IMPLANT SYSTEM

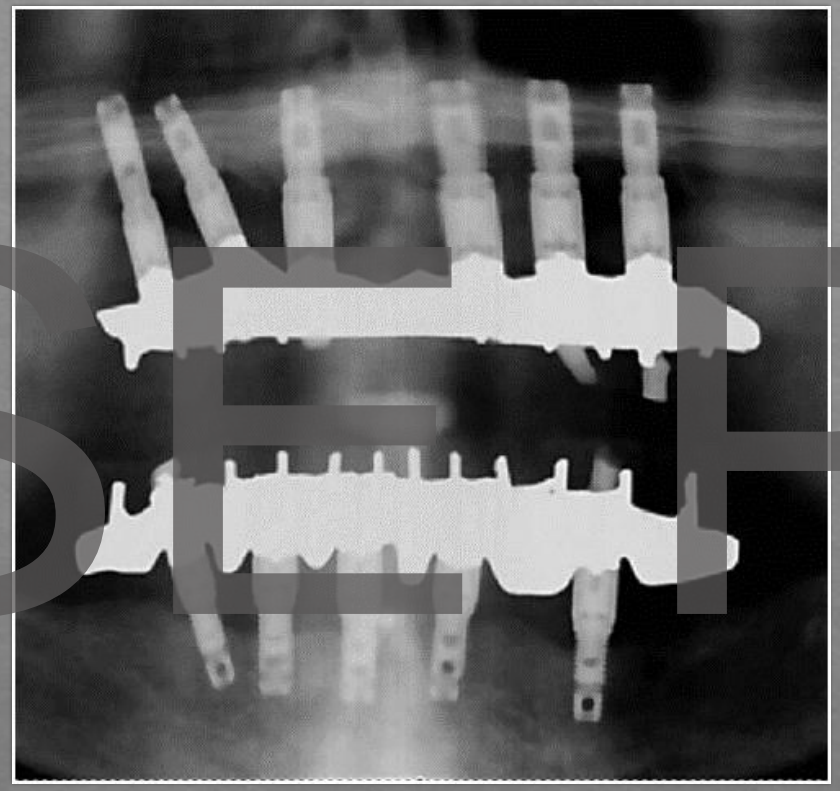
Dr Péter Windisch

The philosophy of Nobel Biocare

Nobel Biocare has a 40-year heritage of scientific research and innovation.

- Nobel Biocare is synonymous *with* ***scientific leadership and innovation***. The company has a 40-year heritage of original scientific research and innovation in ***restorative and esthetic dentistry***—the longest in the industry—and is dedicated to continually advancing safe and effective solutions.
- Nobel Biocare builds upon Professor Per-Ingvar Brånemark's foundation of modern implant dentistry and Matts Andersson's development of prosthetic and CAD/CAM dentistry with Procera.
- Upon these two innovations, Nobel Biocare has introduced to the market numerous advanced restorative and esthetic dental solutions, many of which have become industry standards.

A 44-year Success Story – Sven Johansson has had oral implants longer than anyone else on Earth



These eleven implants were placed by Professor Per-Ingvar Brånemark himself and are still fully functional for Sven Johansson

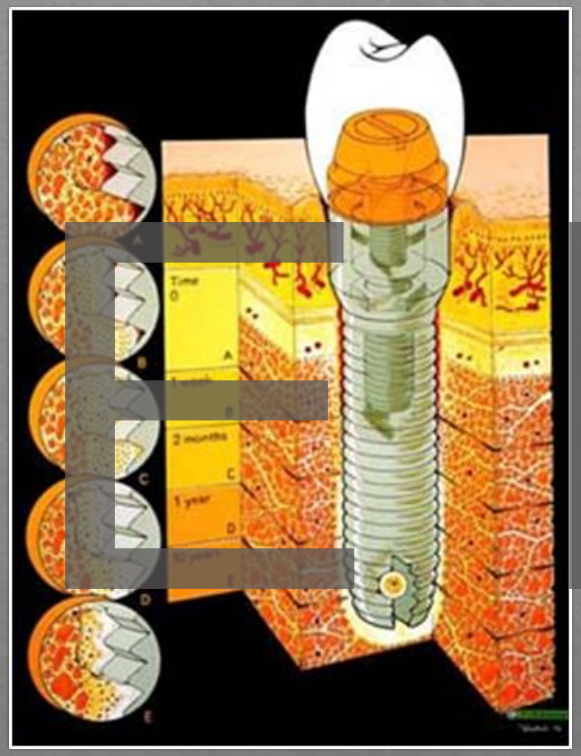
Sven Johansson of Gothenburg, Sweden, was the second patient to ever receive Brånemark System implants. They have been serving him well since 1967.

Nobel Biocare NEWS Issue 1/2012

Per-Ingvar Brånemark

- was born in 1929
- swedish orthopedic suregon
- the „father of modern dental implantology”

Concept of osseointegration



Schematic drawing of the principles of osseointegration

Scanning electron micrograph showing a bone cell attaching to titanium

Association of Brånemark Osseointegration Centers (ABOC)

Concept of osseointegration

Direct structural and functional connection between living bone and the surface of a load-bearing artificial implant.

- **Albrektsson, T., Branemark, P.-I., Hansson, H.-A., Lindstrom, J.:**Osseointegrated titanium implants. Requirements for ensuring a long-lasting, direct bone-to-implant anchorage in man(1981) Acta Orthopaedica Scandinavica, 52 (2), pp. 155-170.
- **Branemark, P.-I., Albrektsson, T., Skalak, R., Symington, J., Zarb, G.:** Osseointegrated Dental Implants. (1982) Transactions of the Annual Meeting of the Society for Biomaterials in conjunction with the Interna, *5*, p. 132.
- **Branemark, P.I., Adell, R., Albrektsson, T.:**Osseointegrated titanium fixtures in the treatment of edentulousness(1983) Biomaterials, 4 (1), pp. 25-28.
- **Linder, L., Albrektsson, T., Branemark, P.I.:**Electron microscopic analysis of the bone-titanium interface (1983) Acta Orthopaedica Scandinavica, 54 (1), pp. 45-52.

Long-term follow-up studies

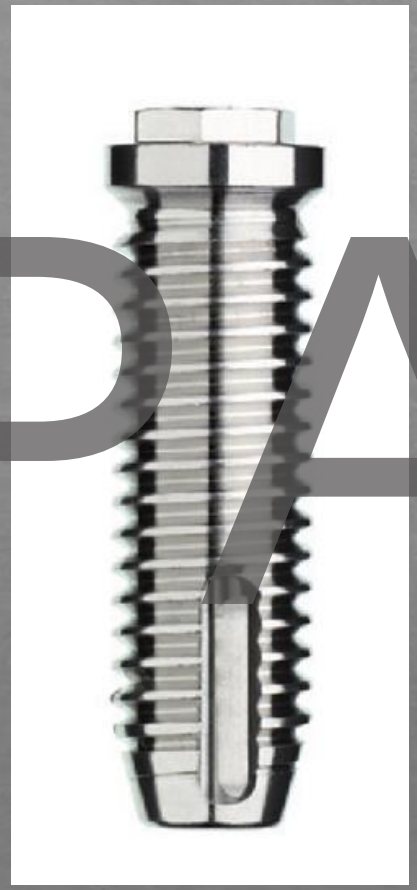
„Tissue integrated prostheses”

• **Ivanoff, C.-J., Gröndahl, K., Bergström, C., Lekholm, U., Brånemark, P.-I.:** Influence of Bicortical or Monocortical Anchorage on Maxillary Implant Stability: A 15-Year Retrospective Study of Brånemark System Implants (2000) International Journal of Oral and Maxillofacial Implants, 15 (1), pp. 103-110.

•**Adell, R., Eriksson, B., Lekholm, U., Brånemark, P.I., Jemt, T.:** Long-term follow-up study of osseointegrated implants in the treatment of totally edentulous jaws.
(1990) The International journal of oral & maxillofacial implants, 5 (4), pp. 347-359.

Development of Brånemark system

- at first 3.75 mm Ø
- second concept 5.5 mm Ø



- good integration
- round cross section
- smooth surface
- continuous spiral
- external hexagonal interlocking connection

Development of Brånemark system

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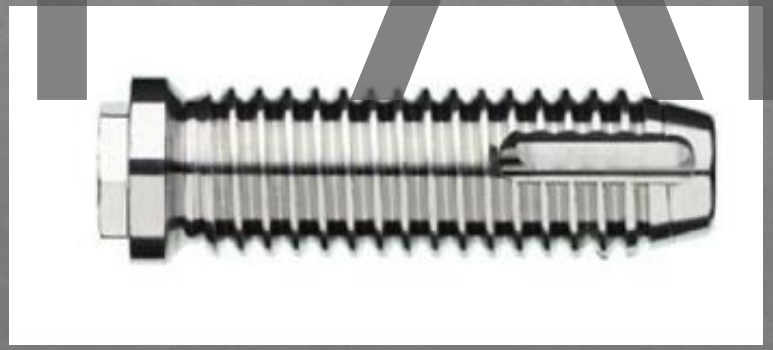
- 1983 MK I (the first selftapping type of Brånemark) the introduction of a new implant concept – only for soft bone



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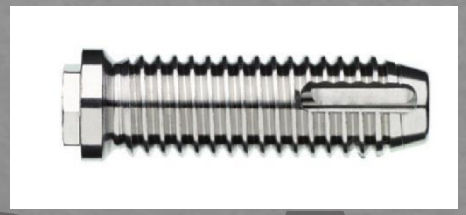

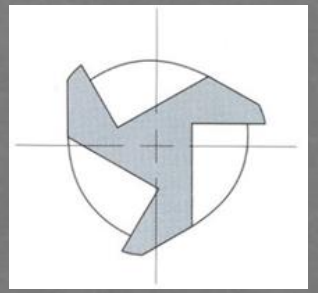

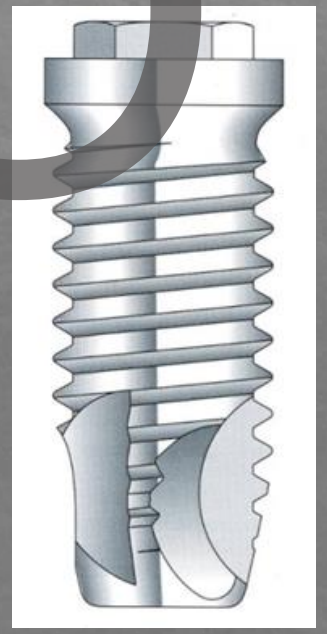

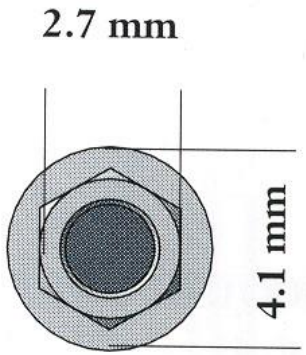

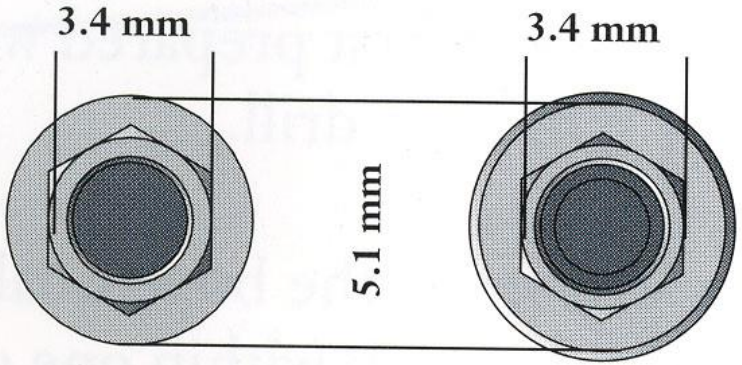

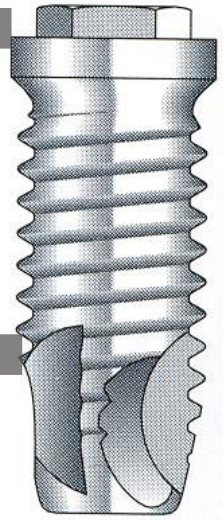

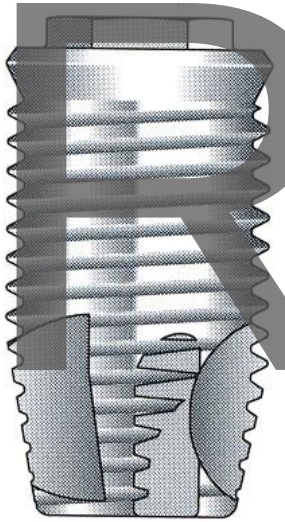

Mk II
∅ 3.75 mm RP

Mk II
∅ 5 mm WP

Mk II
∅ 5.5 mm WP

Development of Brånemark system

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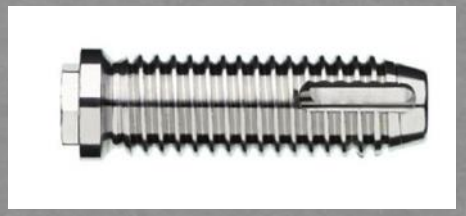
- second concept 5.5 mm Ø



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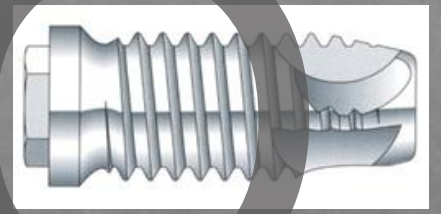

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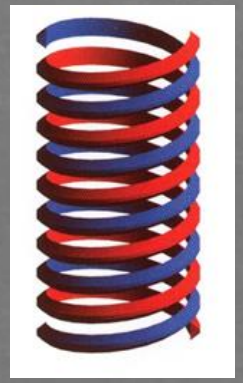
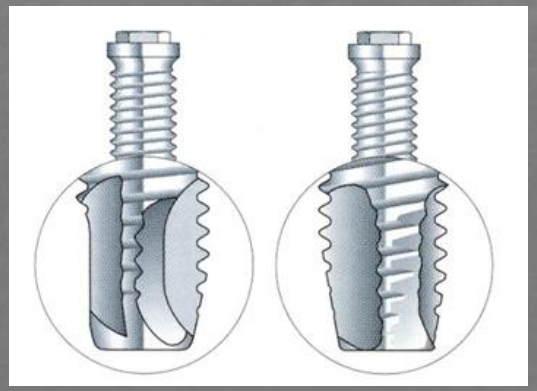
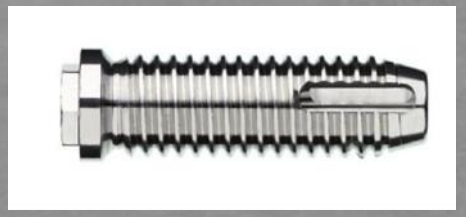
- MKIII implant - instead of fixture mount uni star grip 1996-1999





Development of Brånemark system



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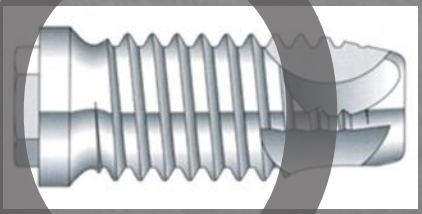
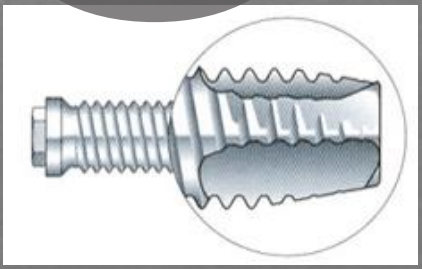
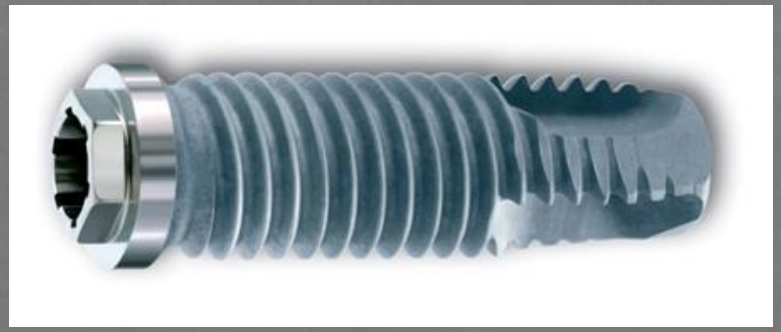
- MKIV 2000-2001





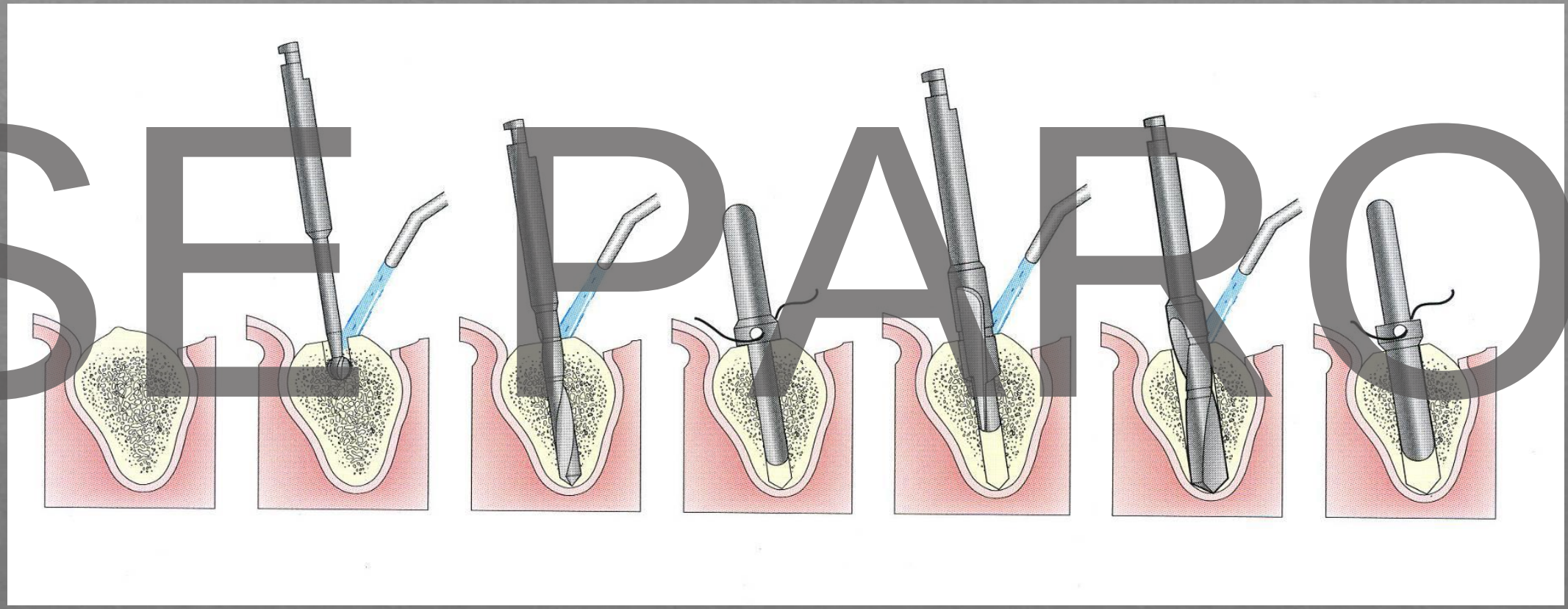


The surgical procedure of implant placement

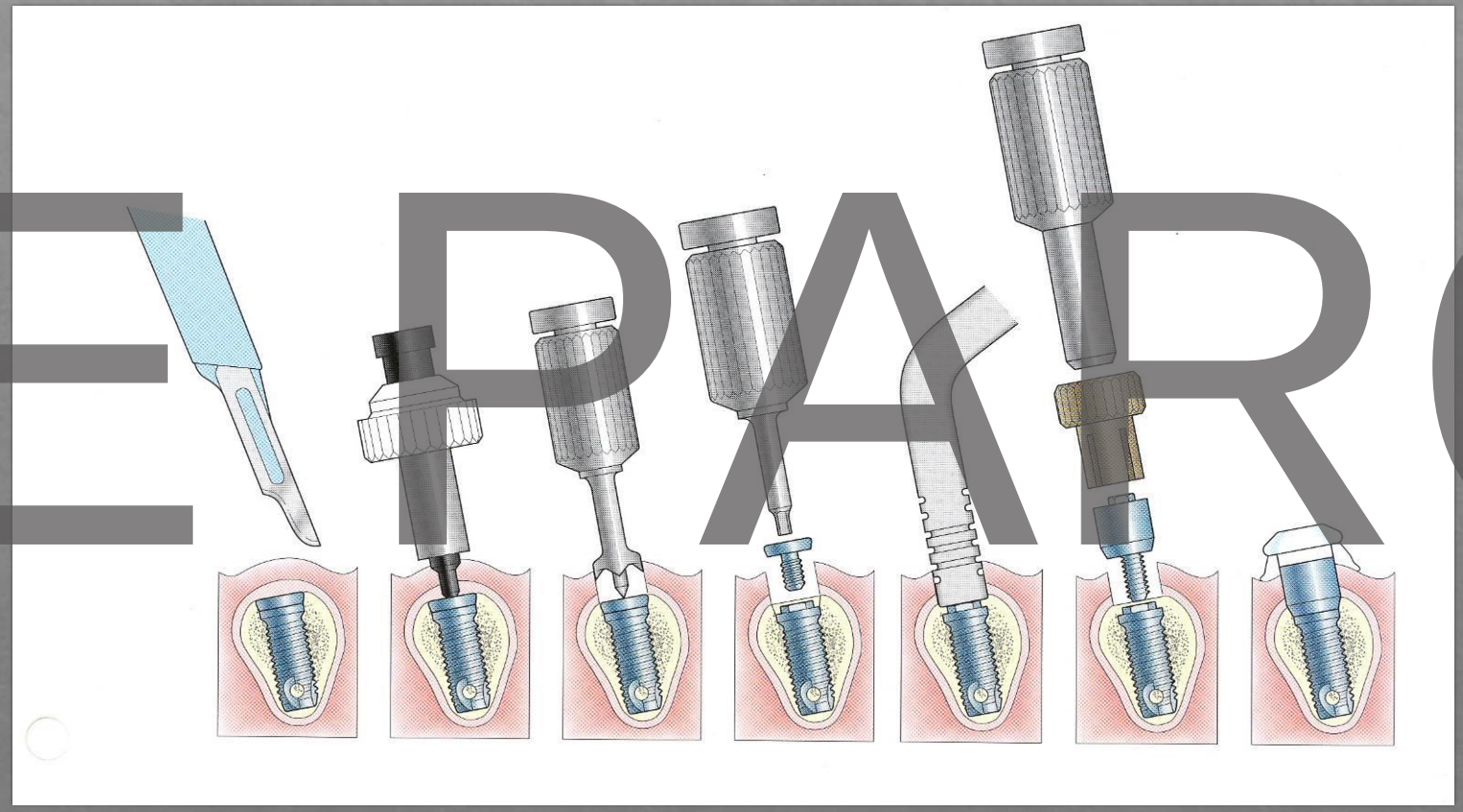
- **Stage 1**: 2.85 – 3 – 3.15 mm Ø drill – depending on the bone density (Albrektsson-Zarb)
- Diameter of a standard implant is 3.75 mm, diameter of the neck is 4.1 mm, diameter of the external hexagon is 2.7 mm, the height of the external hexagon is 0.7 mm
- **Stage 2**: 4-6 months later (time of osseointegration) fixture-abutment connection
- Technique of the periimplant mucosa formation

Branemark P-I, Lekholm U and Zarb GA, Albrektsson T.: Tissue –Integrated Protheses. Quintessence Publishing Co. 1985, p.202

Stage 1.



Stage 2.



SEPARO

Clinical importance of the „proper soft tissue” around implants

- early publications: „in bone anchored implants” with standard abutments
- later animal studies on soft tissue healing around implants (***Berglundh – Lindhe*** 1996-1997; ***Abrahamsson et al*** 1997)
- gum healing caps – soft tissue depth measuring tools – EstheticCone
- esthetic solutions for implant born prosthesis – Luminates - Alloy-free ceramics – CeraOne system CerAdapt
- development of Nobel Rondo system
- 1983 Matts Andersson –Procera system

Clinical importance of the „proper soft tissue" around implants

- **Berglundh T.& Lindhe J.:** Dimension of the peri implant mucosa. Biological width revisited. J Clin Periodontol 1996: 23: 971-973. © Munksgaard, 1997.
- **Berglundh T., Lindhe J., Ericsson I., Marinello CP., Liljenberg B., Thomsen P.:** The soft tissue barrier at implants and teeth. .Clin Oral Implants Res. 1991; 2(2):81-90.
- **Abrahamson I., Berglundh T., Wennstrom J., Lindhe J.:** The peri-implant hard and soft tissues at different implant systems. A comparative study in the dog Clin Oral Implants Res. 1996 Sep;7(3):212-9.
- **Abrahamsson I., Berglundh T., Lindhe J.:** The mucosal barrier following abutment dis/reconnection. An experimental study in dogs. J Clin Periodontol 1997: 24: 568-572. © Munksgaard, 1997.

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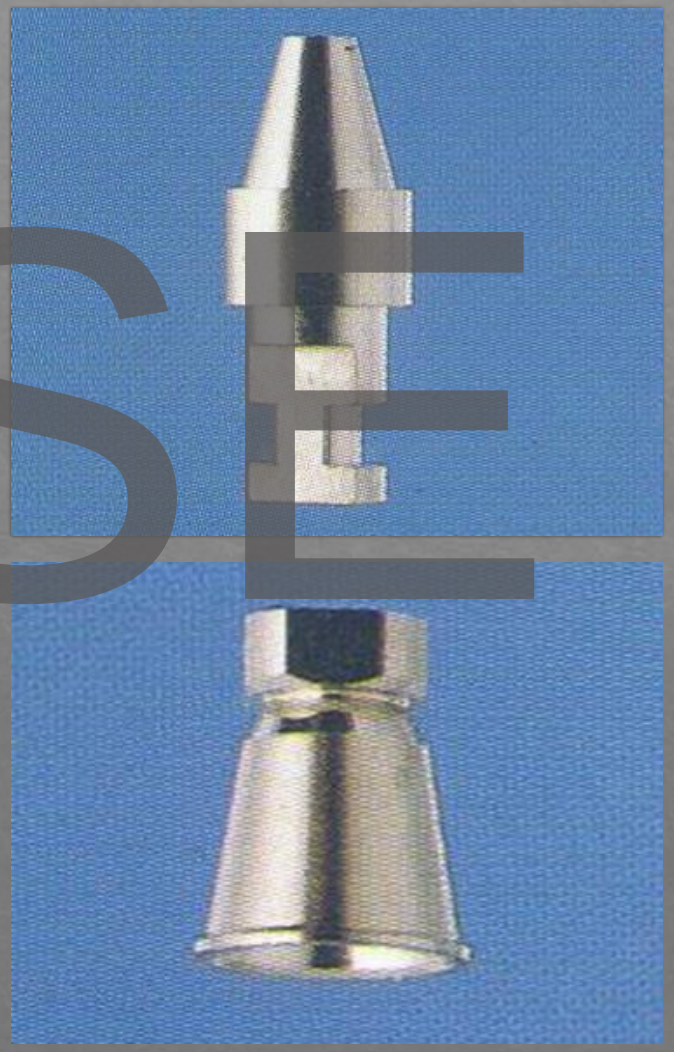
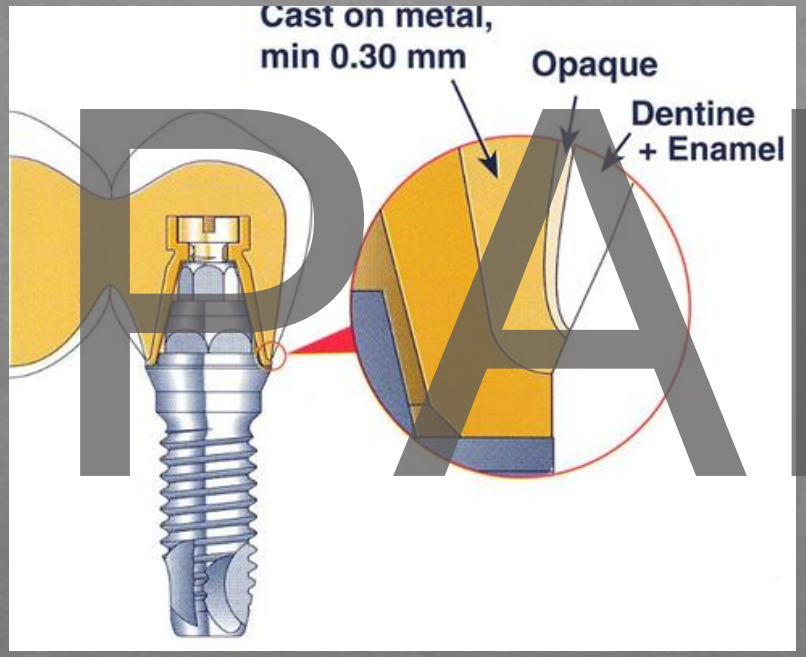
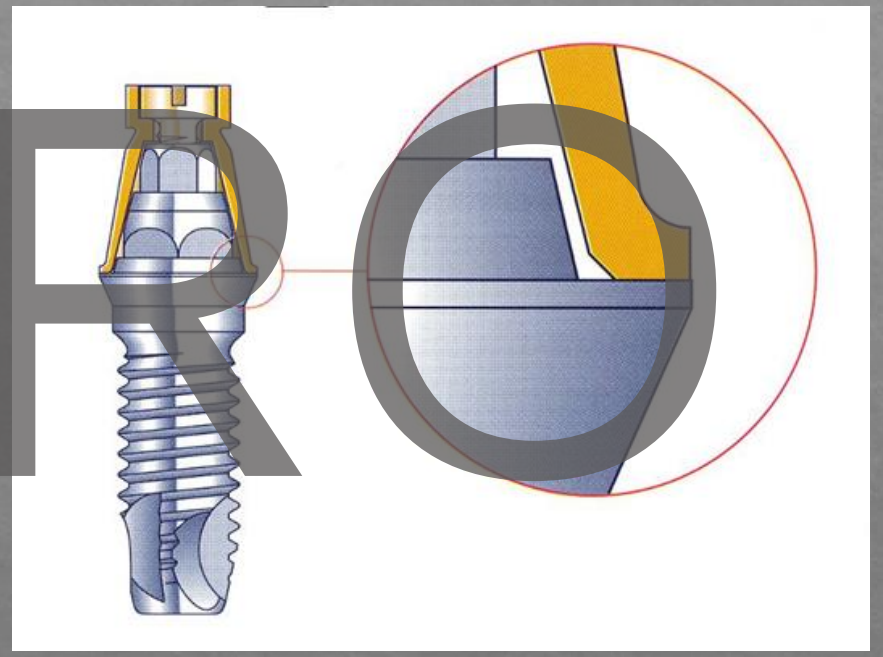
Soft tissue individualization - EsthetiCone







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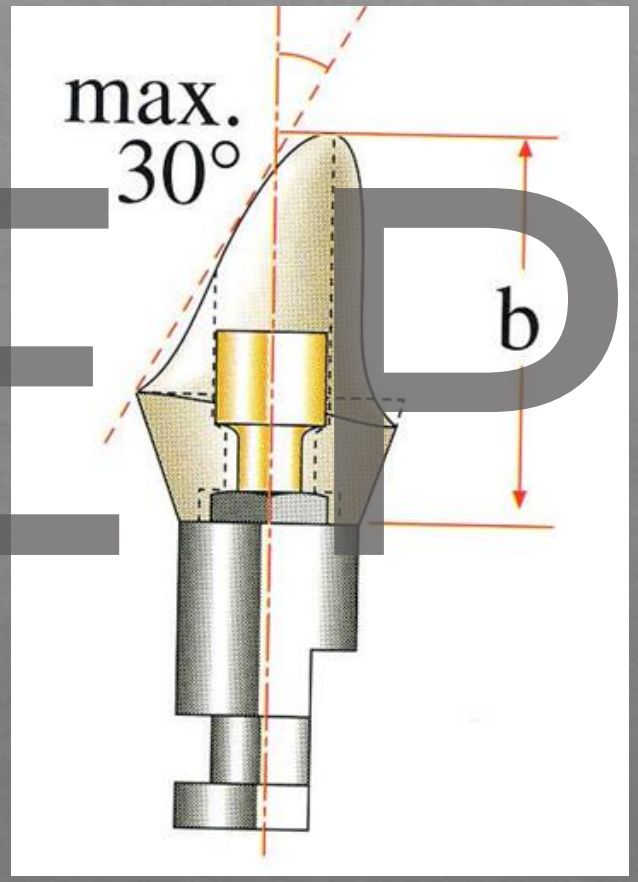
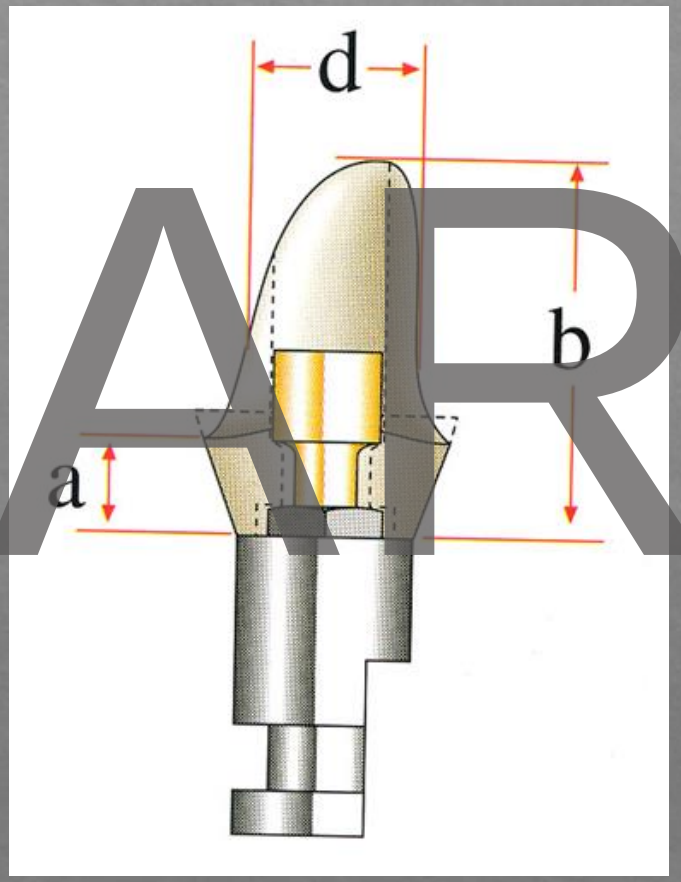
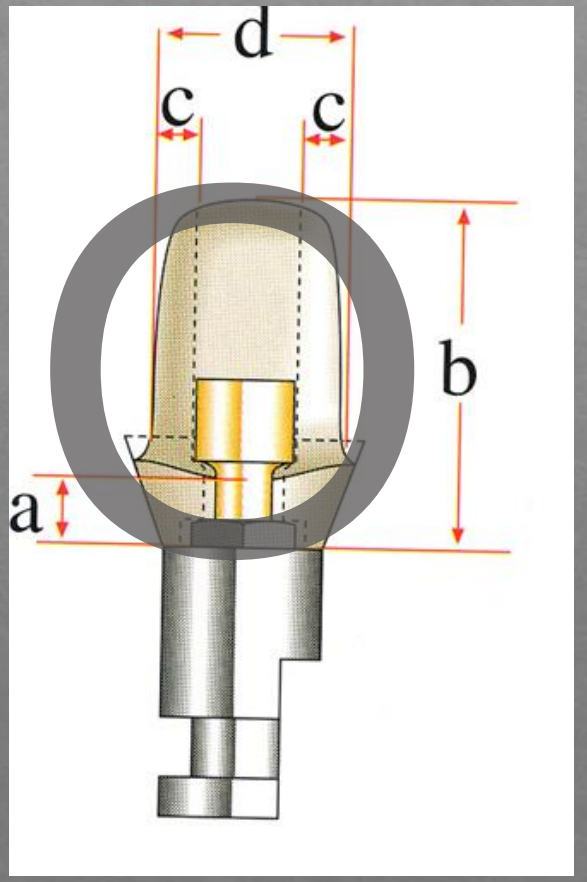
NobelProcera™

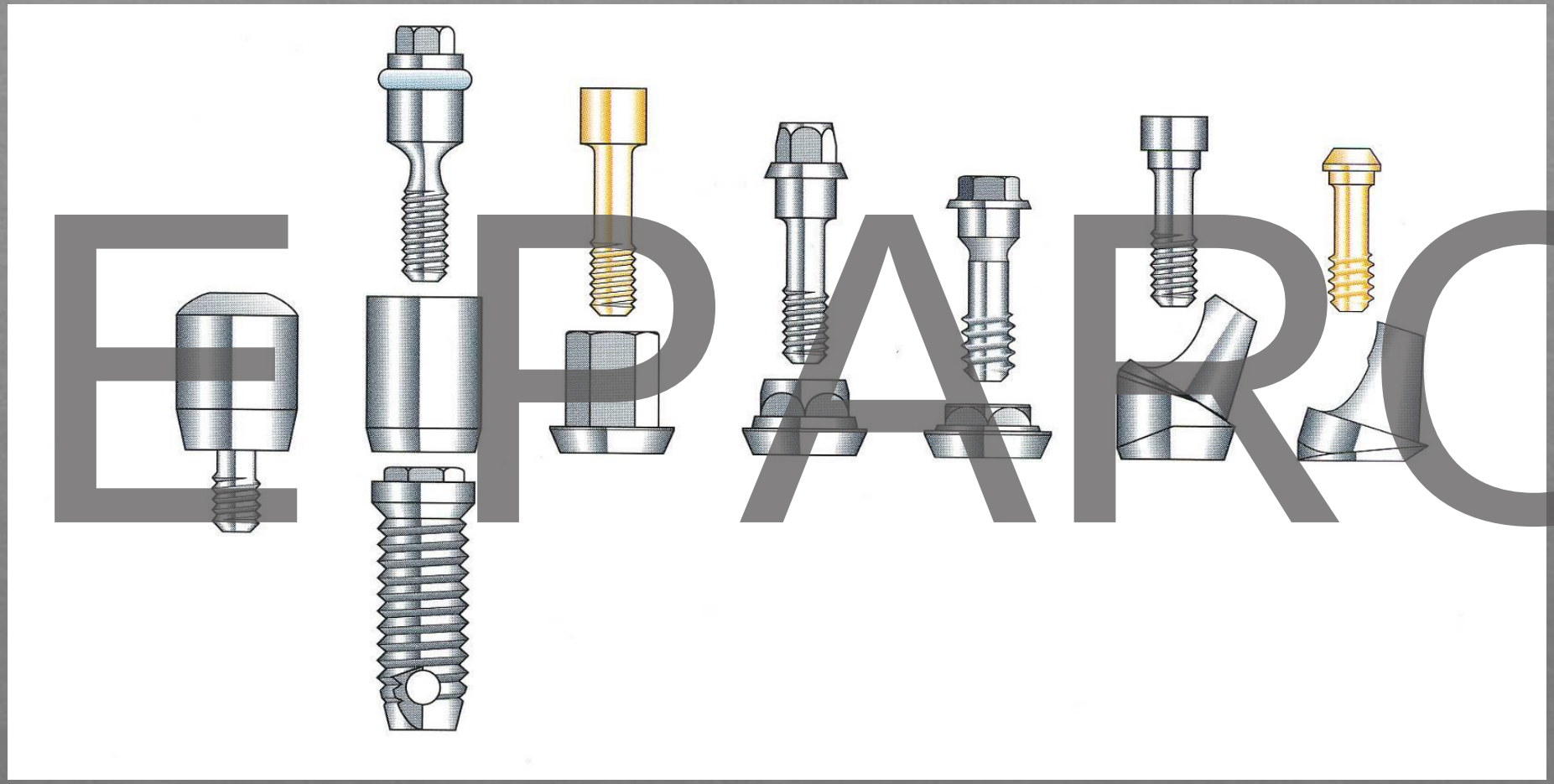






Development of the precision prosthetic elements

- First standardised system
- Impression coping, implant replica, gold cast to framework (GCTF) titanium frameworks - Nordic Bridge
- Impression coping elements for open – closed tray system



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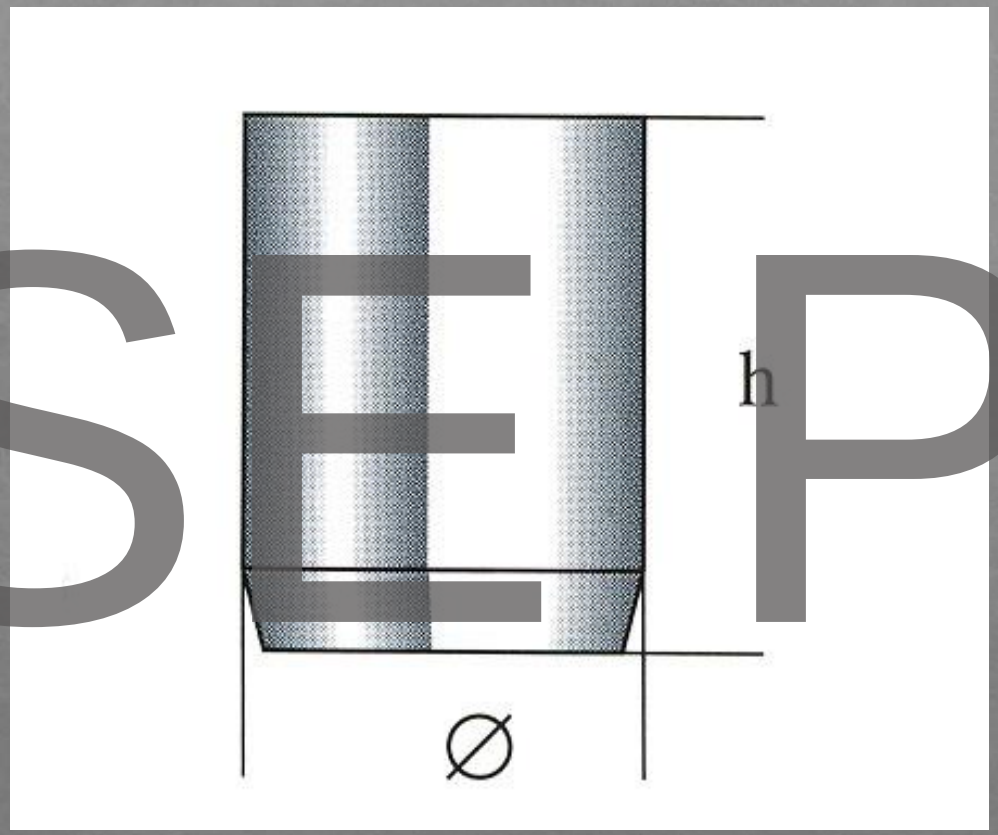
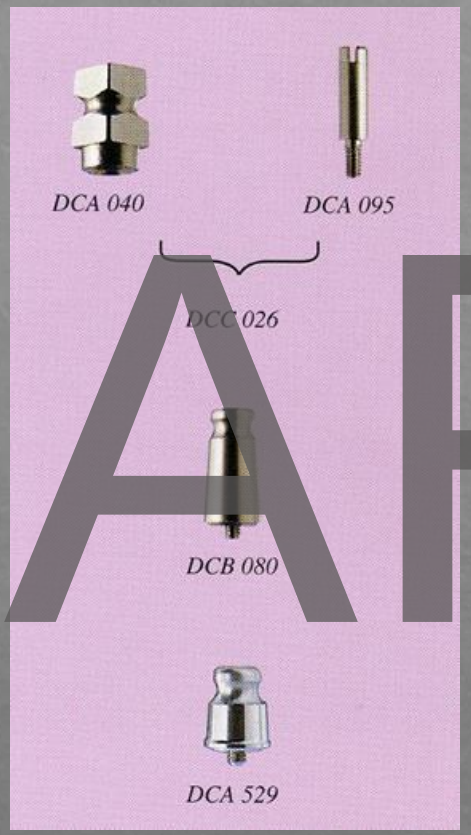

h
∅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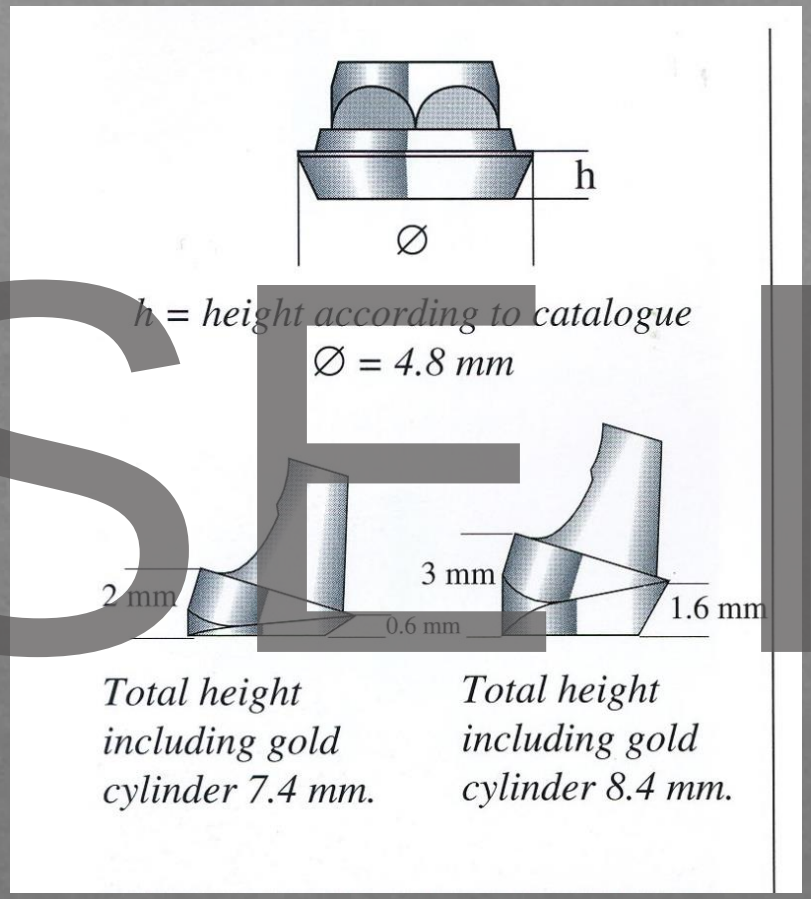
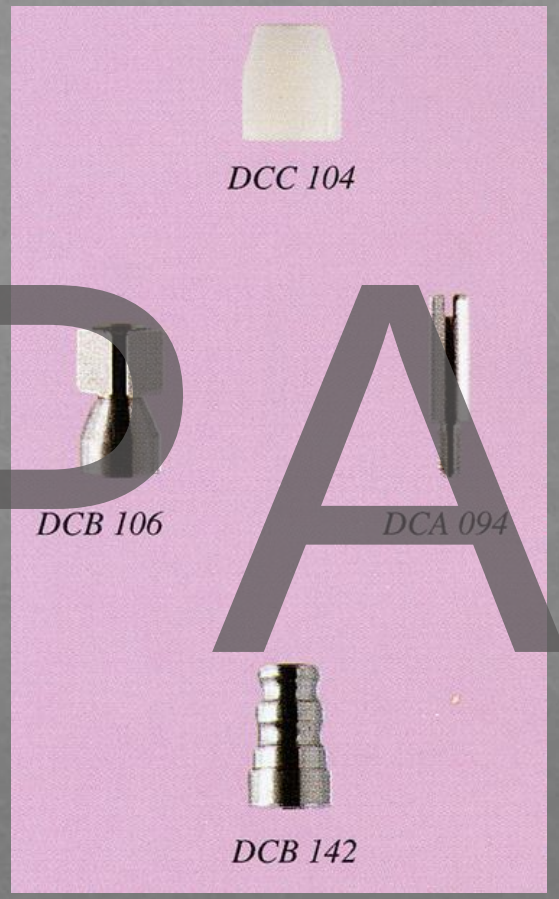
DCA 529


SDCA 006
DCC 045
DCC 046
CPB 012


h
∅
h = height according to catalogue
∅ = 4.8 mm
2 mm
3 mm
0.6 mm
1.6 mm
Total height including gold cylinder 7.4 mm.
Total height including gold cylinder 8.4 mm.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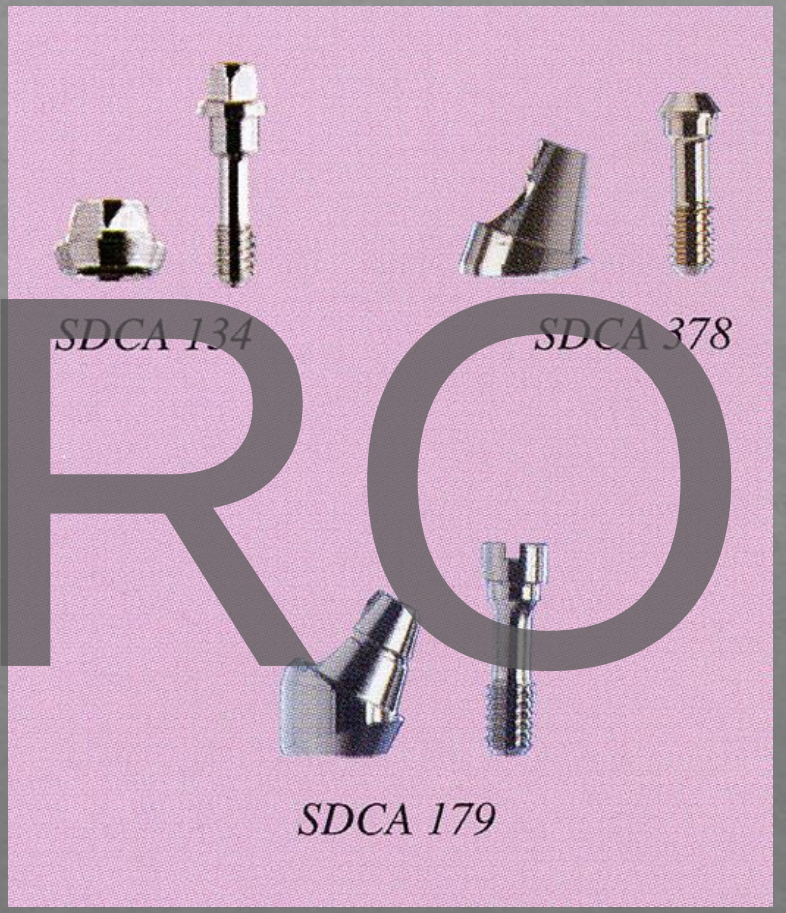
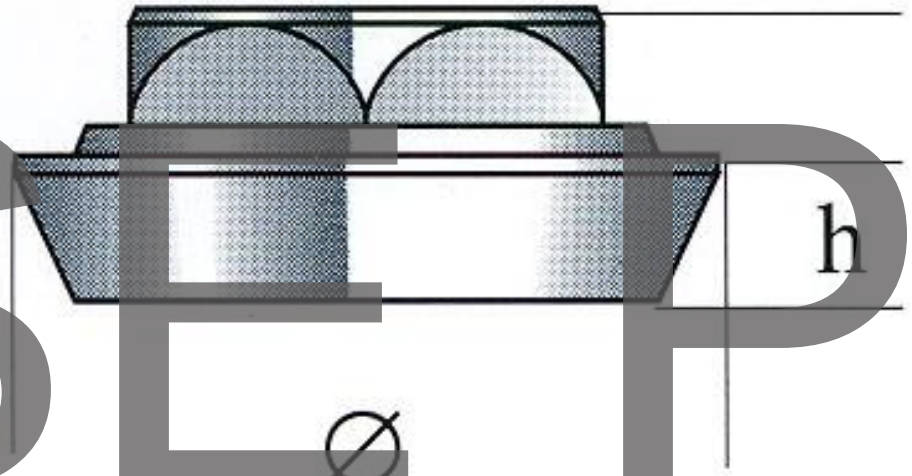
DCA 094
DCB 142


SDCA 134
SDCA 378
SDCA 179



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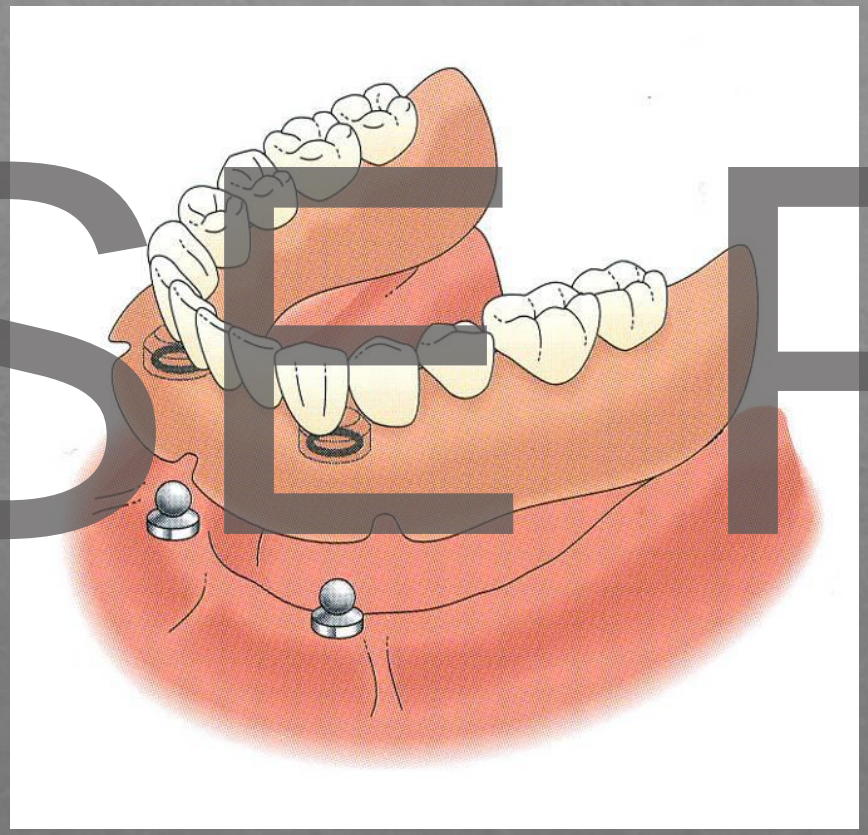
DCA 436

DCA 438

SDCA 419

DCA 476



1996 Nobelpharma→Nobel Biocare

- Tissue - friend biological materials
- Simple surgery – more esthetic solution
- Are You satisfied with it?

SE PARO

Procera® technology

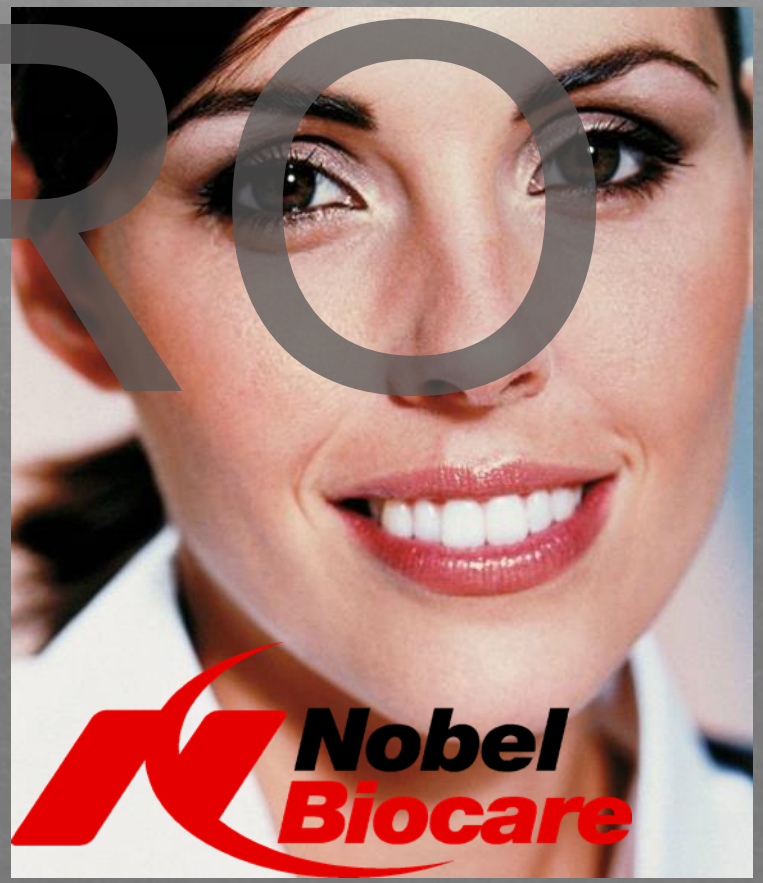
Introduction of CAD/CAM technology in implant dentistry

1985 the first patient solved by the new technology

4.5 million patients

7 million prosthetic elements

290 scientific publication



Well-known CAD/CAM systems

- Cerec® (Sirona)
- Precident DCS®
- Everest® (KaVo)
- Cercon® (DeguDent)
- Lava® (3M Espe)
- Procera® (Nobel Biocare)

CAD/CAM systems

- Computer Aided Design

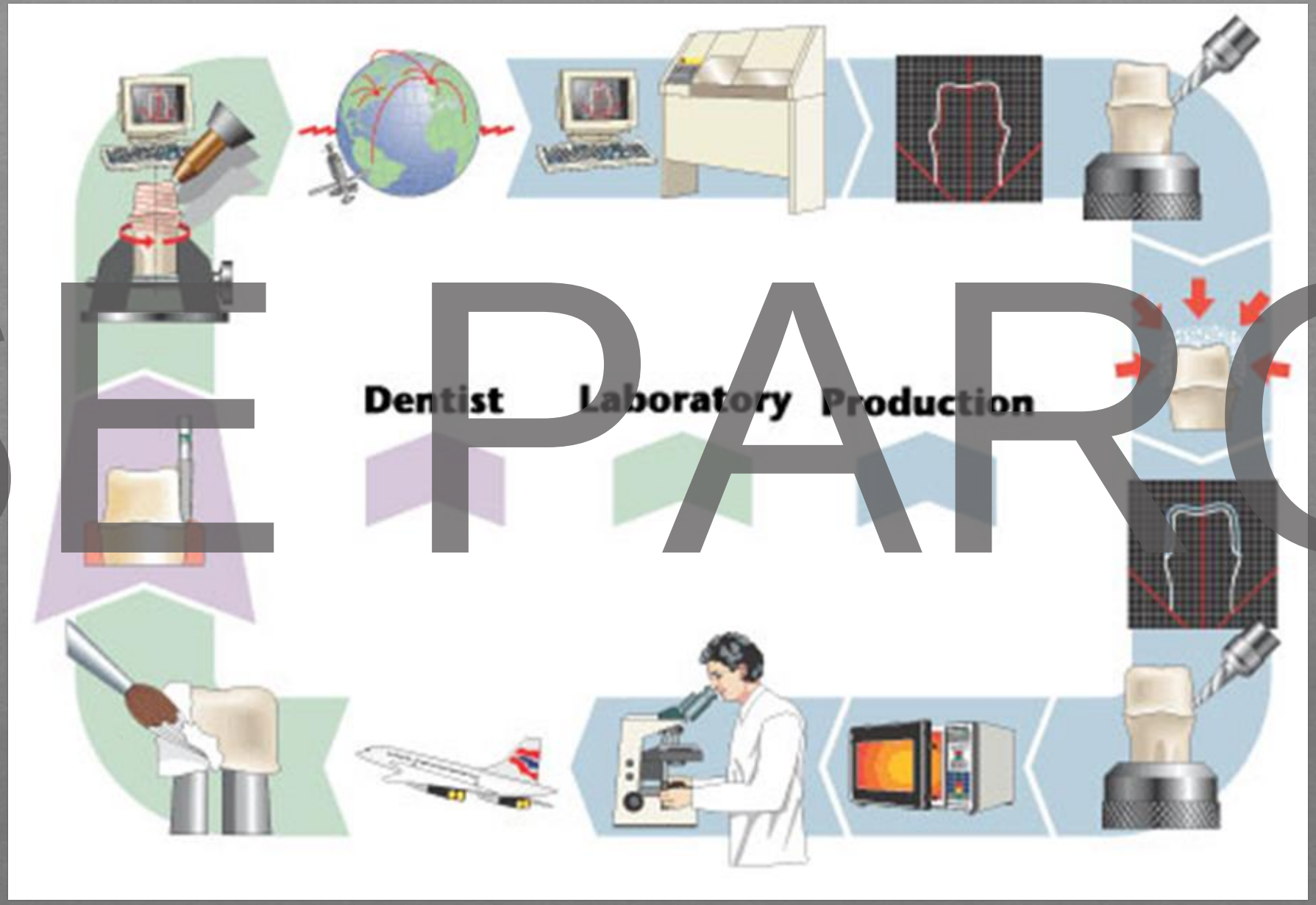
  (in lab / chairside)

- Computer Aided Manufacturing

  (in lab / in factory)

Duret & co. in 1970s

Procera® technology



Alloyfree ceramics based on milled technology and other materials

- Base manufactured body-core for further individualised technology
- With best mechanical properties
- Materials:
  - Cercon Base® (DeguDent)
  - Lava Frame® (3M Espe)
  - Procera AllCeram® (Nobel Biocare)


SE PARO


SE PARO


SE PARO

Clinical experiences

- Luminates
  - single crown, less extensive front bridges /up to a limited number of pontics/ (700 MPa)
  - translucency is better
    - metallic cast posts Ø
    - root canal treated teeth, discolourisation Ø
- Zirconia
  - single crowns, lateral bridges, implant abutments (1200 MPa)
  - no translucency
    - cast dowels ✓
    - root canal treated teeth, discolourisation ✓

Optical behaviour of different ceramics in permitted and reflected light at a 1.5 mm thickness

Jacket crown | Empress | Spinell | Empress 2

Procera | Alumina | Zirconia | Metal-ceramic

MJ Heffernan, SA Aquilino, AM Diaz-Arnold, DR Haselton, CM Stanford,MA Vargas: Relative translucency of six all-ceramic systems. Part II: Core and veneer materials J Prosthet Dent 2002; 88: 10-5.

Clinical outcomes

- ***Walter MH et al. Int J Prosthodot. 2006***

  (107 Procera Alumina 6 yrs, 6 fractures) 94%

- ***Odén et al. J Prosthet Dent, 1998.***

  (100 procera 5 yrs, 3 fractures) 97%

- ***Odman P et al. Int J Prosthodont. 2001***

  (87 procera - 89'-95' 10 yrs), 93%

The importance of the implant surface microstructure

- surface modificated implants vs. machined implants
- success rate of machined implants in maxilla IV – type bone
- HA - coated implants – periimplant laesions ?

Liao H., Fartash B., Li J.: Stability of hydroxyapatite coatings on titanium oral implants (IMZ) 2 retrieved cases. Clin Oral Implant Res 8:68, 1997

Ichikawa T., Hirota K., Kanitani H., et al: Rapid bone resorption adjacent to hydroxyapatite-coated implants. J Oral Implant01 22:232, 1996

Albrektsson T., Astrdnd P., Becker W., et al: Histologic investigations of failed dental implants: A retrieval analysis of four different implant designs. Clin Mater 10:225, 1992

Oglso M., Yamashita Y., Matsumoto T.: Microstructural changes in bone of HA-coated implants. J Biomed Mater Res 39:23. 1998

TiUnite surface

- to achieve enhanced osseointegration by the surface microstructure modification instead of coating incorporating external body
- surface roughness must be similar to natural bone
- exposed roughed surface promoting plaque accumulation?

Porous outer layer of implant surface accomplished by anodic oxidation

Nobel Biocare
The introduction of the Replace select system in 1999

- 1998 innovation from Steri-Oss implant system: from external hexagonal connection to internal triangular connection: simplified precision connection. 4 platforms NP, RP, WP, 6.0
- Replace Select Tapered: Anatomical, conical root - shaped fixtures. Length: 8,10,13,16mms
- Replace Select Straight: Paralelled wall selftapping implant : Length:8.5,10,11.5,13,15,18mms

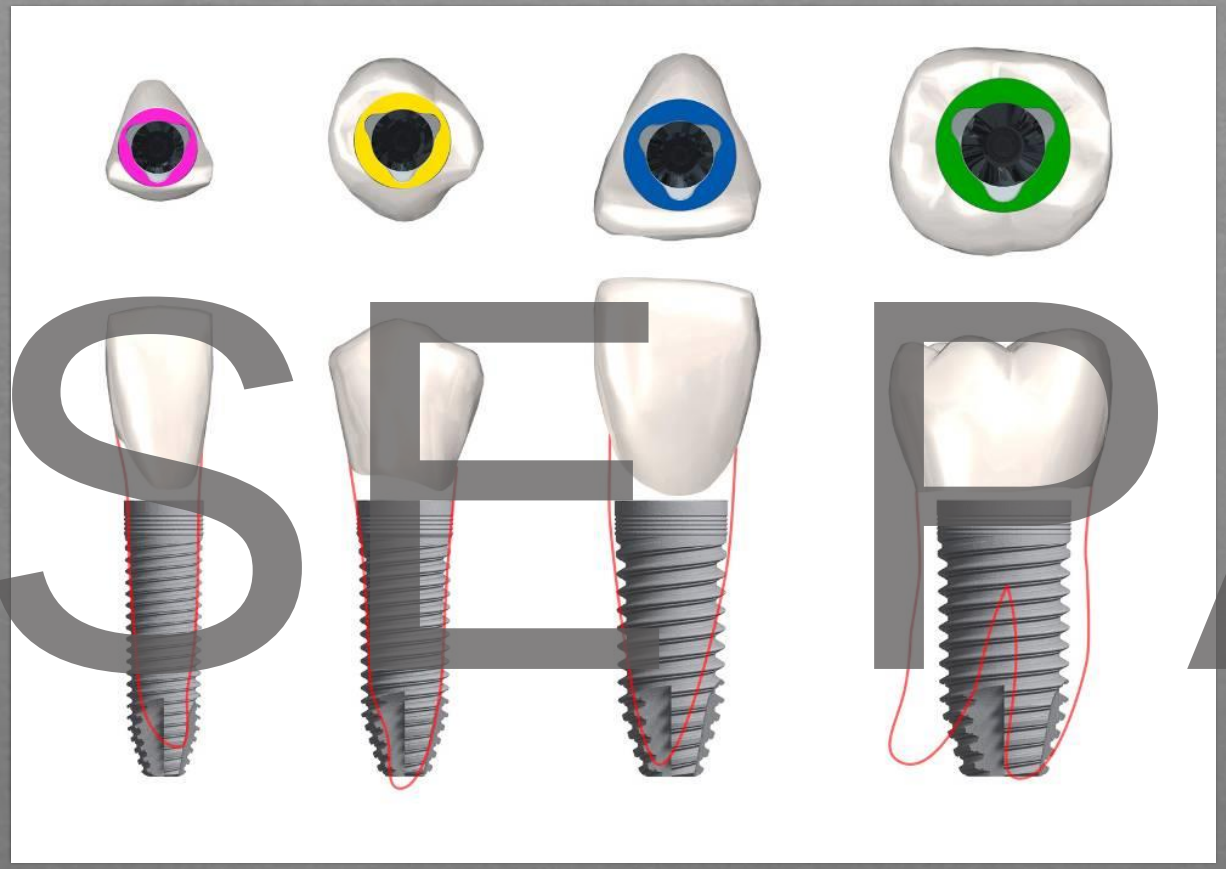
Groovy

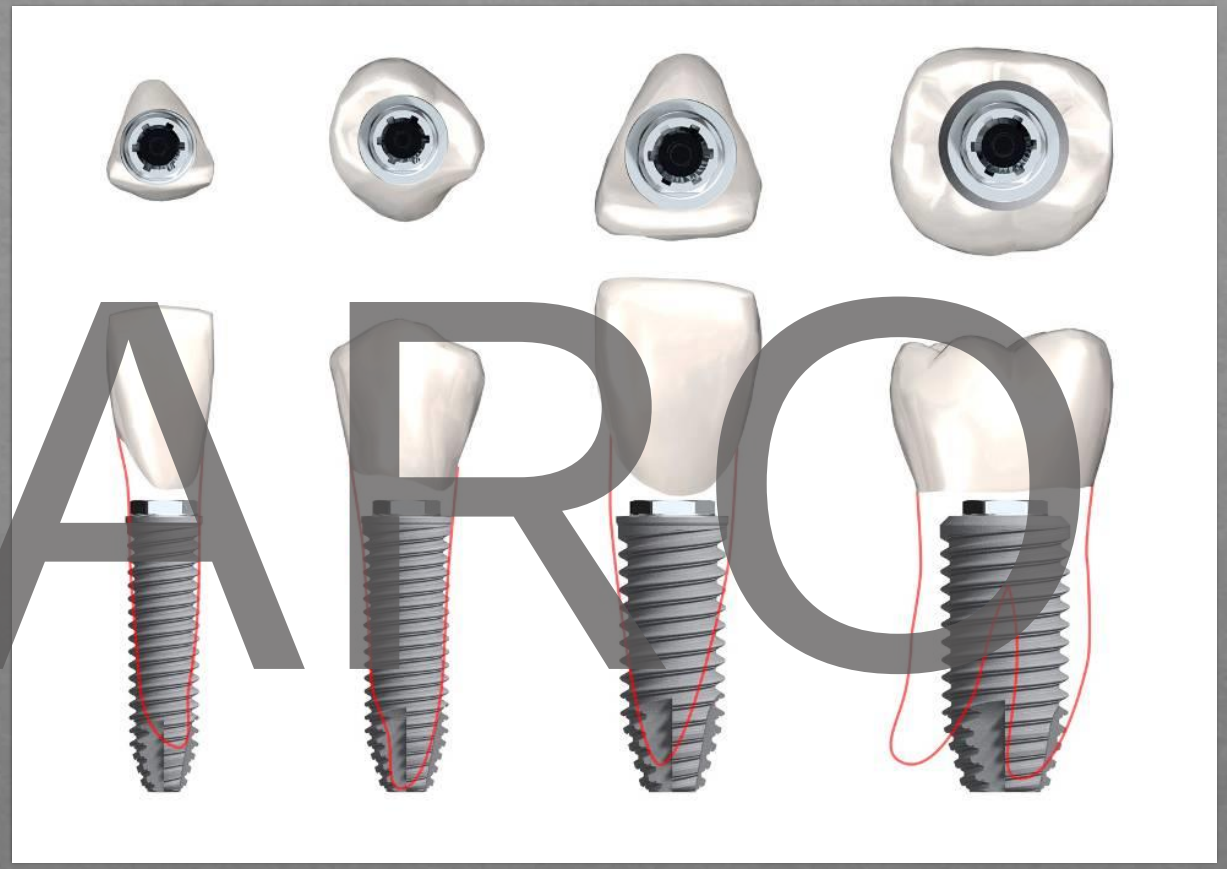
- the collar polished region will be replaced by TiUnite surface (2005)
- for better osseointegration, groves on the ventral surface of the upper threads and small groves on the marginal collar

Schüpbach P, Glauser R, Rocci A, Martignoni M, Sennerby L, Lundgren A, Gottlow J. :The human bone-oxidized titanium implant interface: A light microscopic, scanning electron microscopic, back-scatter scanning electron microscopic, and energy-dispersive x-ray study of clinically retrieved dental implants. Clin Implant Dent Relat Res. 2005;*7 Suppl 1*:*S36-43*. PMID: 16137086

Glauser R, Schüpbach P, Gottlow J, Hämmerle CH. :Periimplant soft tissue barrier at experimental one-piece mini-implants with different surface topography in humans: A light-microscopic overview and histometric analysis.Clin Implant Dent Relat Res. 2005;*7 Suppl 1*:*S44-51*. PMID: 16137087

Schupbach P, Glauser R. The defense architecture of the human periimplant mucosa: a histological study.J Prosthet Dent. 2007 Jun;*97*(*6 Suppl*):*S15-25*. Erratum in: J Prosthet Dent. 2008 Mar;99(3):167. PMID: 17618929





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New implant designs

- **Nobel Perfect** – for upper front esthetic restoration, a new design similar to natural teeth bone contour
- **Nobel Direct** – fixture and abutment as a one-part unit, the abutment will be individually contoured by the dentist immediately after implant insertion

Nobel Perfect & Nobel Direct

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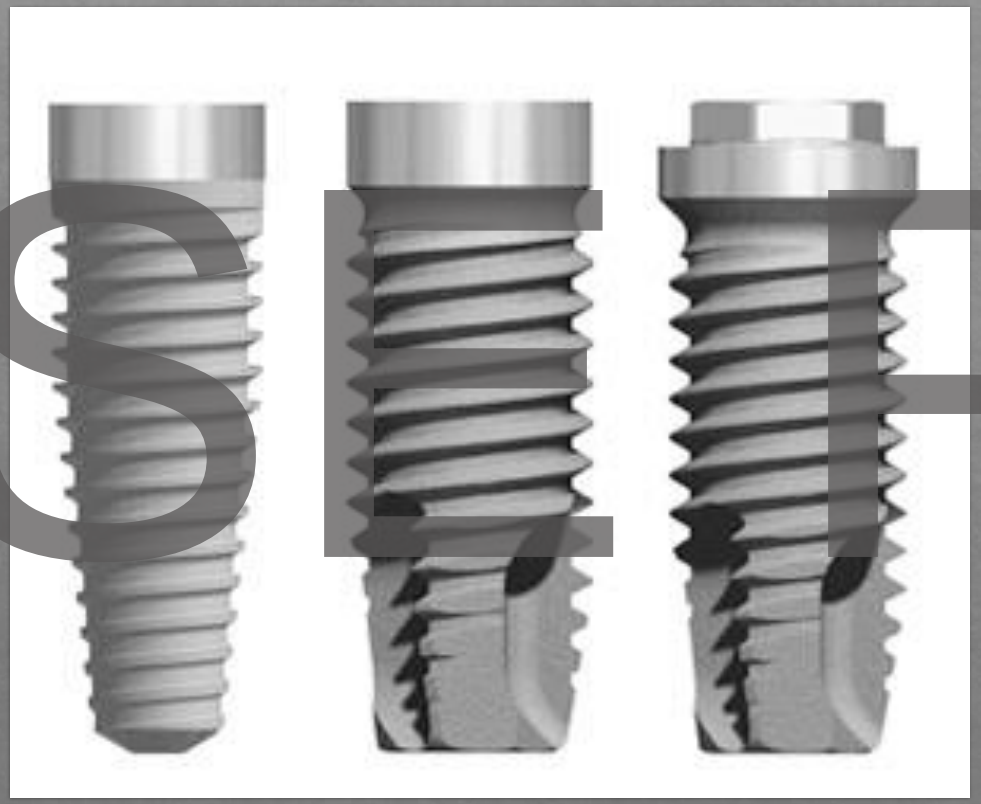
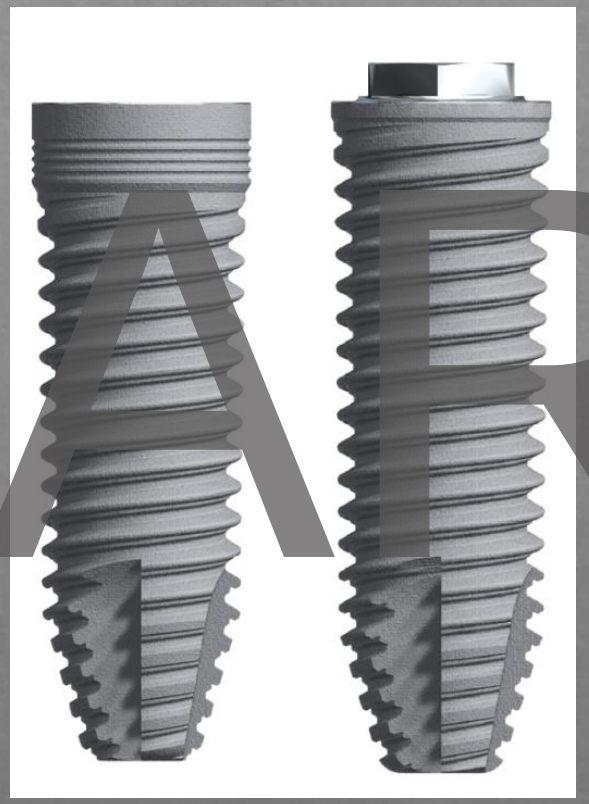
The development of new implanttypes

- Brånemark System Groovy
- Brånemark System Shorty
- Nobel Speedy Groovy
- Nobel Speedy Groovy Shorty
- Nobel Replace Straight Groovy
- Nobel Speedy Replace
- Nobel Replace Tapered Groovy

Other implants





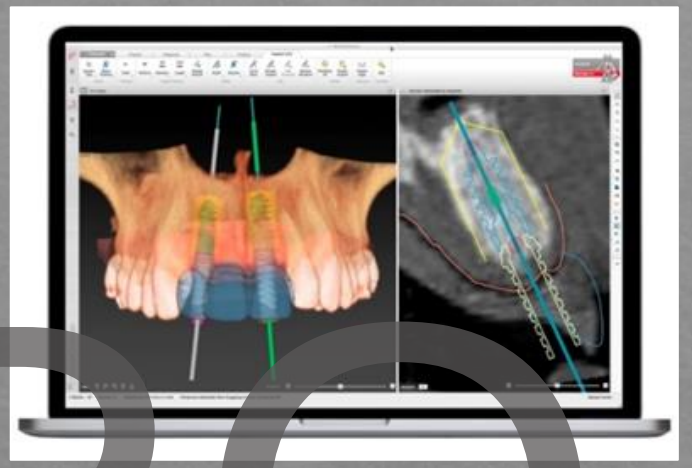
Nobel Guide 2005

- CT scans made by a precision CT radiographic stent
- Computer aided 3D planning for the optimal size and position of implants, taking account the anatomical landmarks and an ideal prosthetic solution by Procera software
- →Procera center for computer manufactured surgical stent
- →„flapless surgery”
- Prefabricated denture „Teeth in an hour”(2003)

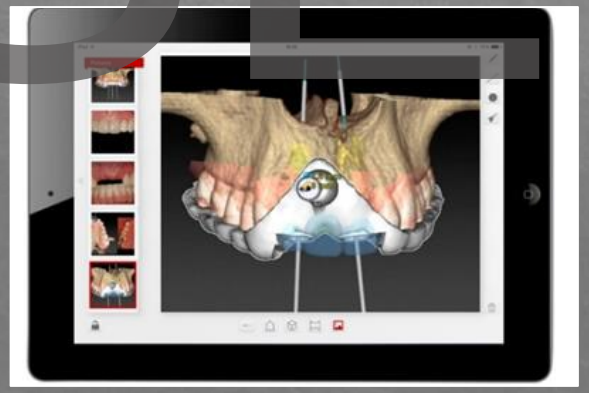
How to use the NobelGuide

1. Clinical diagnostics and treatment acceptance

2. Digitizing prosthetic information



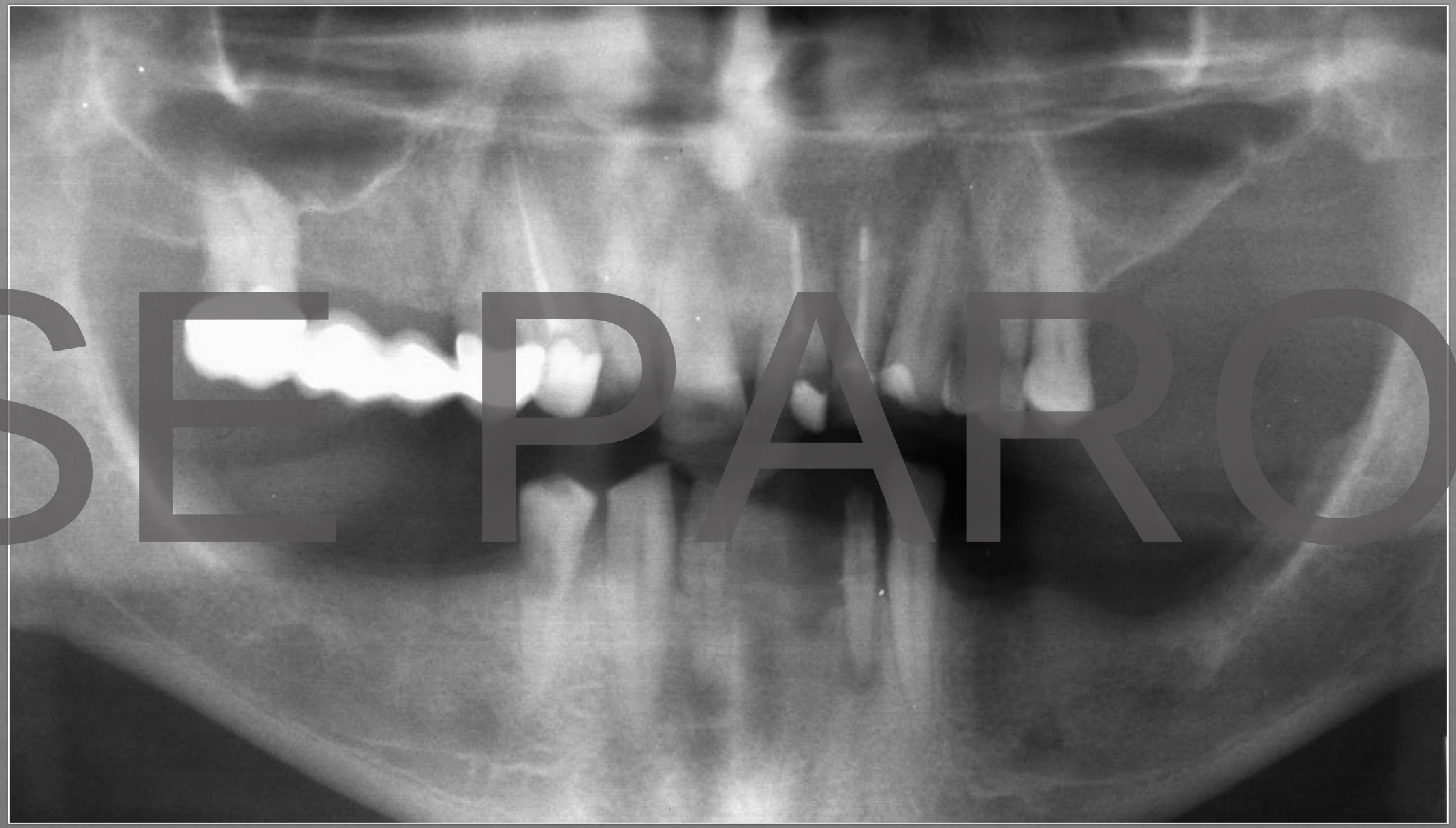
3. Treatment planning



4. Treatment communication

5. Guided surgery

6. Restoration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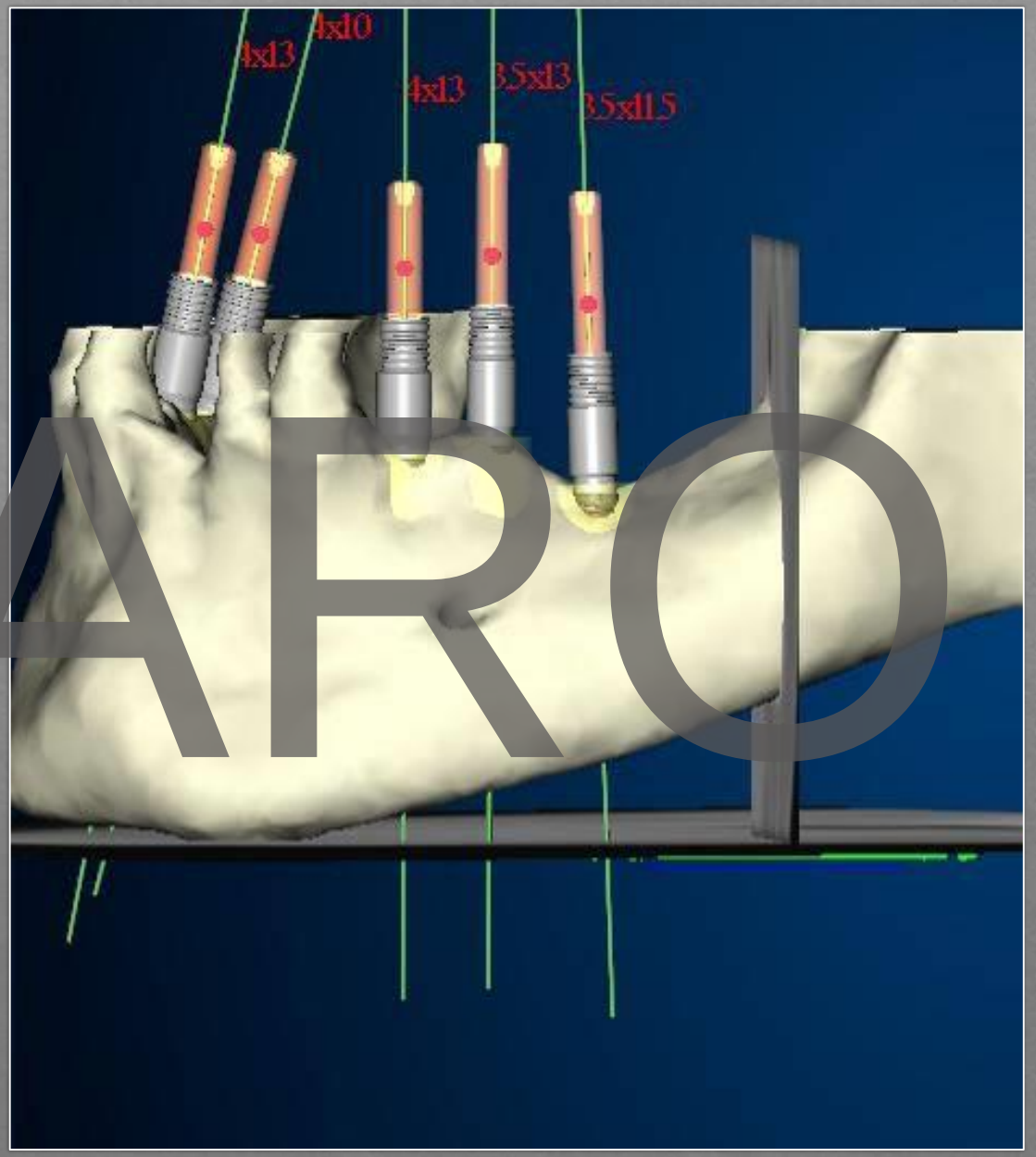

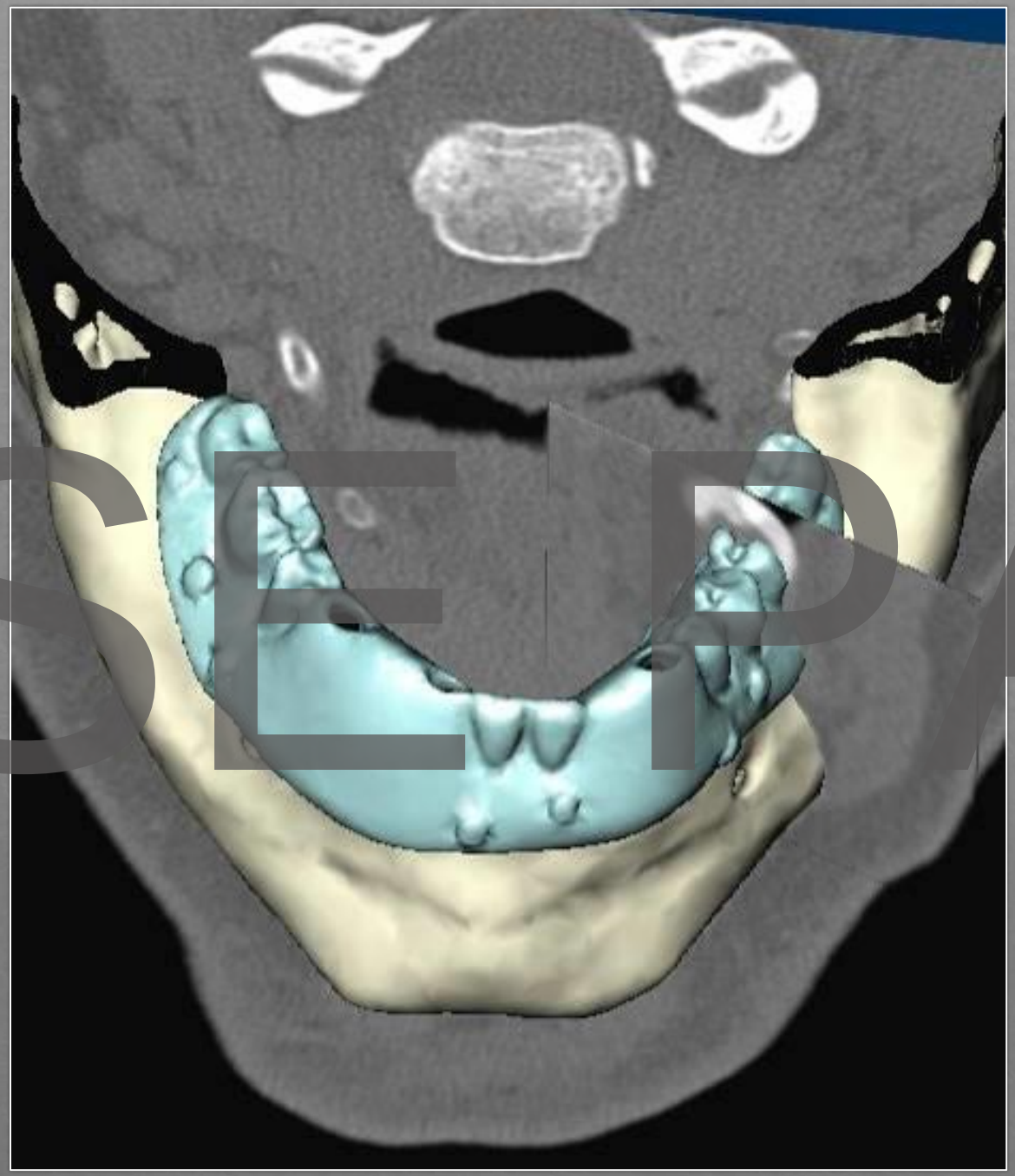

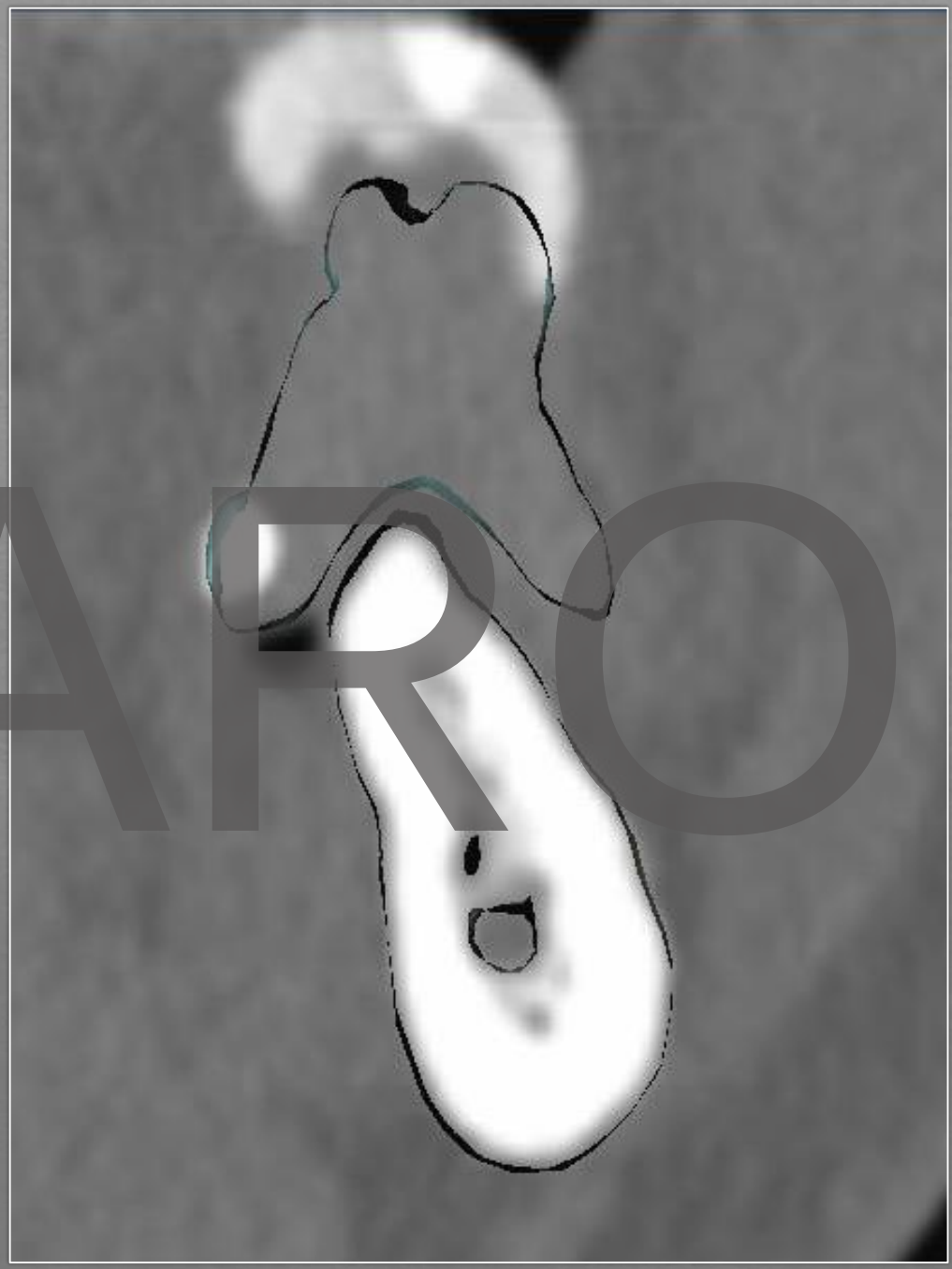

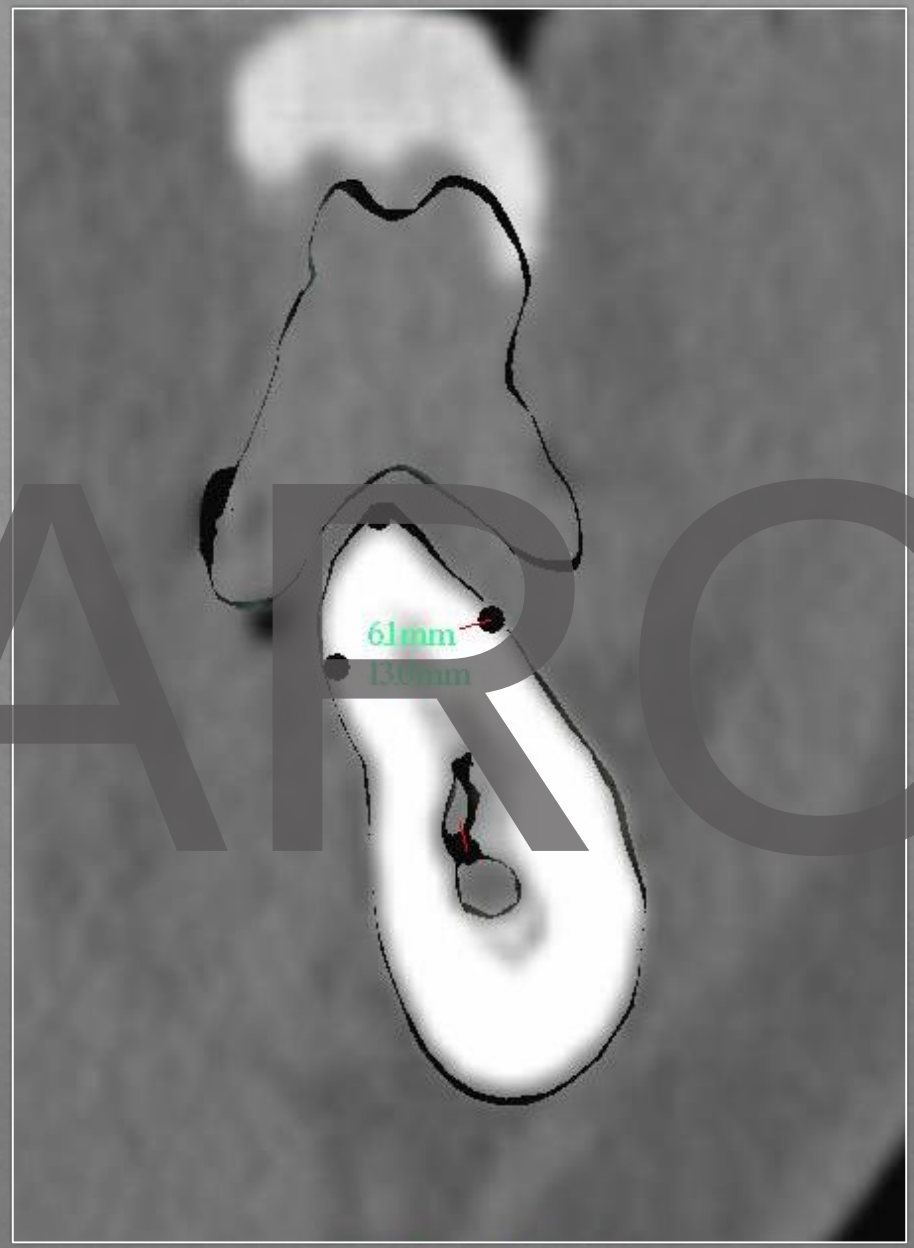

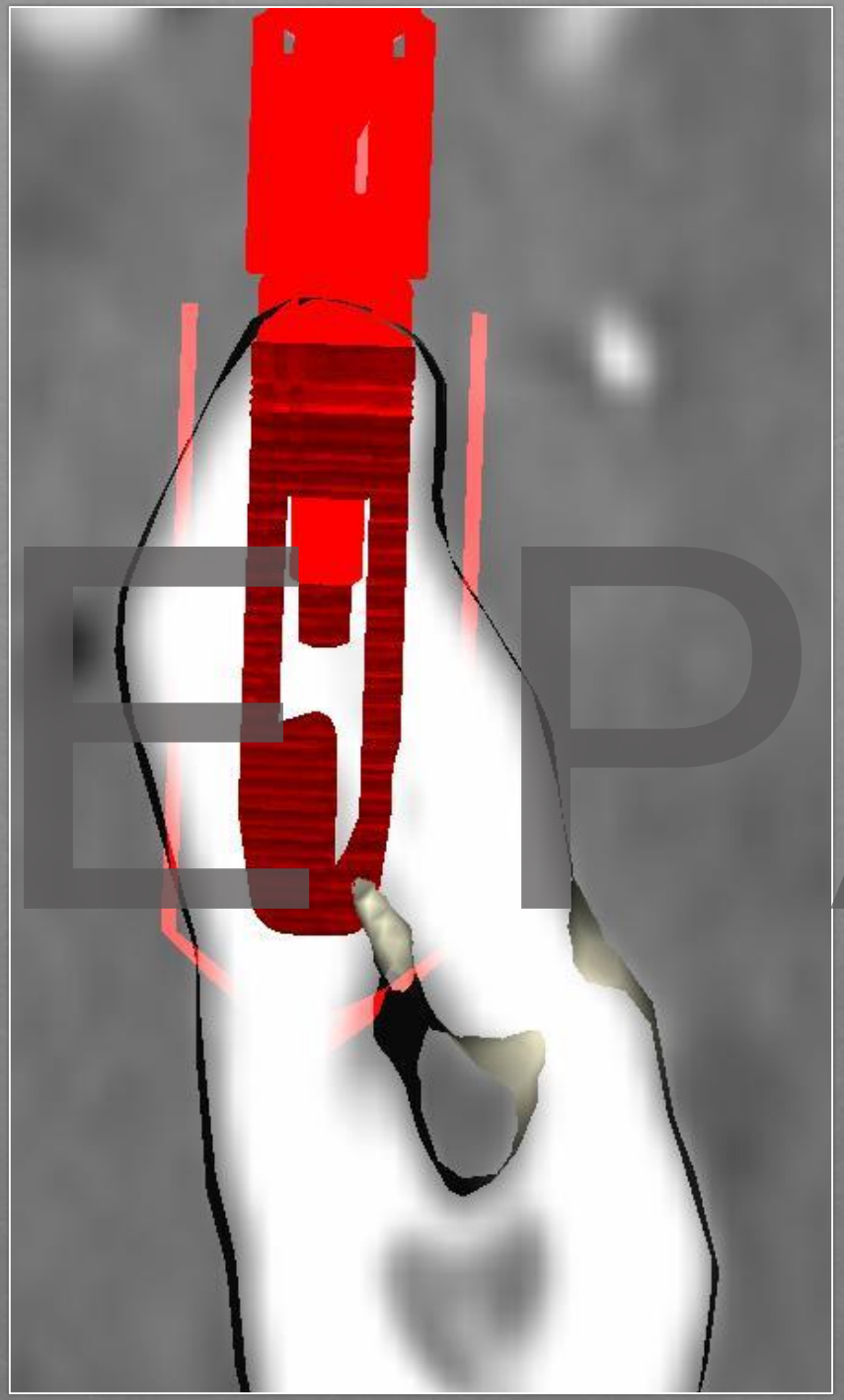

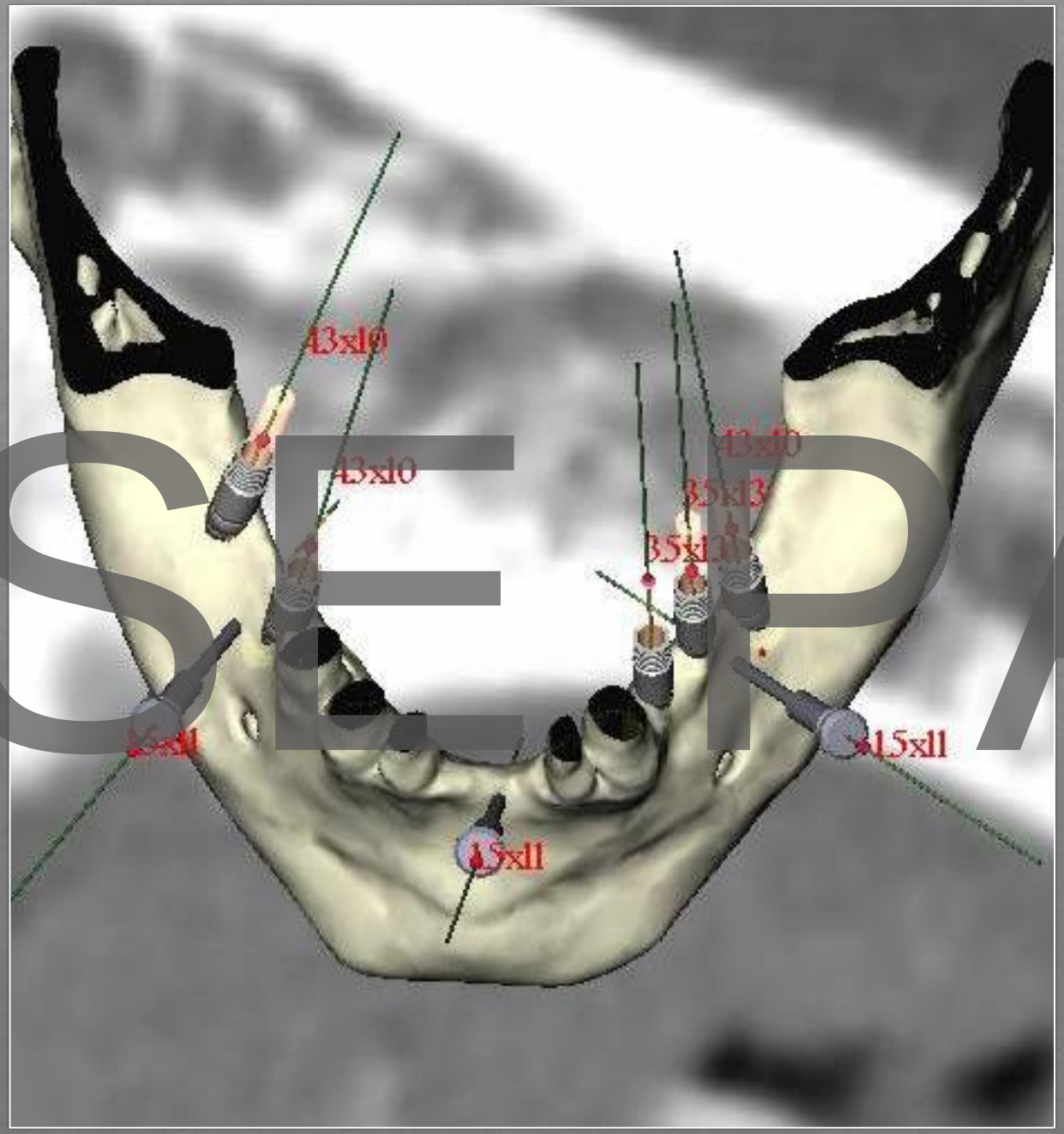
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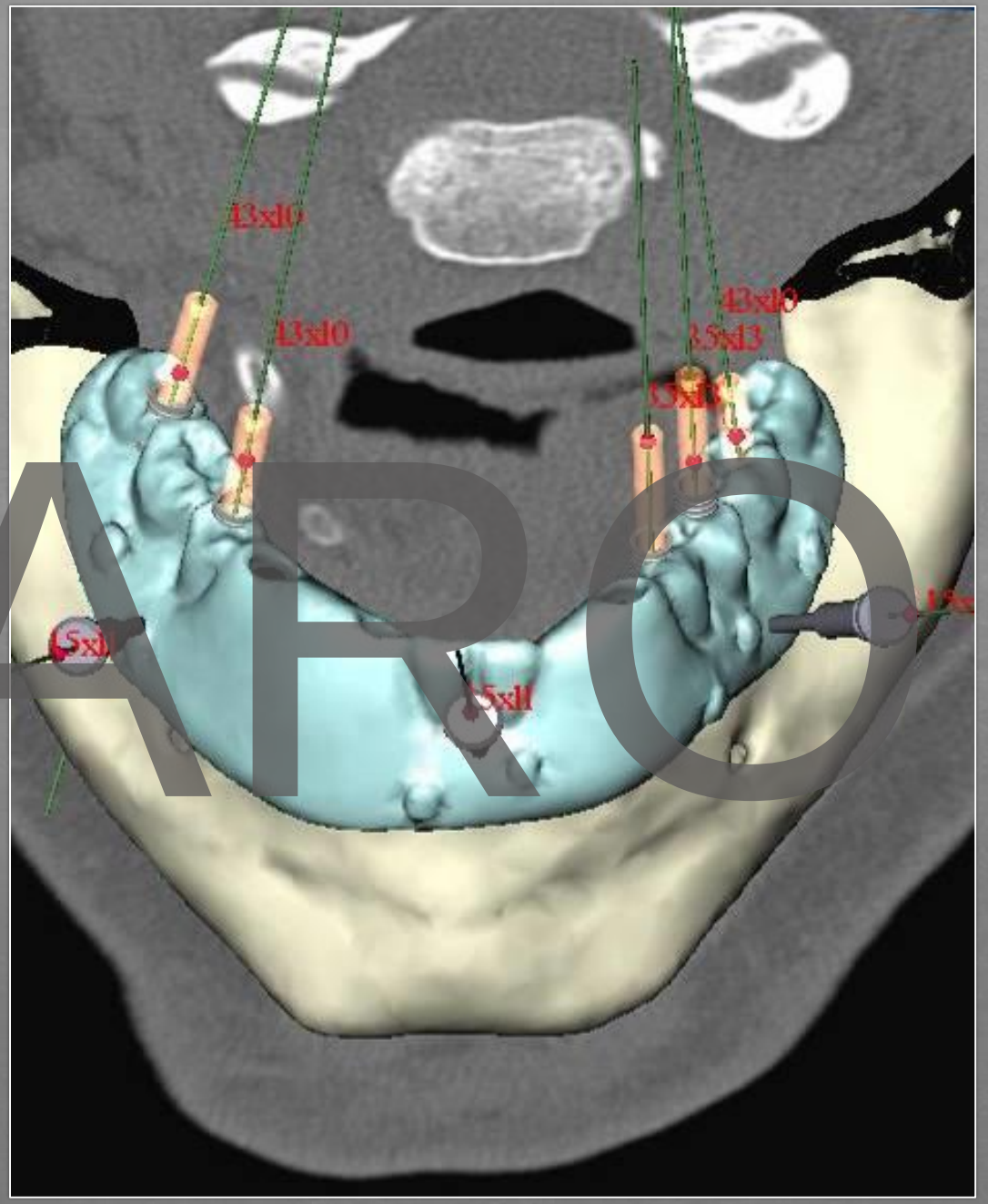
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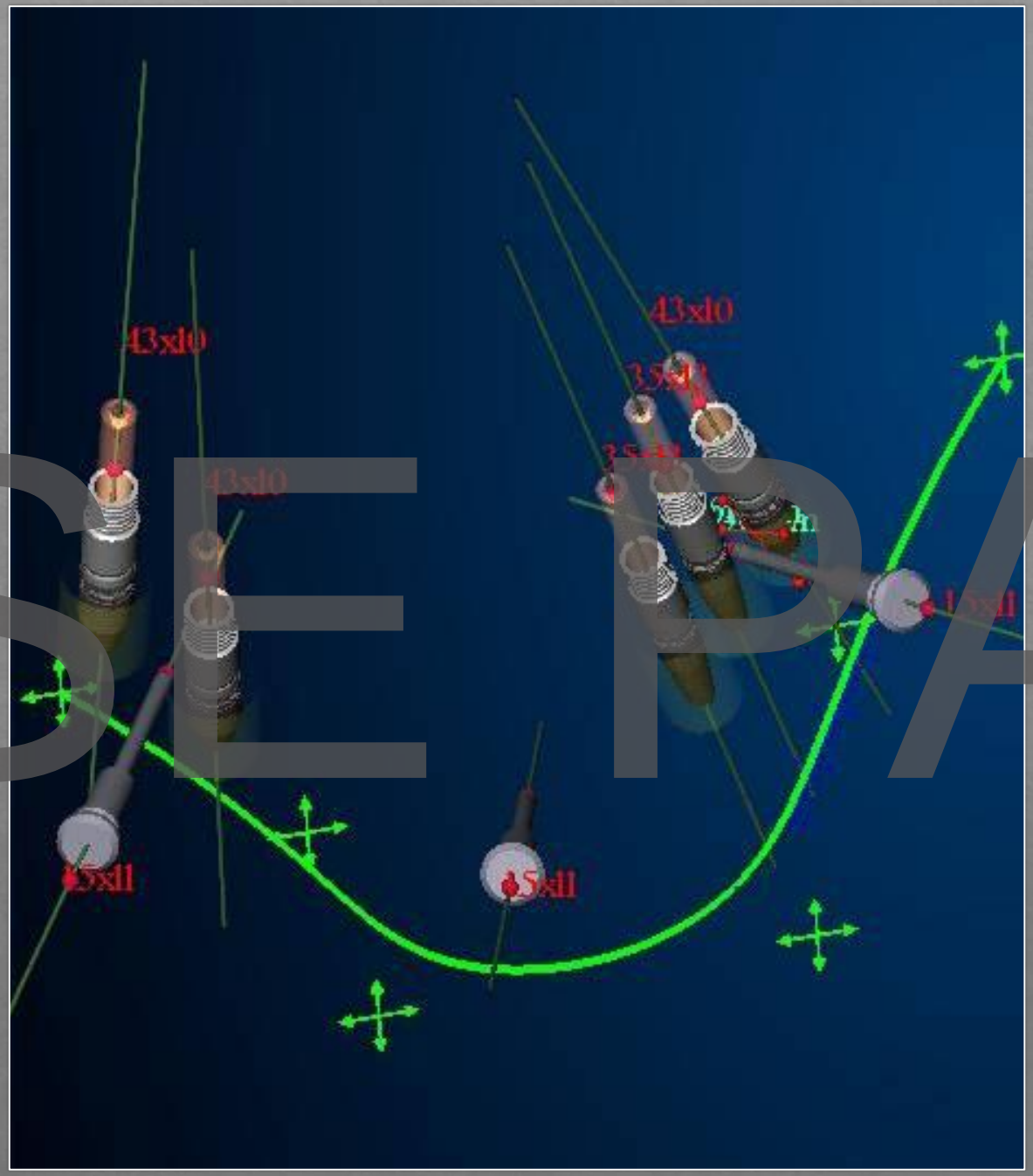
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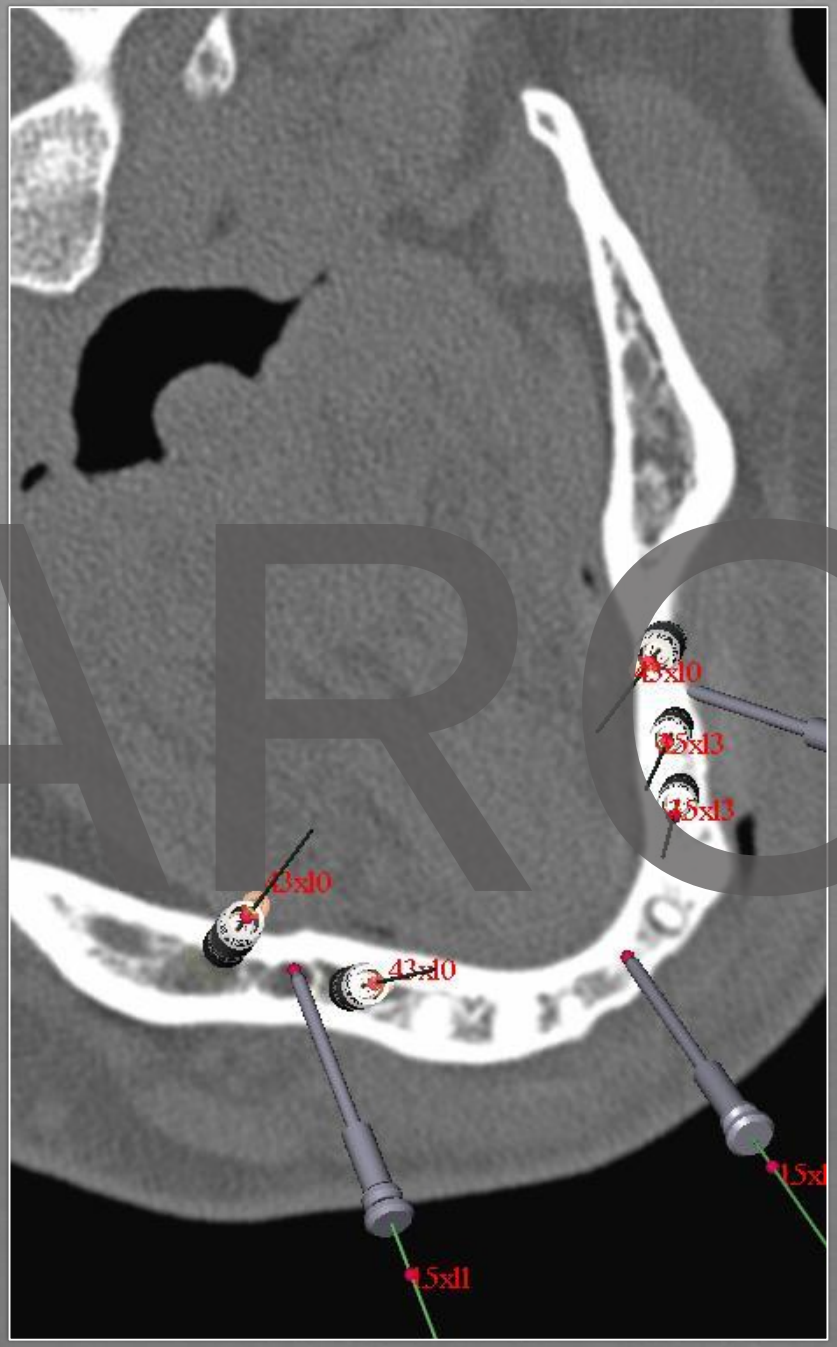
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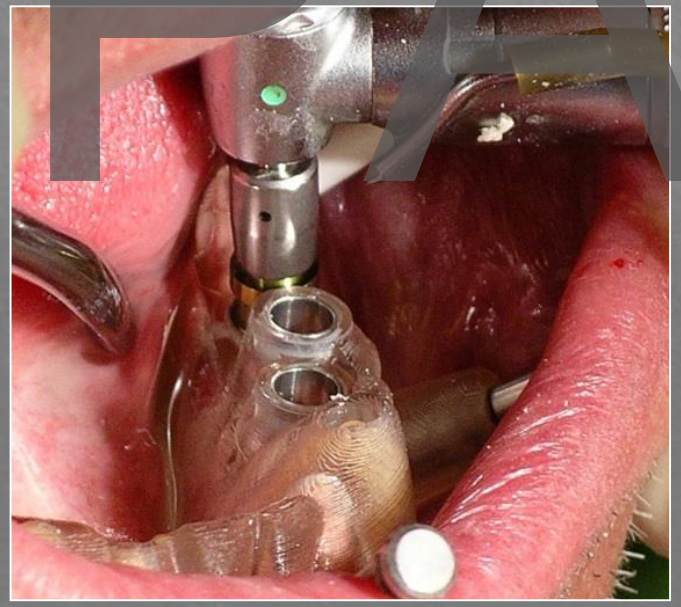
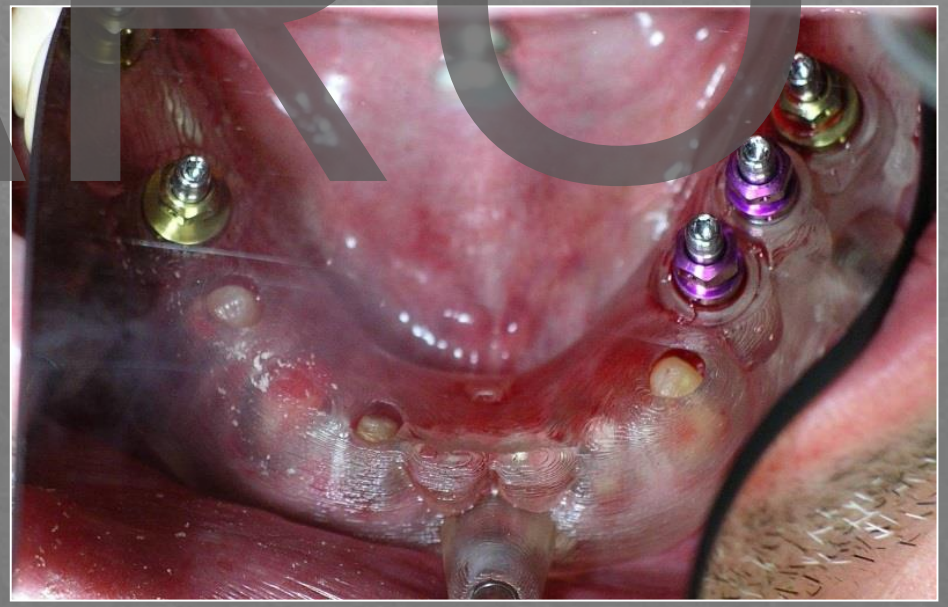

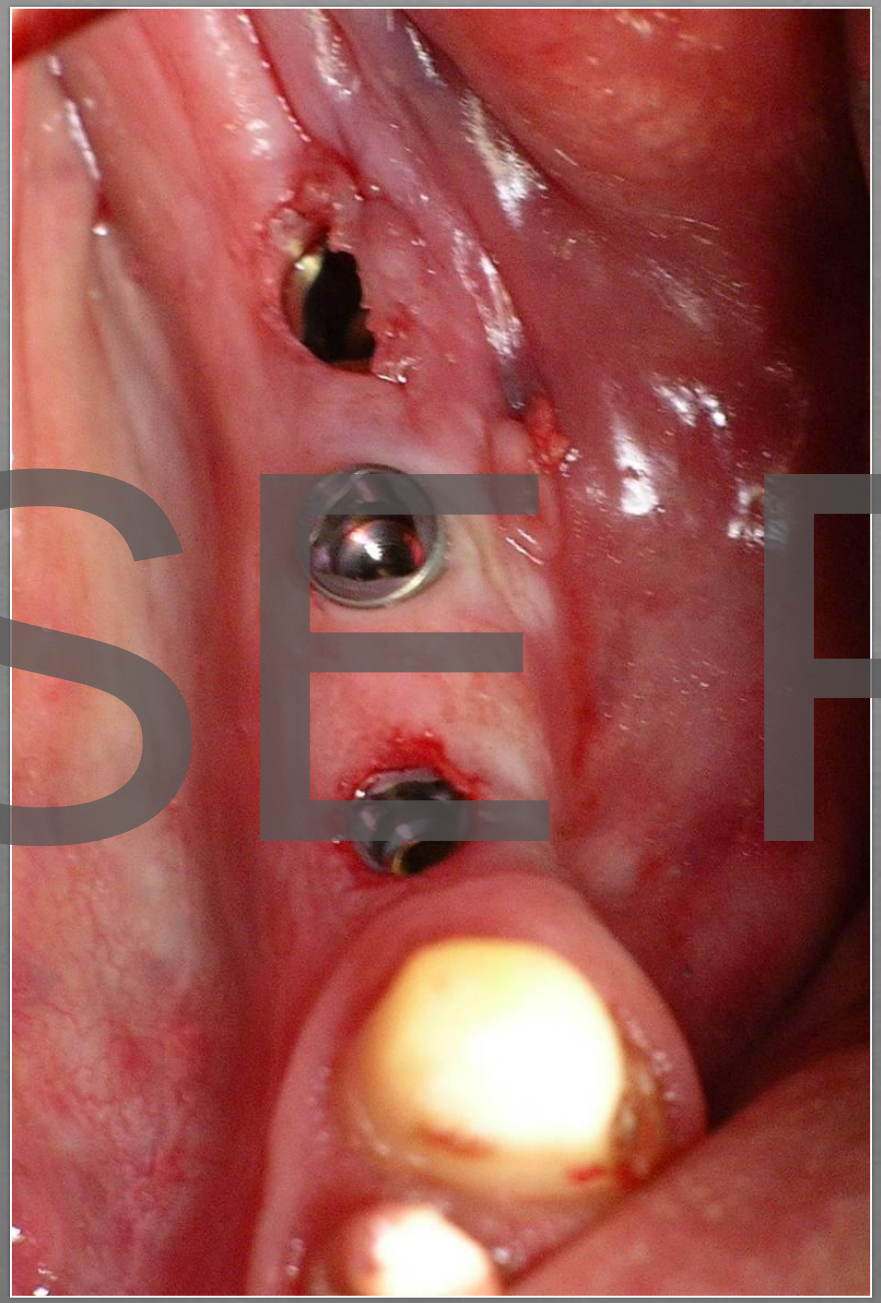

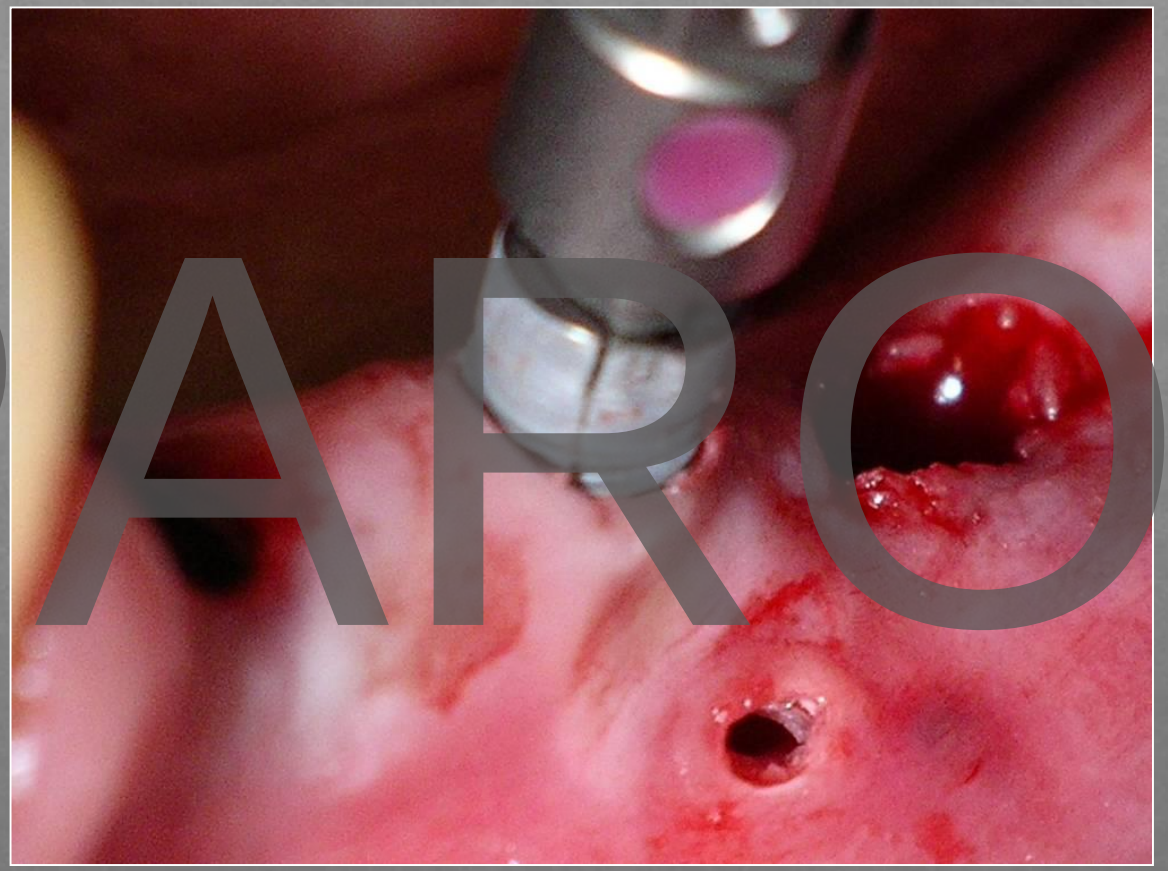

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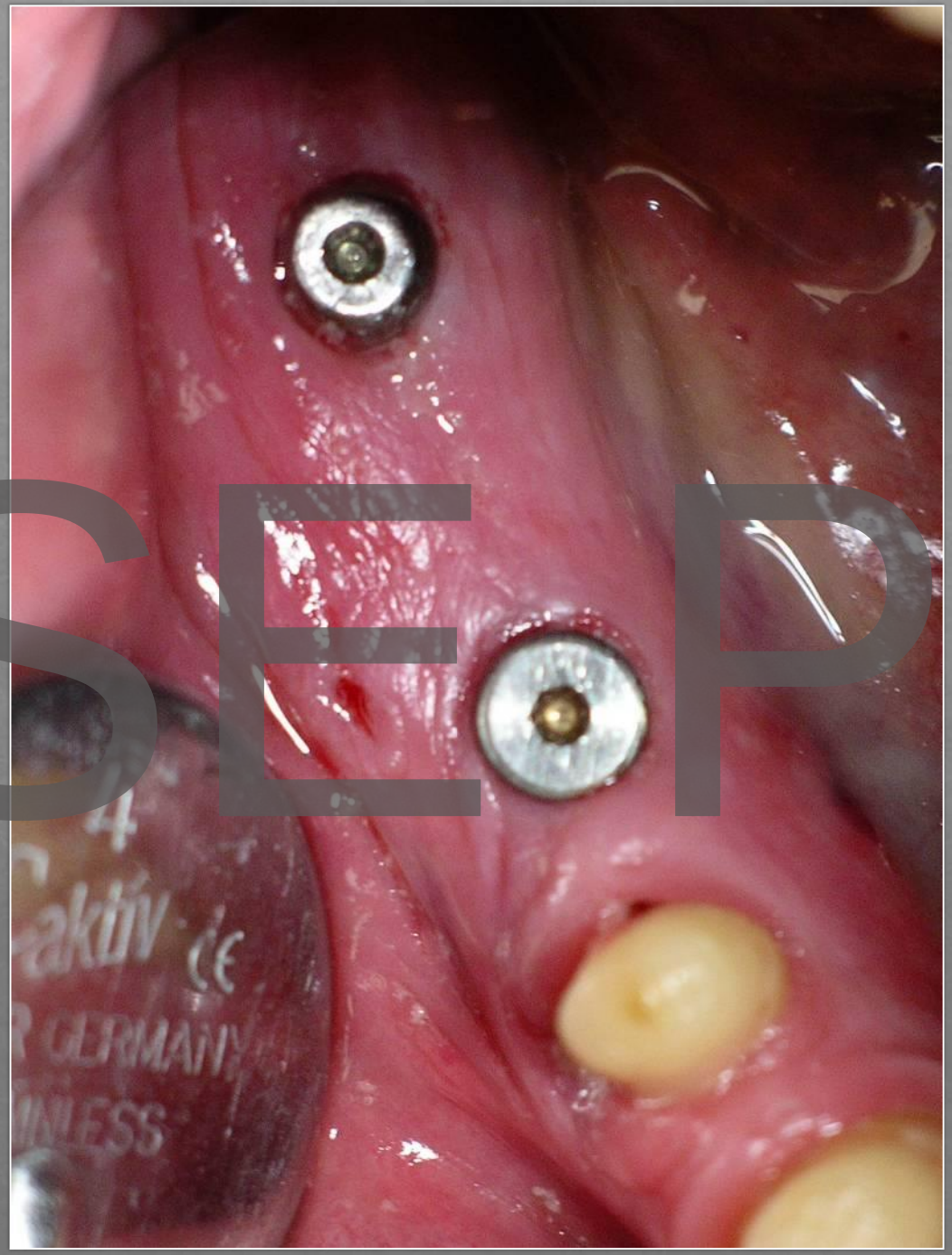
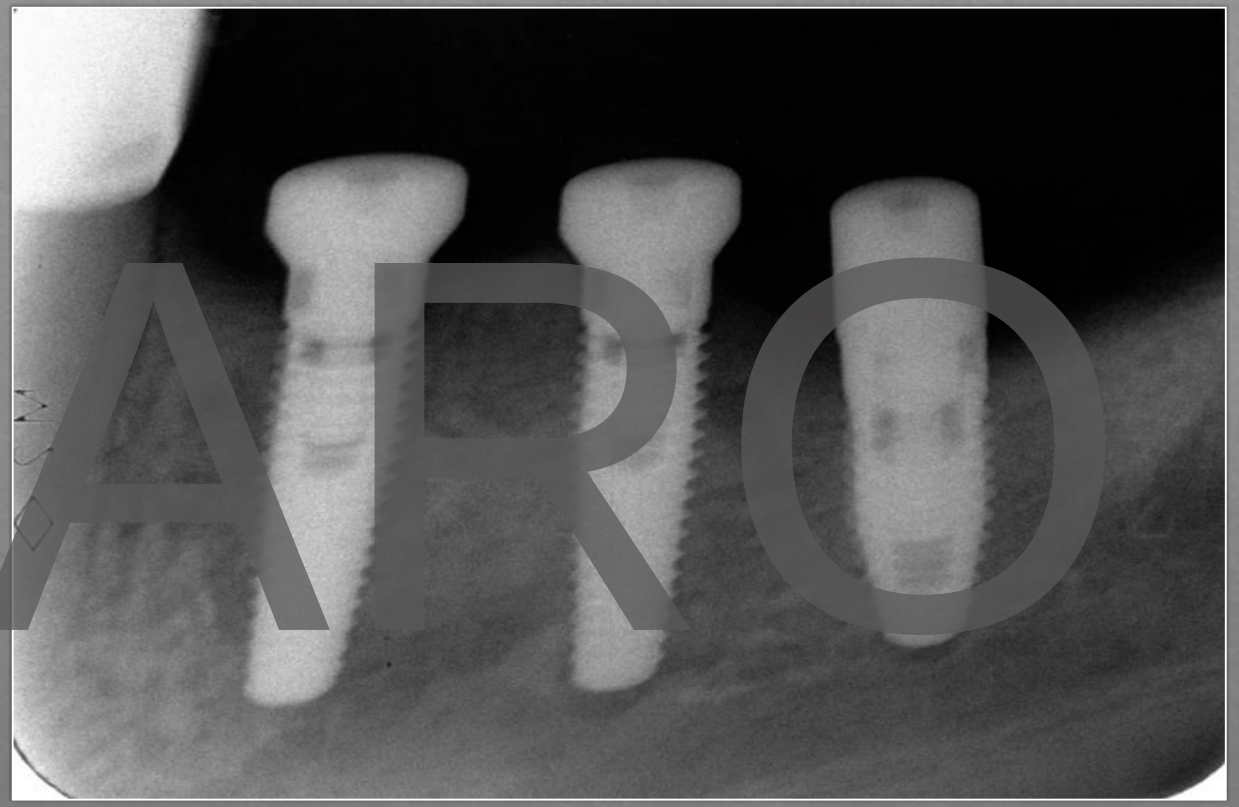
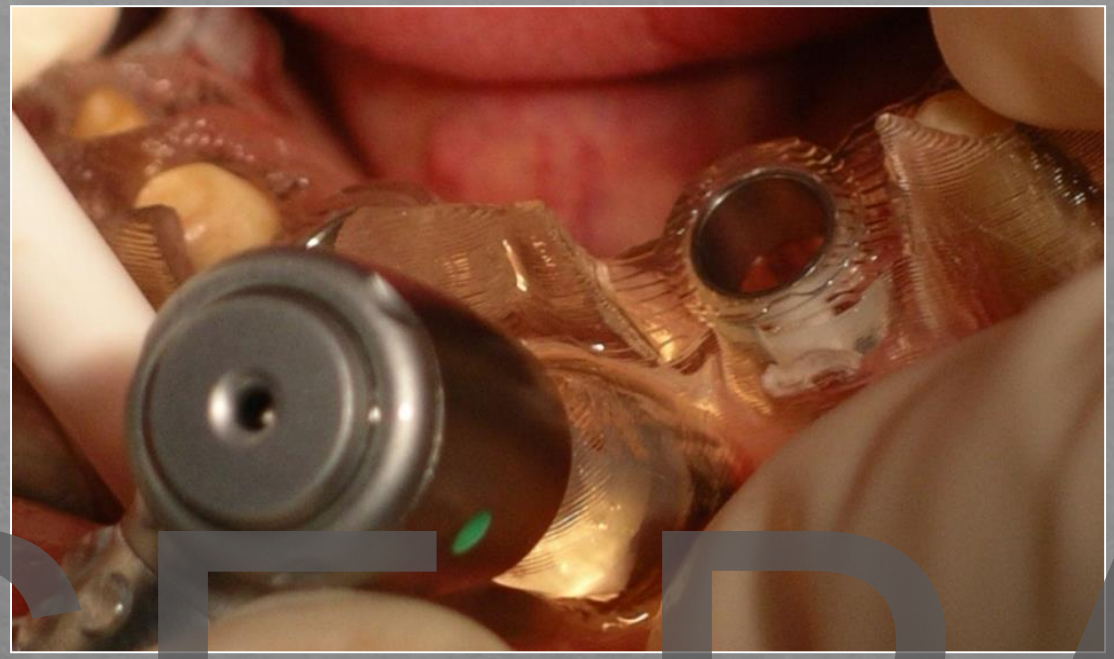
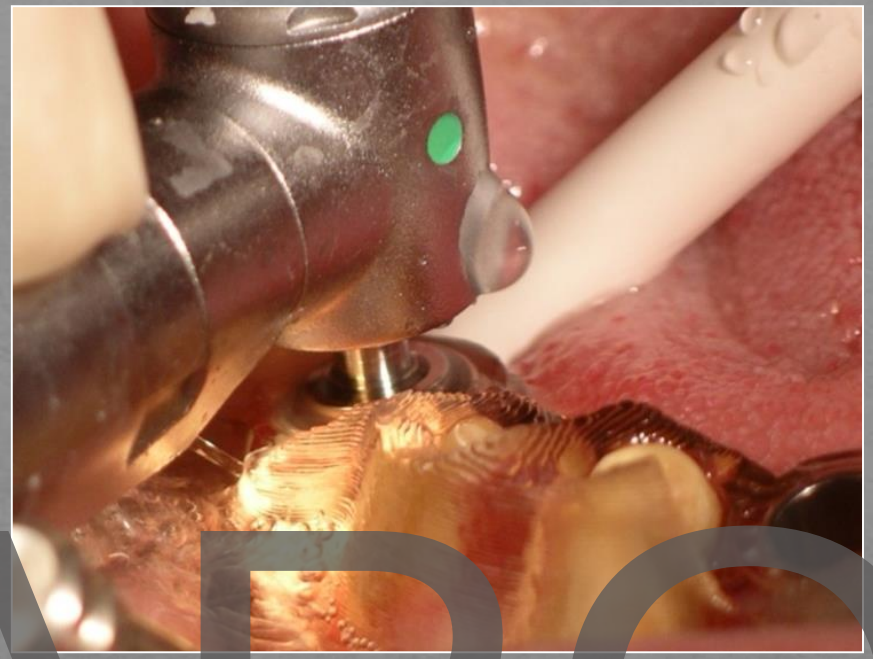
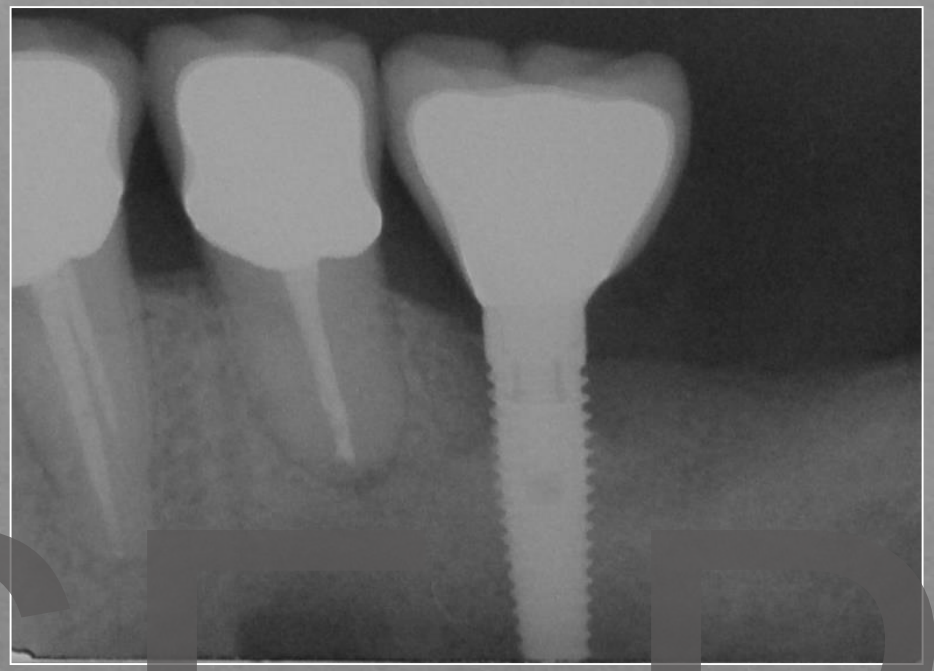










2006

2010

2010

2011

2006 2010 2011

NobelActive™ a new direction for implants

- NobelActive™ has been launched following scientific research and pre-launch experience. It is recommended for experienced users who want to take full advantage of the following abilities:
- high initial stability, even in compromised bone situations
- bone condensing property
- redirecting capability for optimal placement
- Built-in Platform Shifting™
- dual-function prosthetic connection

Unique design expands treatment options

High initial stability even in compromised bone situations.

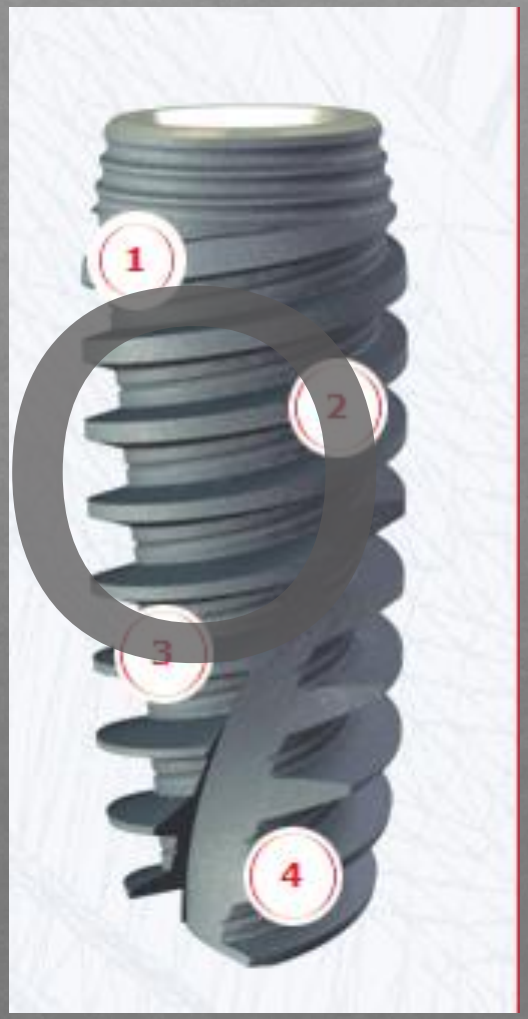
- Minimally invasive insertion enables repositioning at different angles with exceptional initial stability.

1 Expanding tapered body with double variable thread design and apical drilling blades

2 Manual insertion protocol

3 TiUnite®

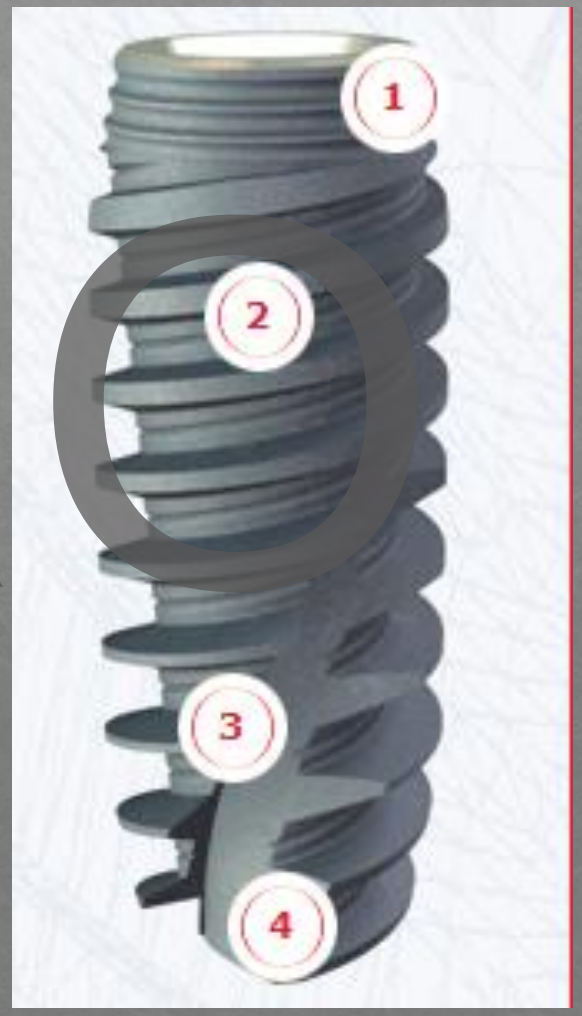
4 Groovy™



NobelActive's™ combination of features improve performance, especially in soft bone

- Its unique tip and thread design, slices through bone, unlike conventional self-tapping implants, which scrape the bone away as they tap.

1. Back-tapered coronal region
2. Expanding tapered body that acts like a threaded osteotome
3. Reverse cutting flutes
4. Drilling blades on apex



www.nobelbiocare.com

Improves performance across every indication

- Unique prosthetic connection design has benefits for both clinicians and laboratories

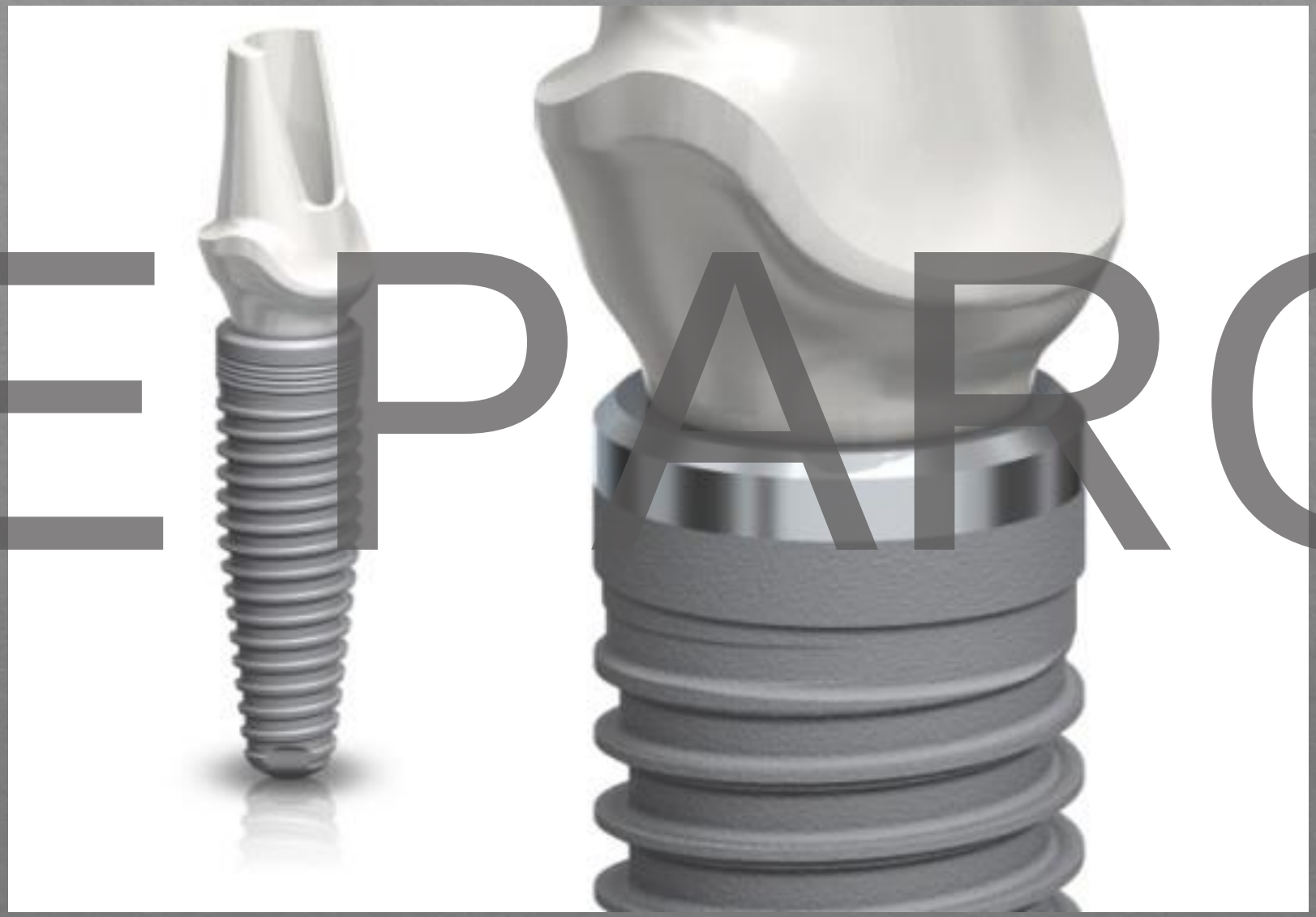
1 Conical connection

2 Built-in Platform Shifting™

3 Hexagonal interlocking

4 Dual-function prosthetic connection

NobelReplace Conical Connection
proven stability, high esthetics



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NobelClinician – the key to successful treatments

- The user-friendly solution for diagnostics, treatment planning and patient communication

Conclusion

Nobel Biocare represents how some brilliant original thoughts utilizing many innovative ideas might improve a new discipline.

Questions occure:

- which details are real outcomes, and
- which ones resulted in a market oriented product

Thank you for your attention!

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