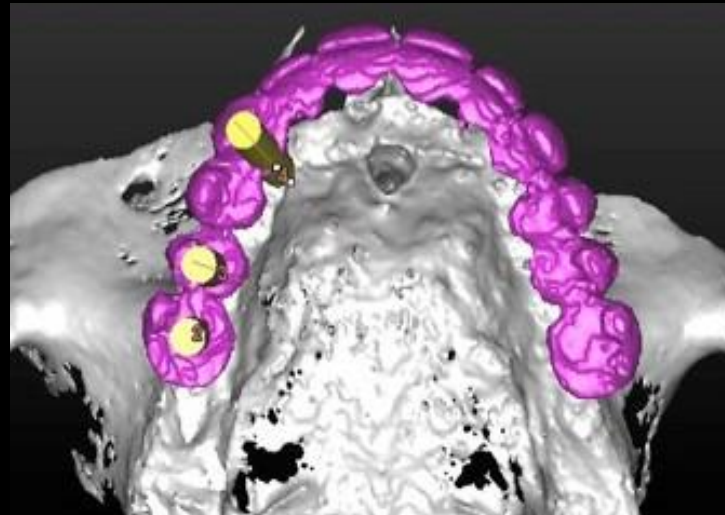
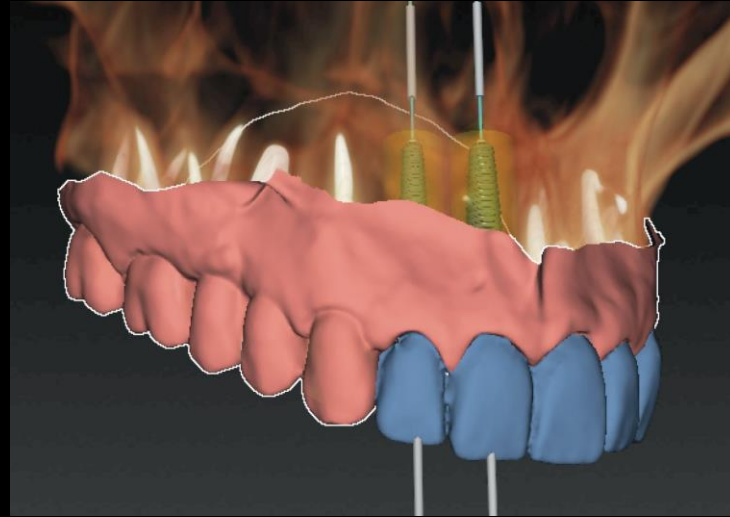
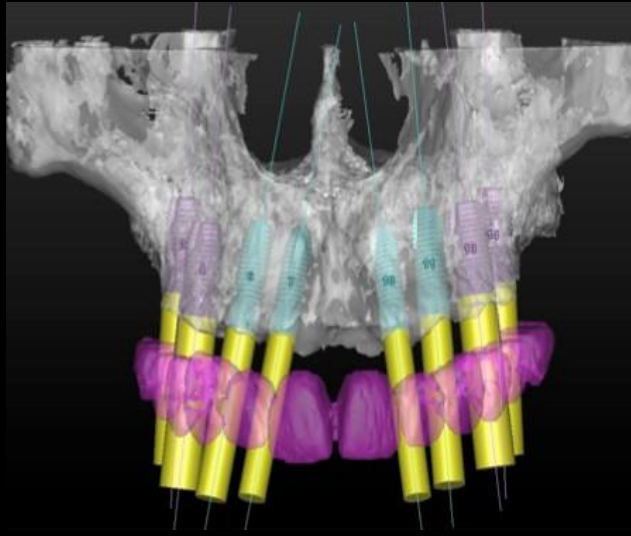
Limitation

- The surgical guide becomes restrictive with less decision to take
- Less coolant efficiency

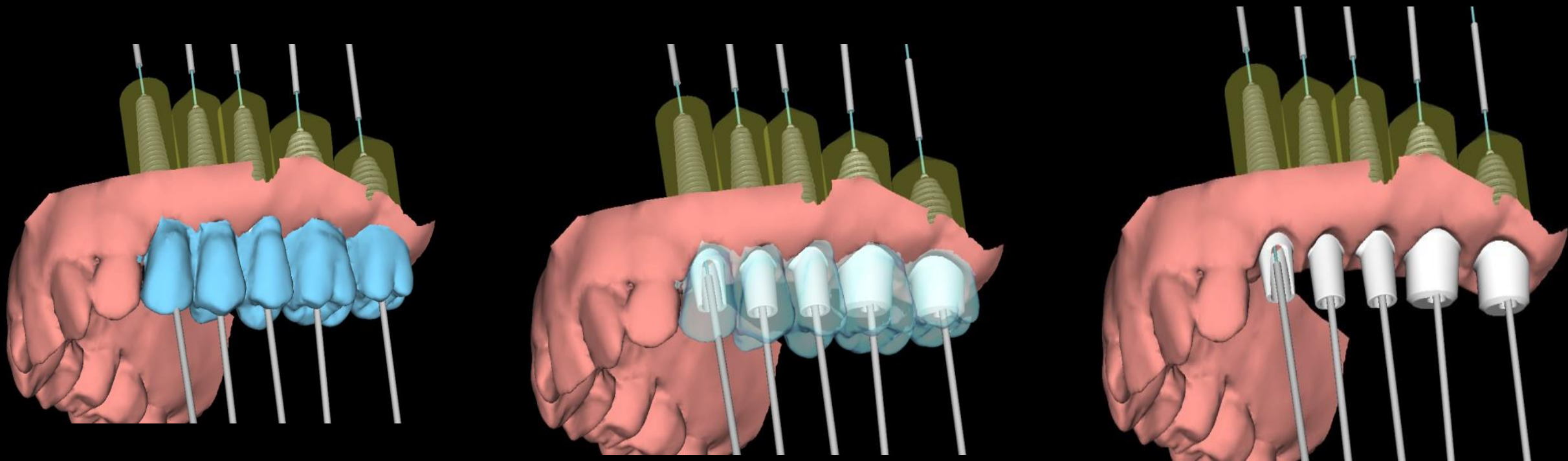




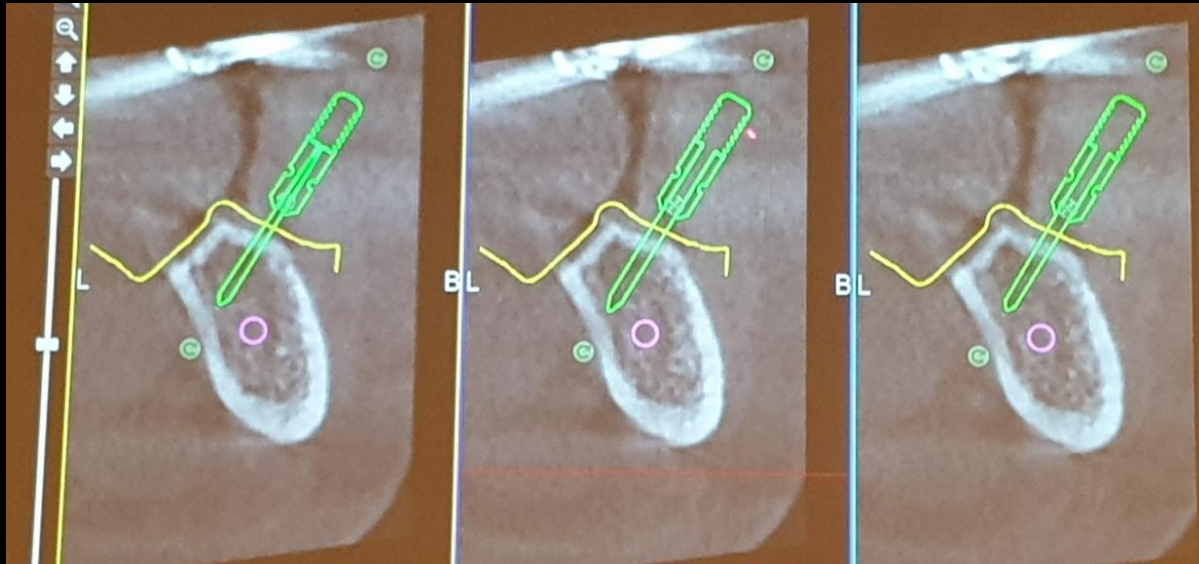
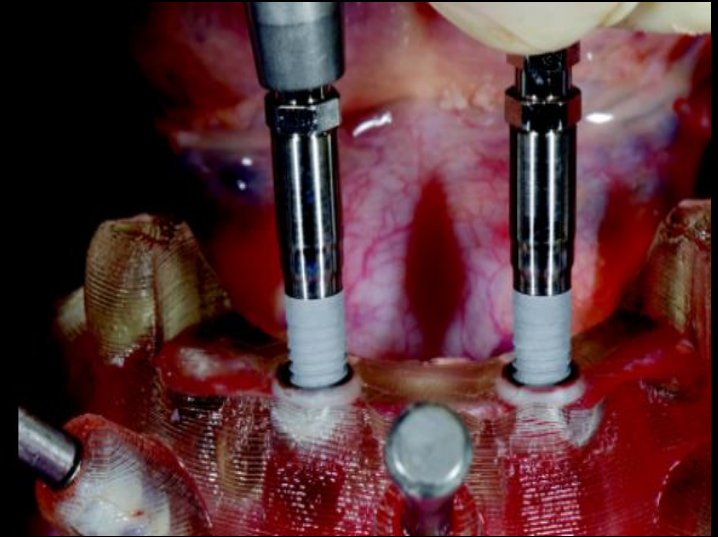
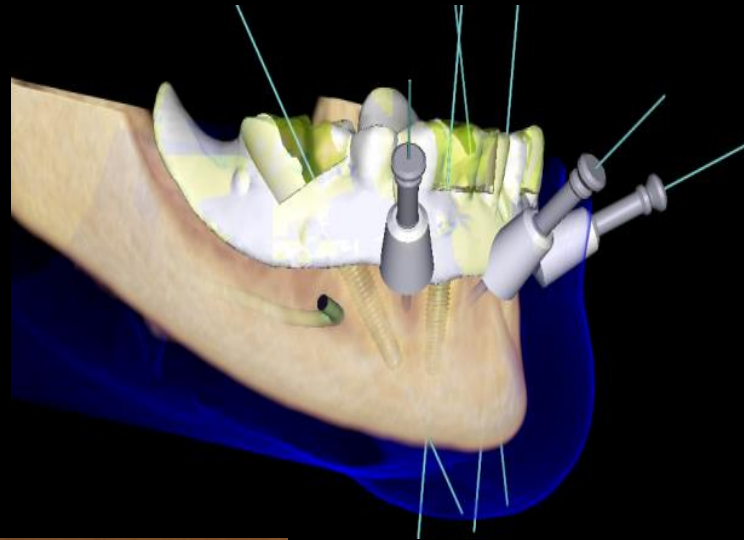
Implant parallelism VIP-protocol



Implant parallelism adjustment

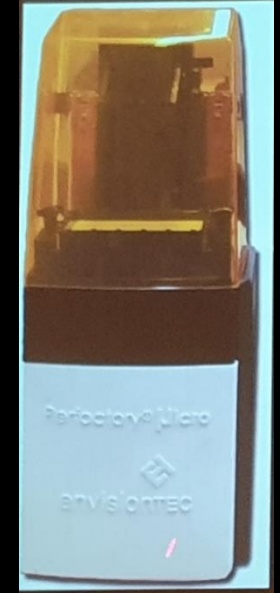
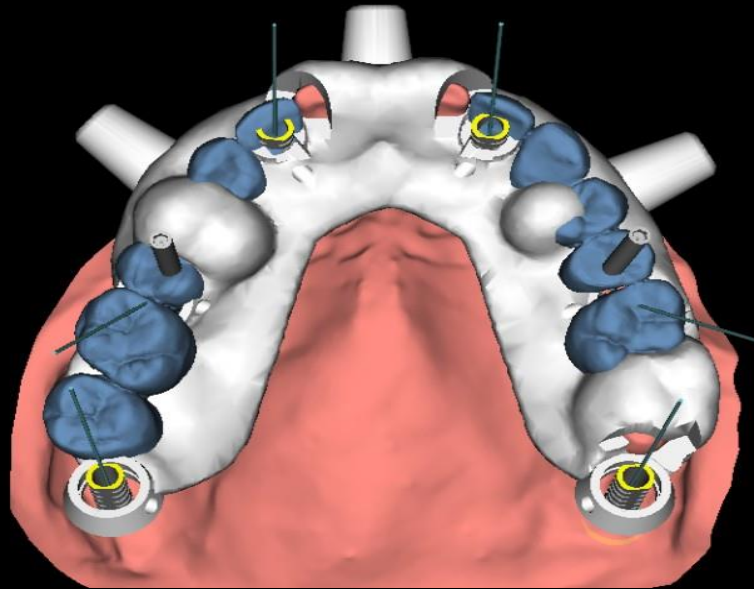
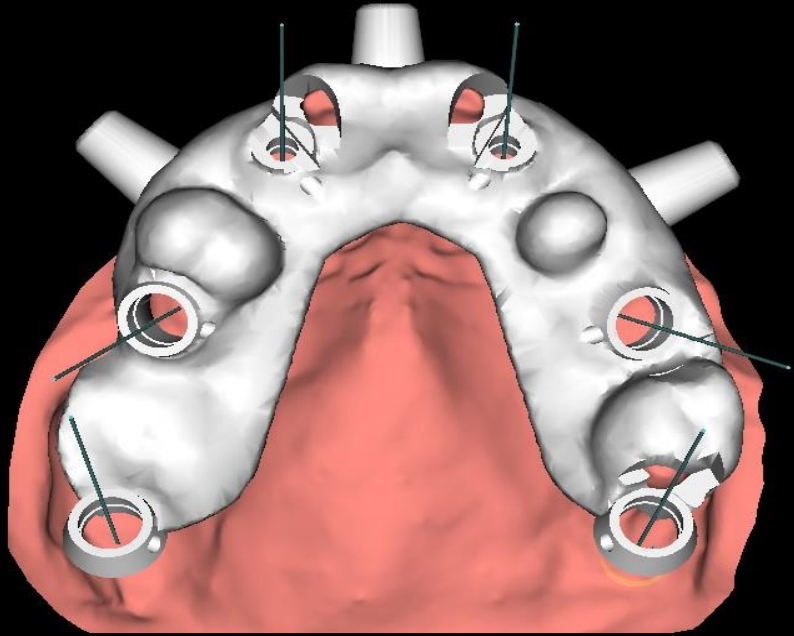


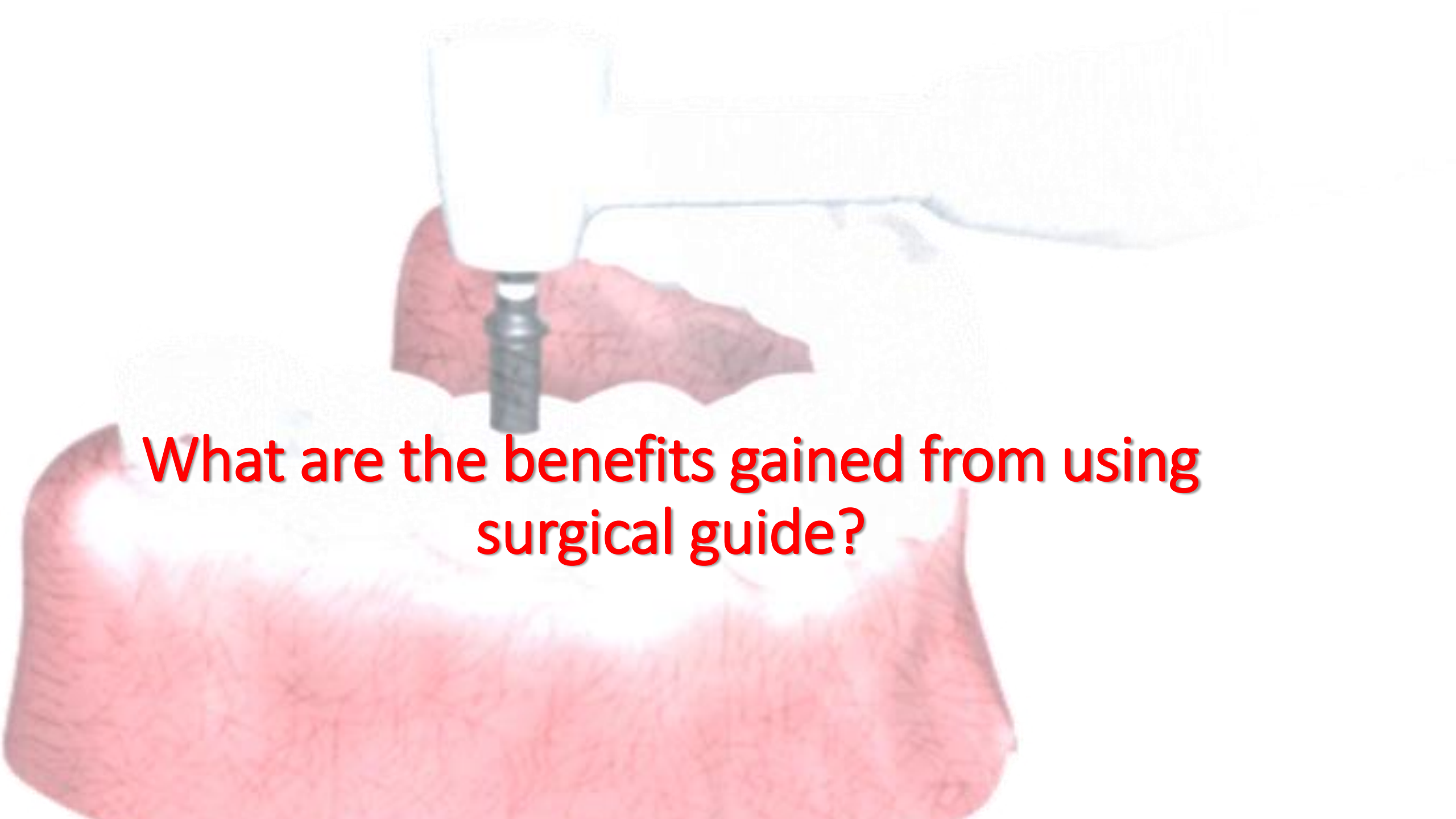
Planning the position of the fixation pins



CAD designing

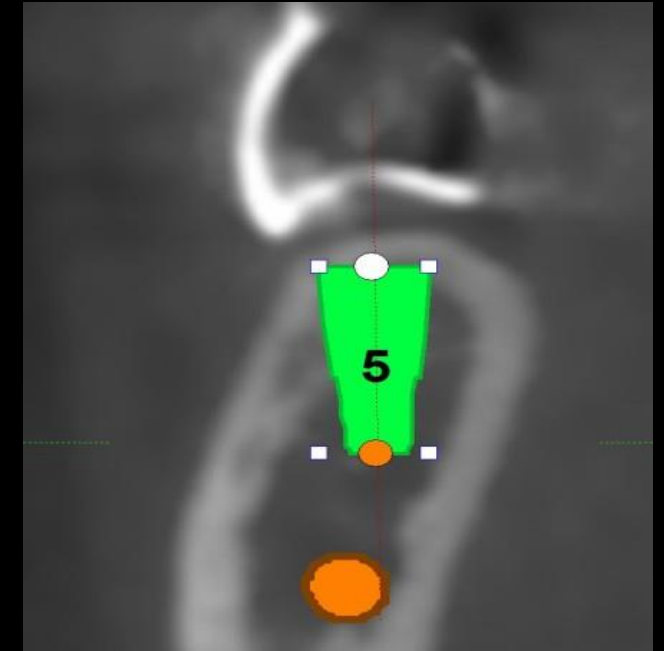
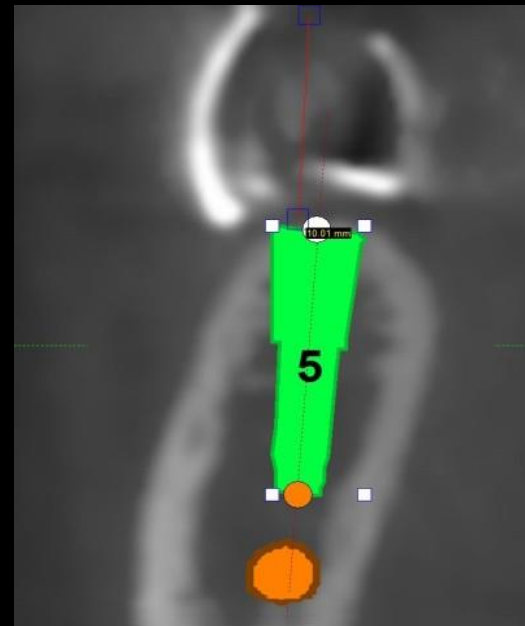
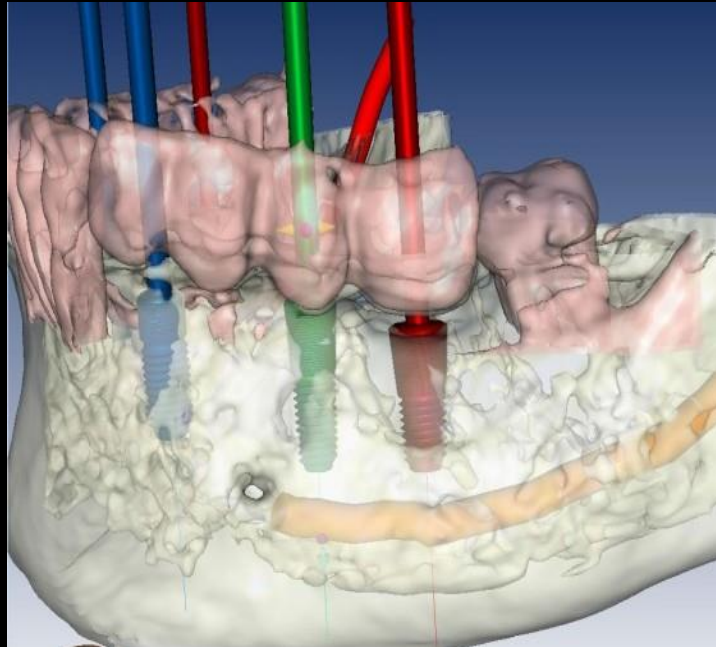
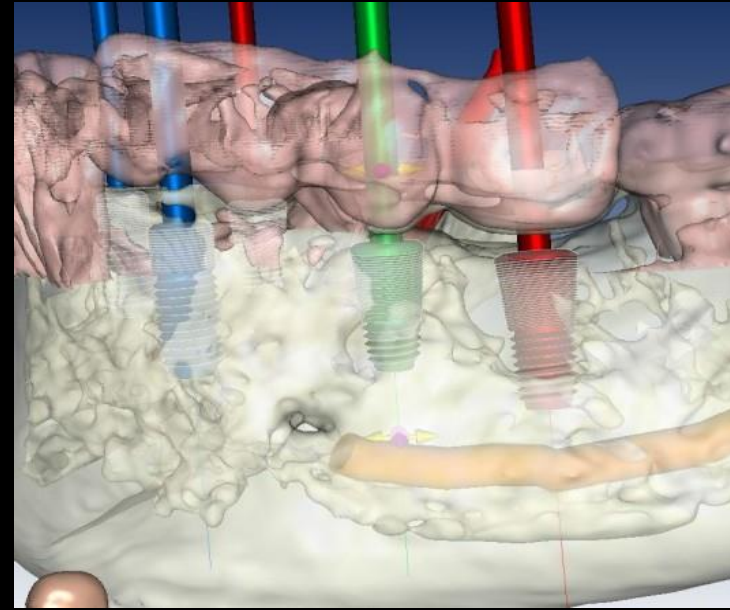
Used to design a surgical guide and extension that will be manufactured



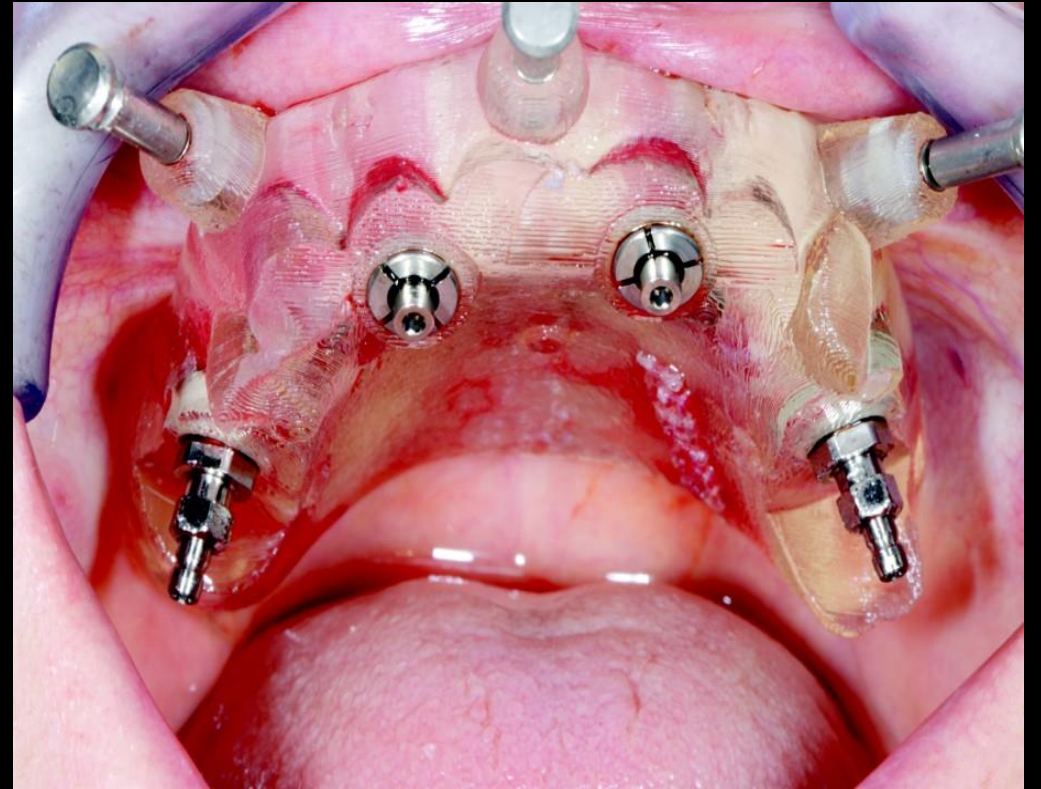
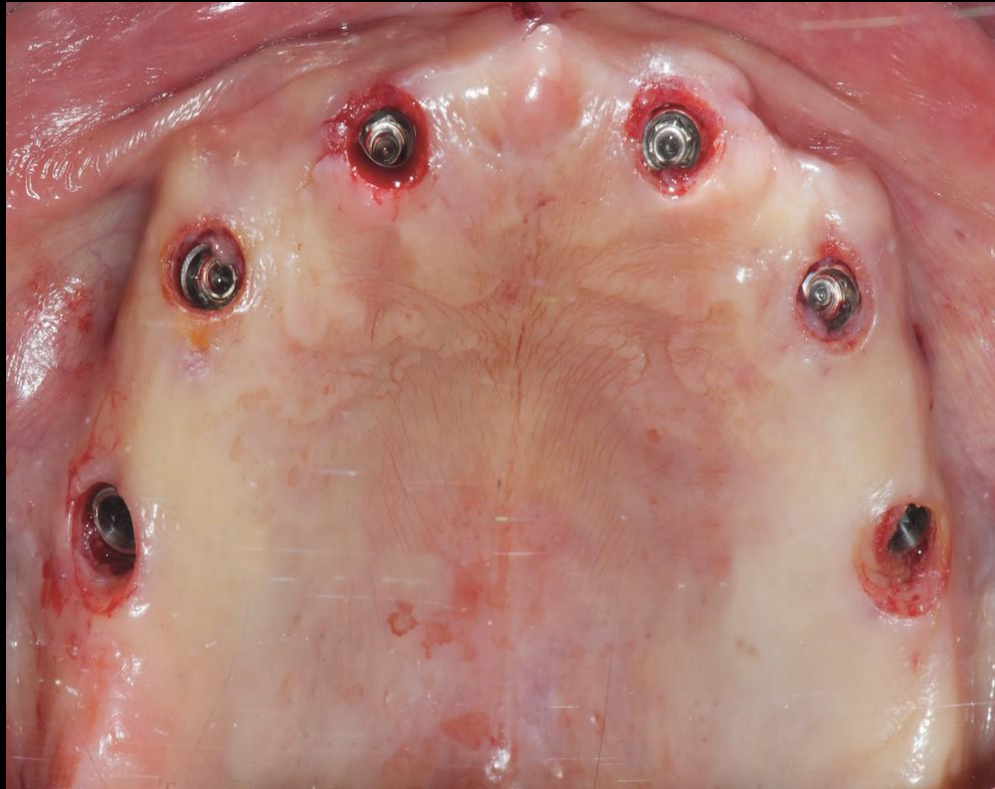


What are the benefits gained from using surgical guide?

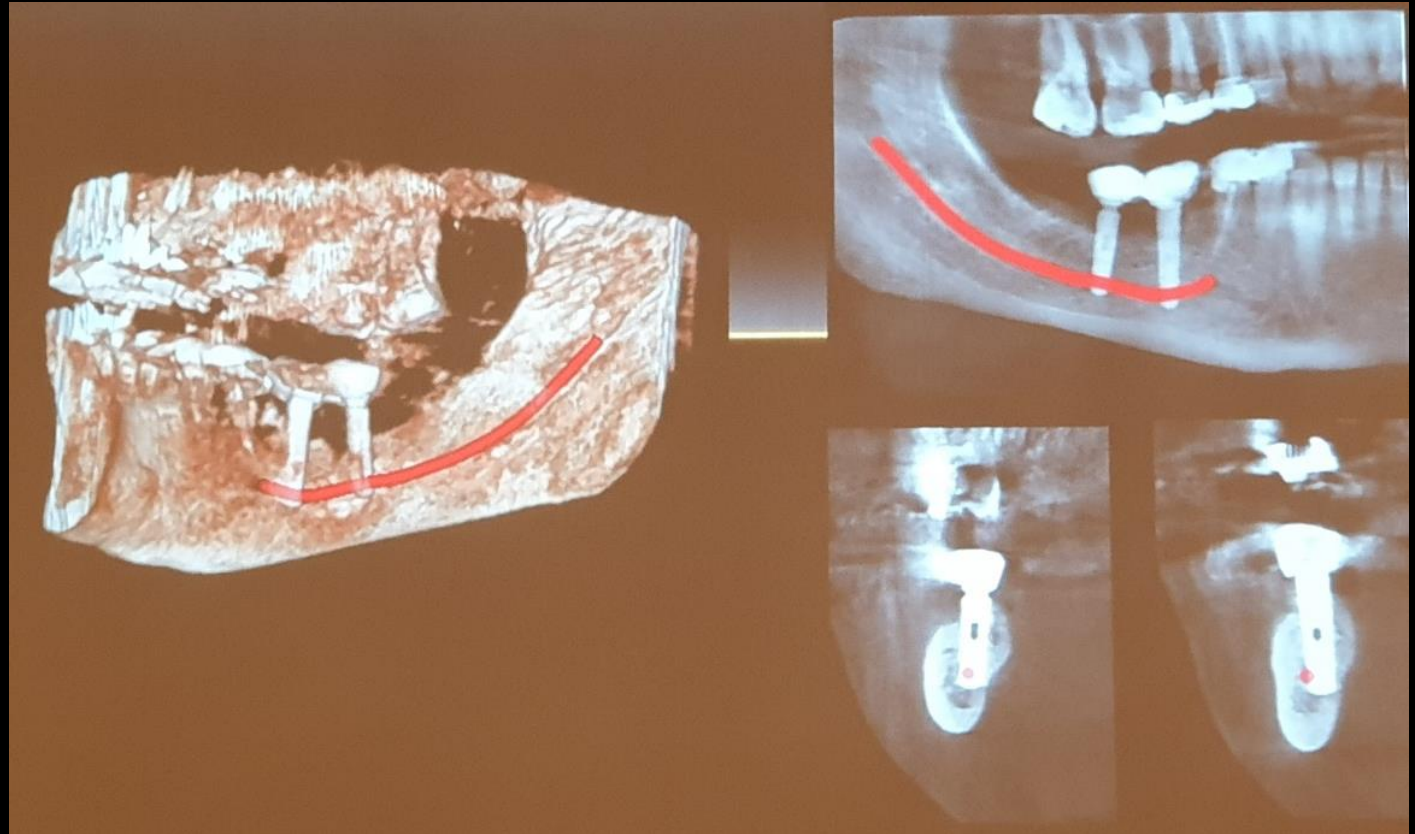
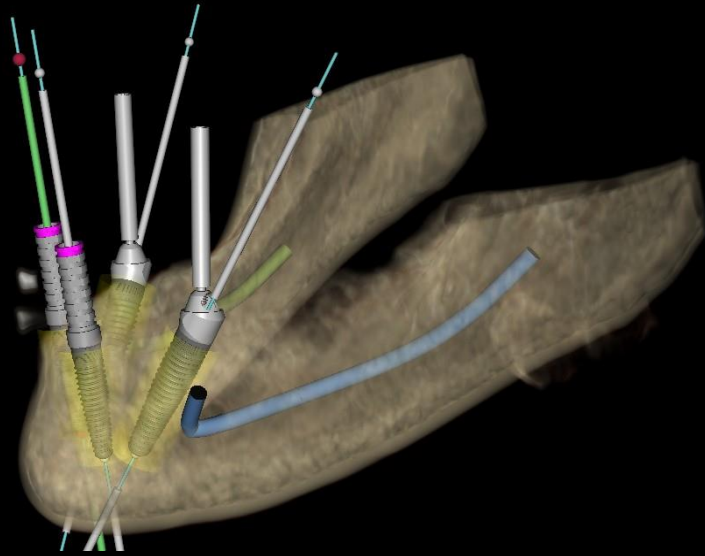
1-Accurate implant placement(depth, direction, position& angulation



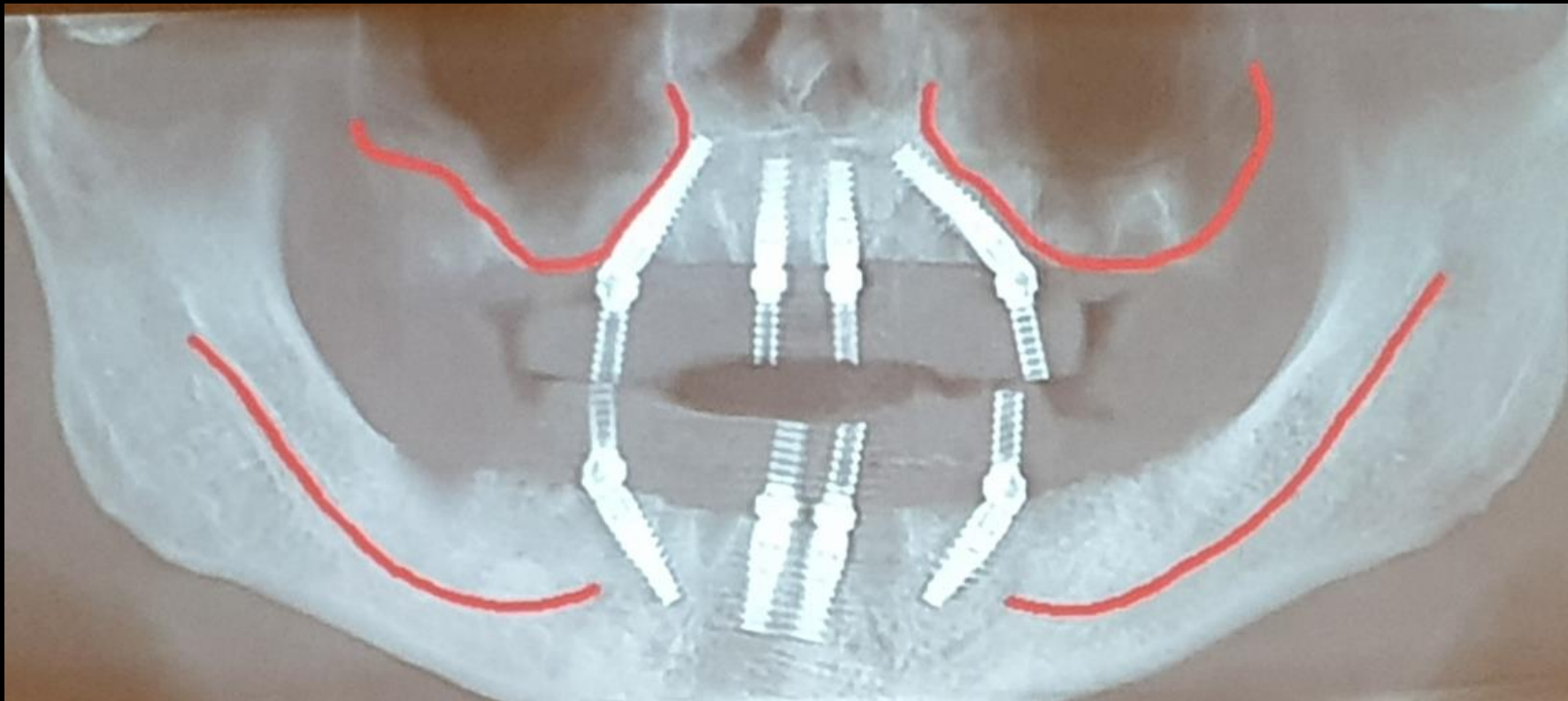
2-Less trauma due to flapless surgery
saves time of surgery with no suturing required



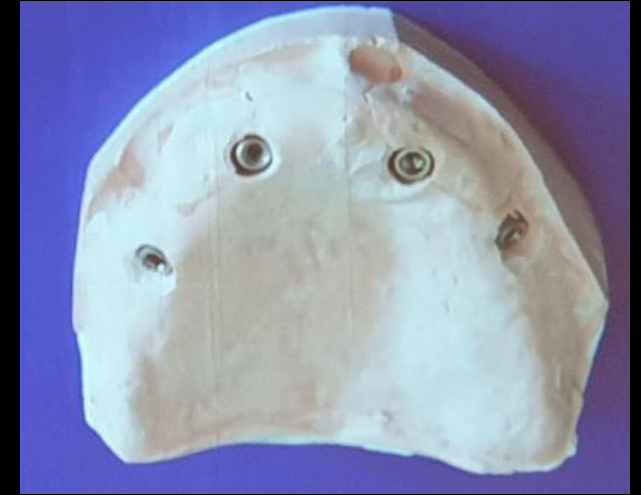
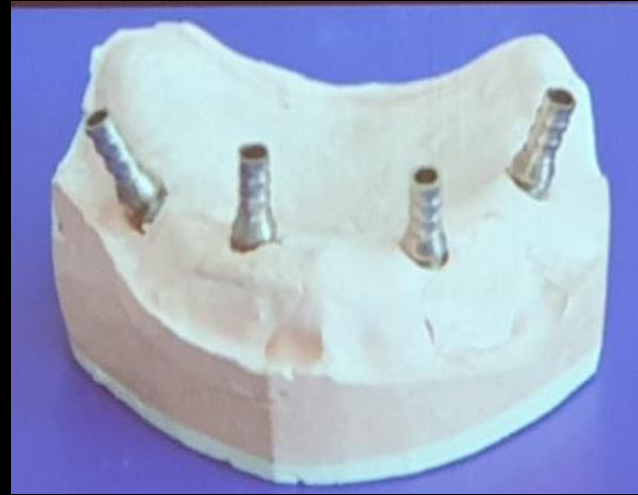
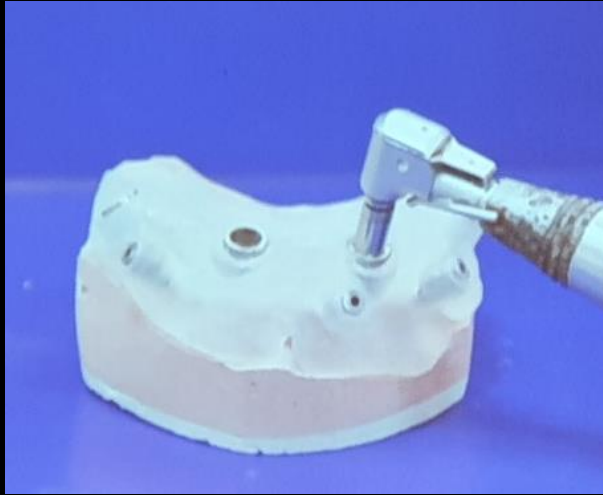
3-Less complication of injuring vital or adjacent structures



4-Very useful in complicated cases such as maxillary sinuses pneumatization that required sinus lift & grafting

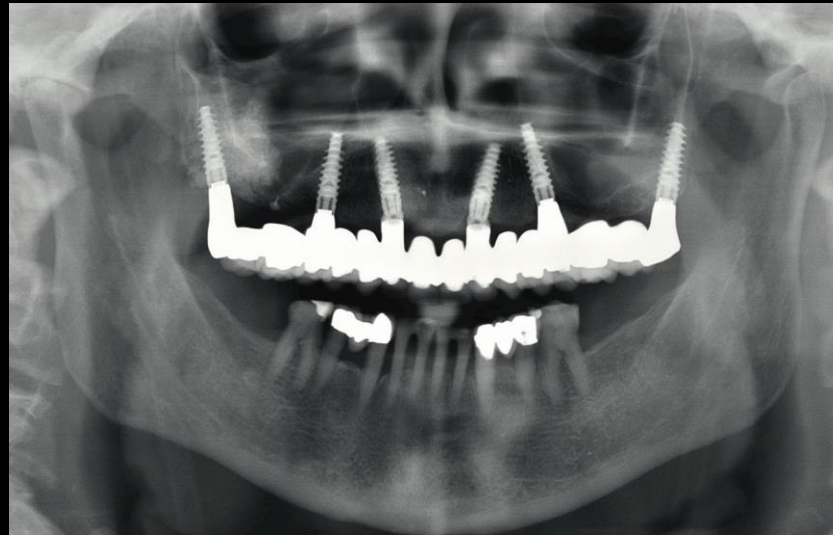
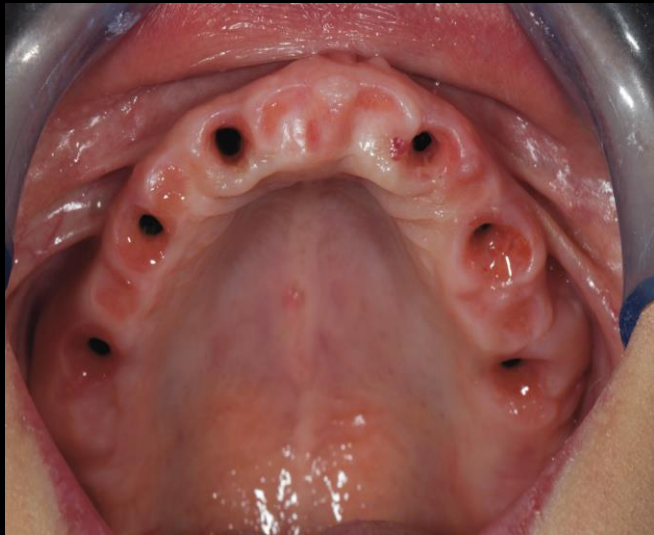
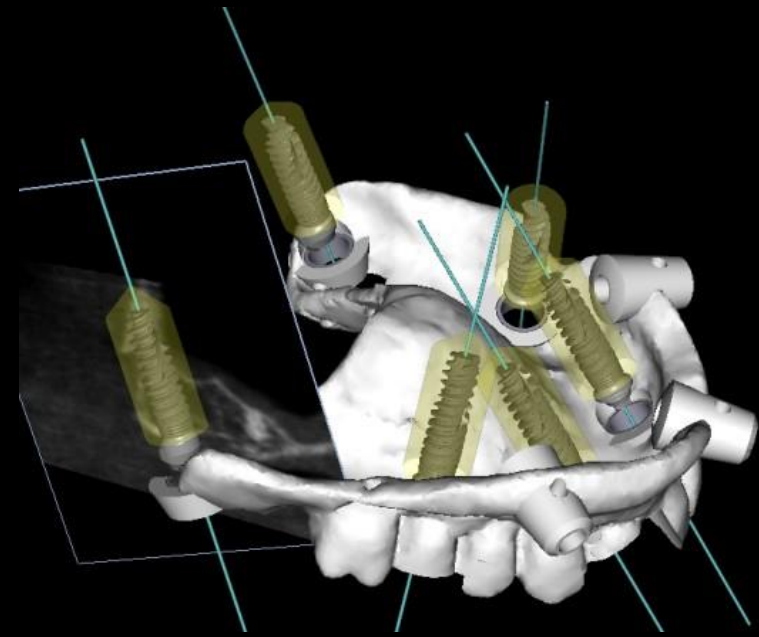


5-Immediate provisional restoration are easily fabricated



6-Precise implant placement

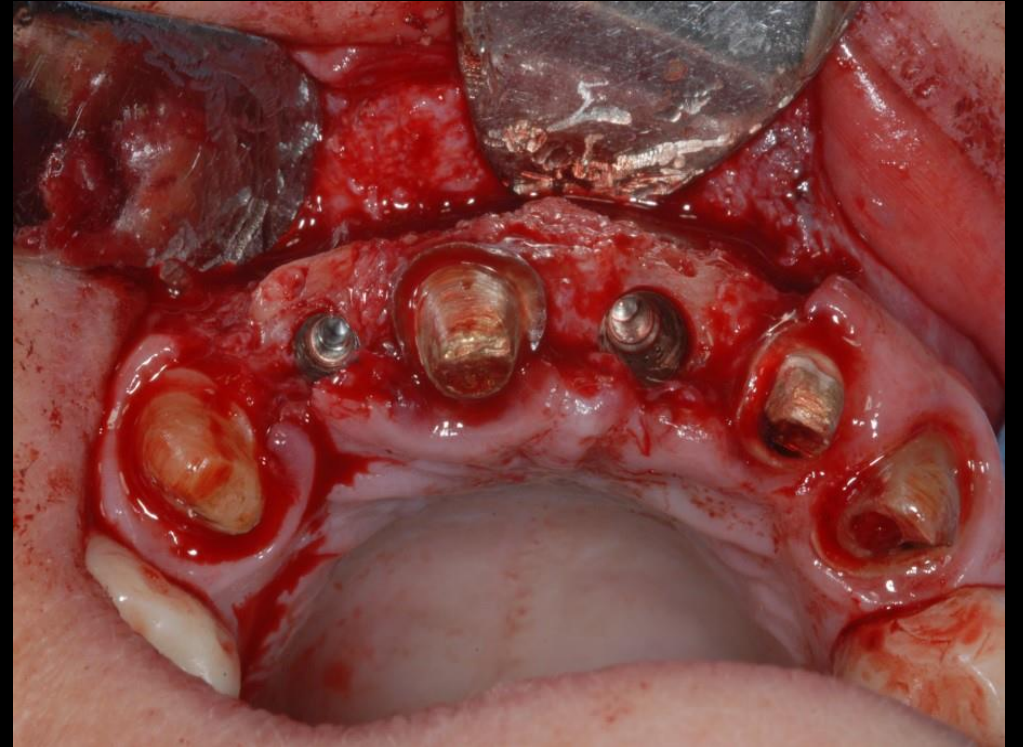
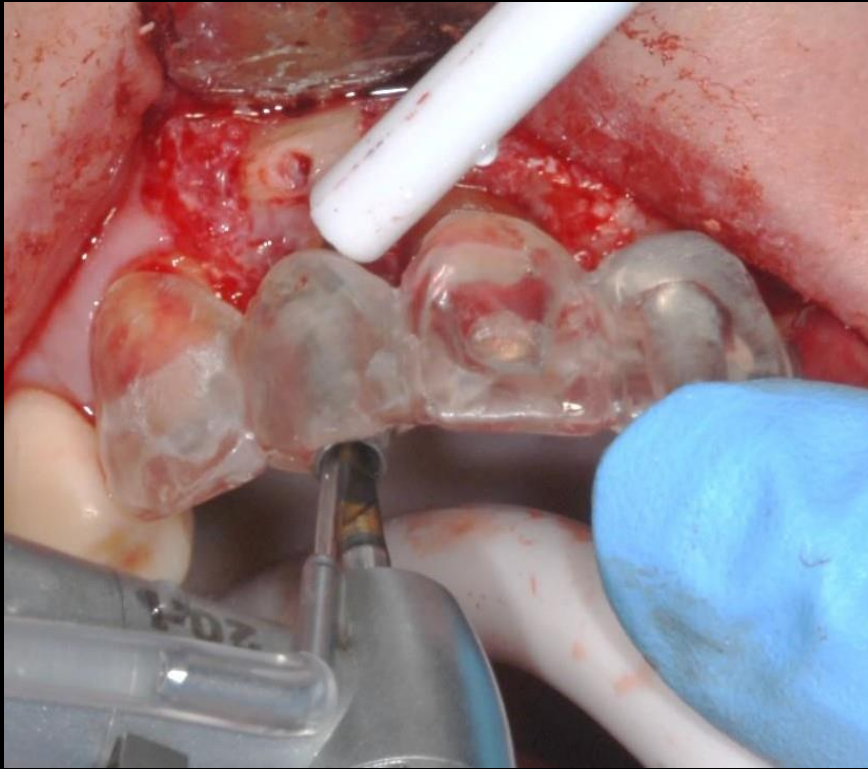
Implants can be precisely placed in tooth positions as opposed to interproximal positions





Is the surgical guide economy for the dentist or not?

1-Saving the cost of hiring an oral surgeon, any dentist can perform this easy task.



2-Saving the cost of general anesthesia, anesthesiologist & hospitalization.

3-Widening the range of case selection as in geriatric patients contra- indication for general anesthesia

4-A very powerful marketing tool in convening the patients , for easily & safely placing implants.

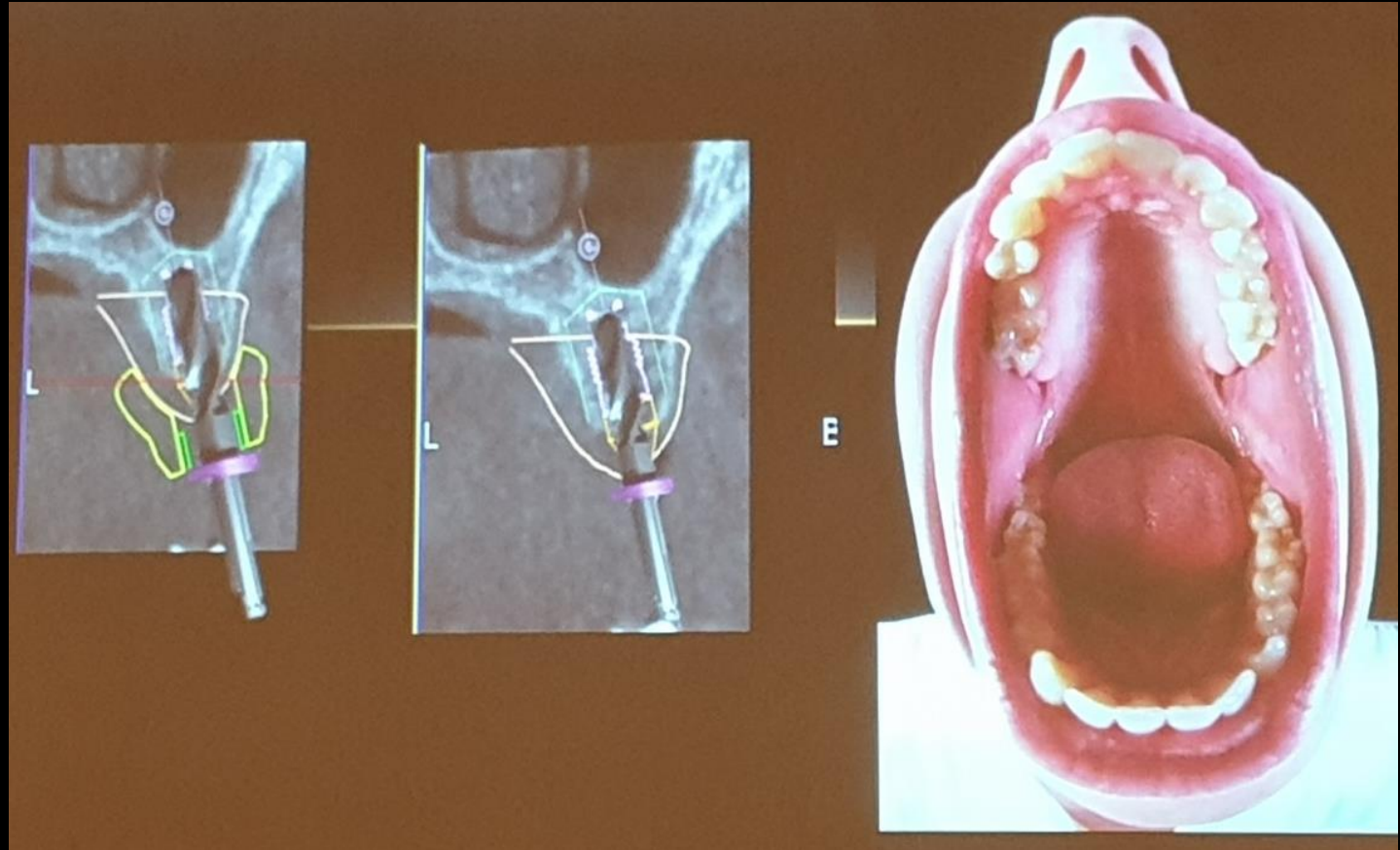
- No flap required
- No sutures
- No general anesthesia
- Less traumatic
- Less time of surgery
- Better accuracy in implant placement
- Immediate provisioned restoration may be possible in some full arch cases
- The latest computer guided technology is used



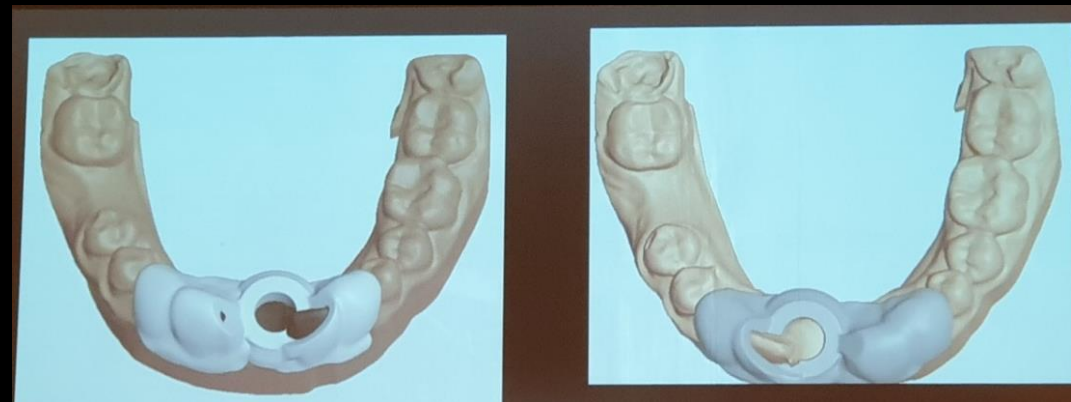
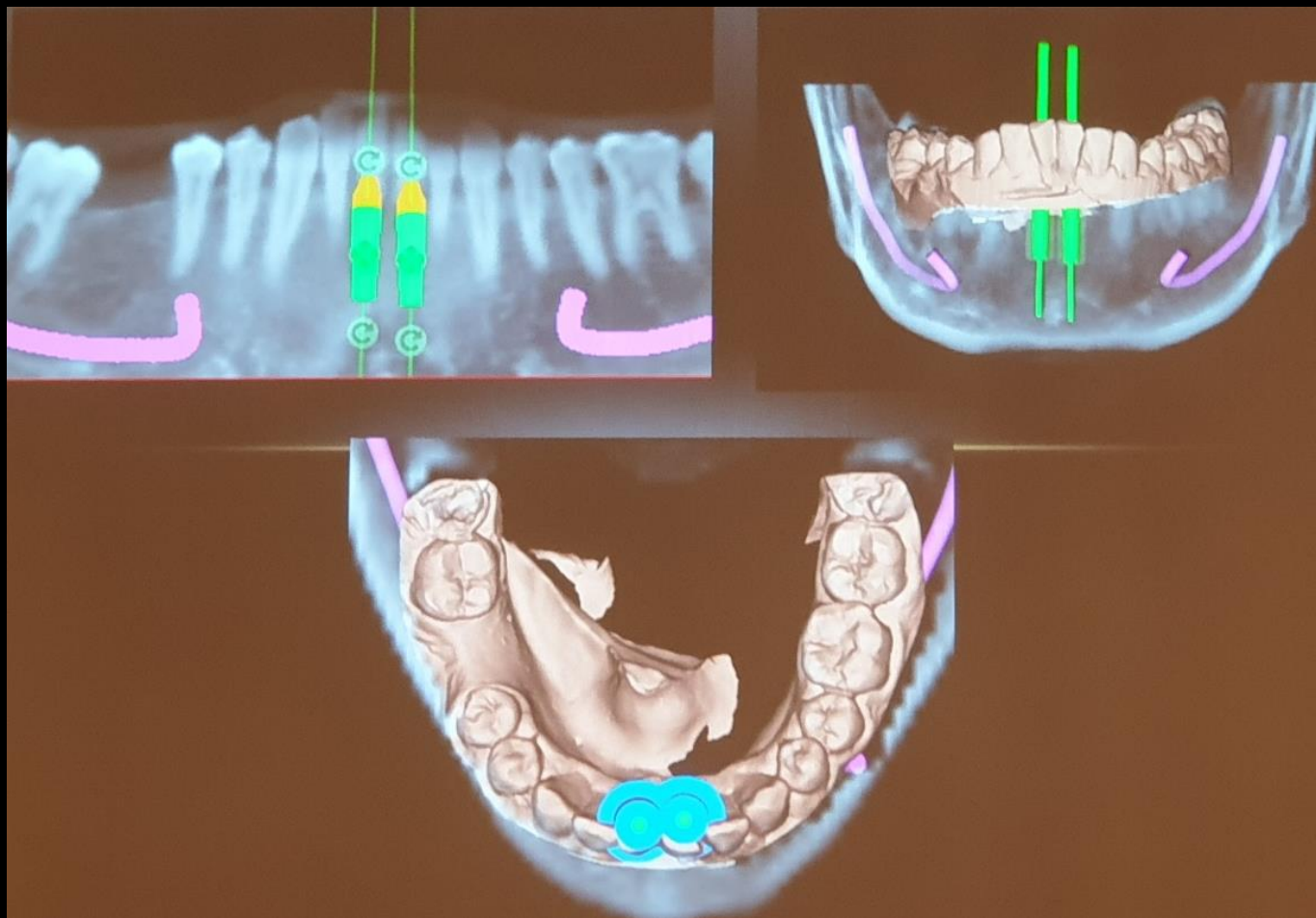
The surgical guide is not cheap but can be very cost effective in full arch cases

Limitation of surgical guide

1- requires a wide mouth opening due to its long drill, so has a limited indication in the second molar region particularly

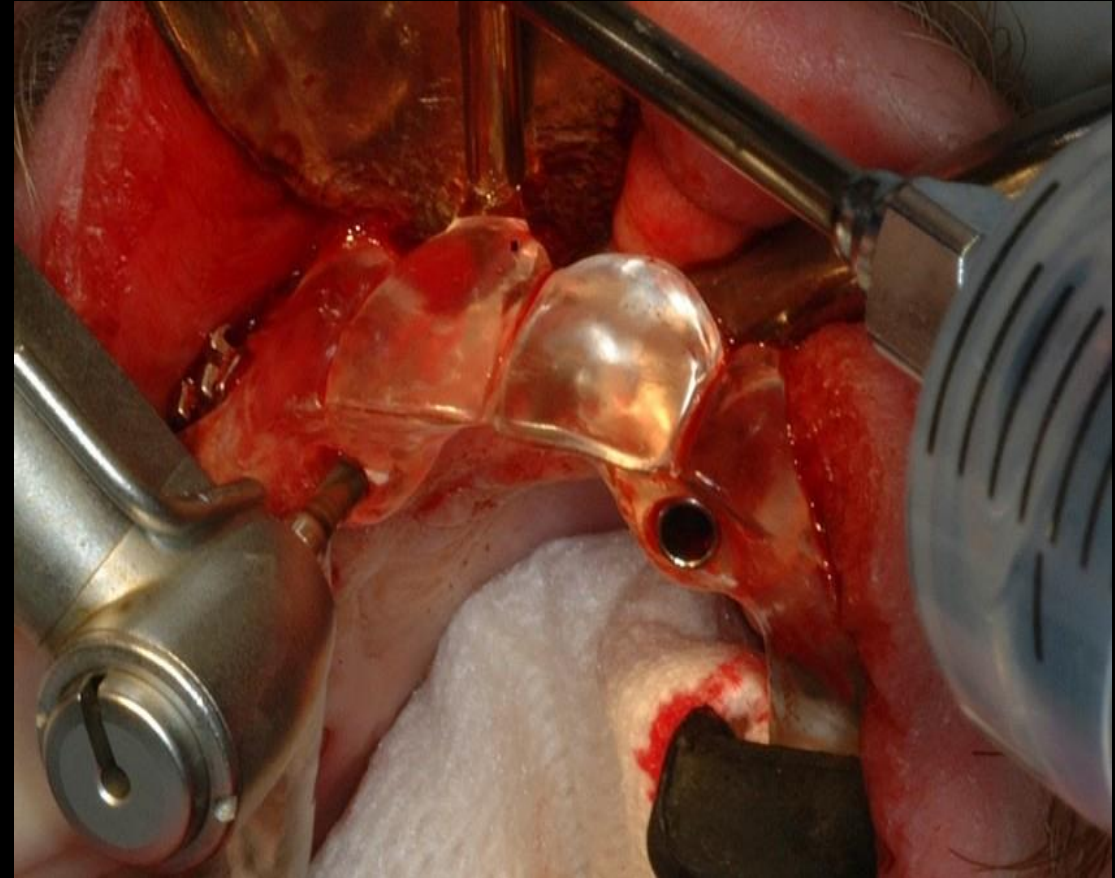


2- required a long mesio-distal space.



3- extra care should be taken with the coolant due to inaccessibility

- Internal irrigating is a solution but clogging of the irrigation tubes is common
- Separate irrigation of the osteotomy site can be performed between each 2 drills.
- Avoid continuous drilling for a long time without irrigation the osteotomy site



4- most of the implant guided surgeries are flapless , which are not suitable for thin ridge cases or cases that require bone grafting ,ridge splinting or only bone graft.



5- inaccuracies due to multiple steps & many equipment used

- **Hardware errors e.g. non calibrated optical scanners**
- **Software errors e.g. wrong registration or planning**
- **Technique errors e.g. wrong fixation**

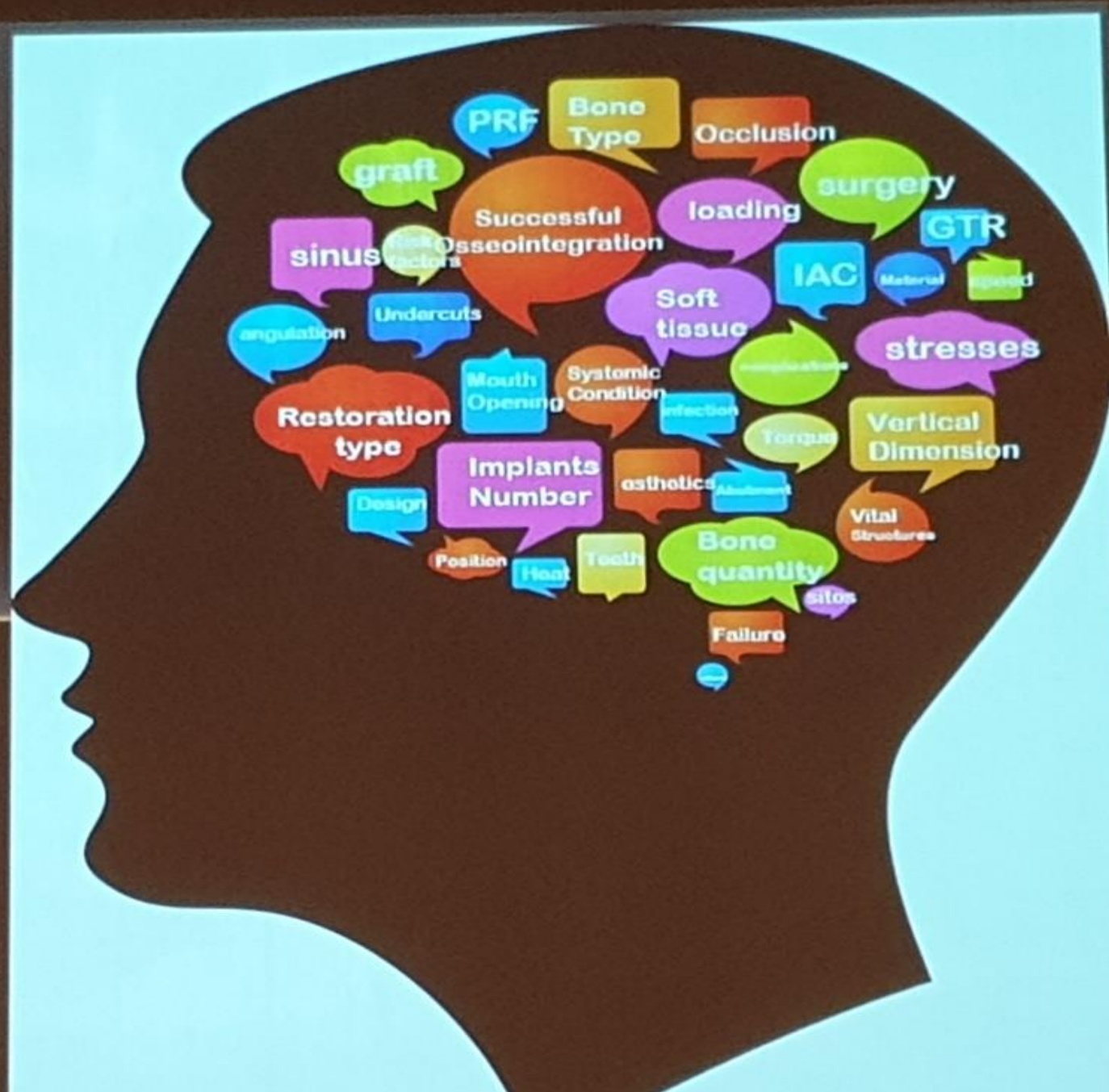


6- expensive for making a single implant

7- requires a lot of training for fabrication

Brain Guided implantology

The computer will
not think for you



A close-up photograph of a hand holding a clear glass filled with water. A white straw is inserted into the glass. The background is a soft, out-of-focus light blue and white. The text "Thank you for you listening" is overlaid in the center in a bold blue font.

**Thank you for you
listening**

avodae



Pause (k)



0:03 / 3:39



YouTube



MacBook Pro