

Prosthetic Driven Implant Treatment

An evidence-based presentation of
Diagnosis, Treatment Planning,
Surgery, and Maintenance

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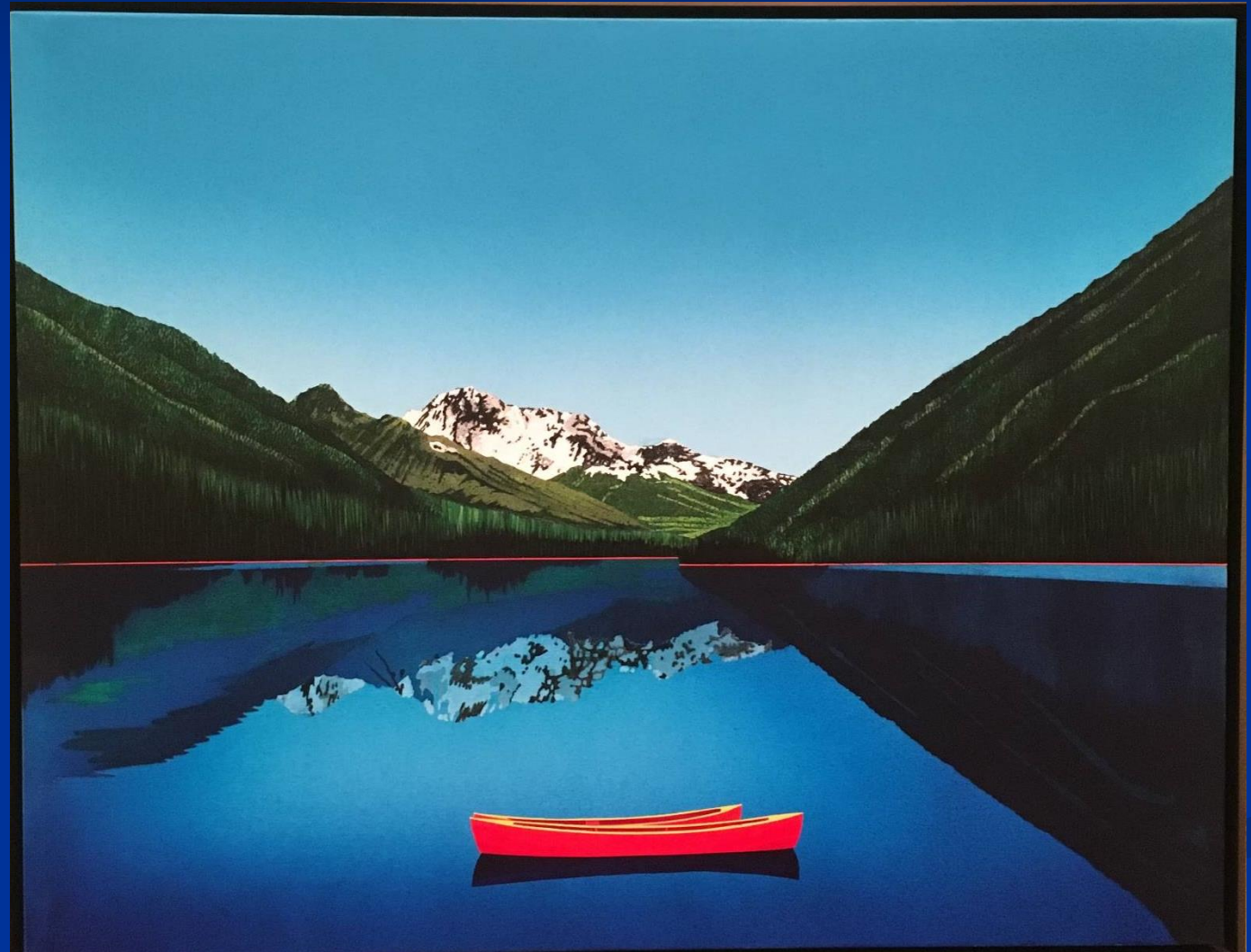
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Expectations

- Safety
- Function
- Value
- Esthetics



Informed Consent

B.R.A.I.N.

Benefits

- Improved function and quality of life
- Bone maintenance
- Less stress to neighbors when compared with a 3-unit bridge. 'Happy neighbour, happy life'

Risks

- Infection/ Peri-Implantitis
- Discomfort
- Damage to neighbouring teeth or anatomical structure
- Esthetic difference to adjacent teeth

Alternatives

- FPD
- RPD
- No treatment
- Overdenture as a valid option

Intuitive/Intelligent decision

Not Now

Informed Consent

Provide “long-term” success and survival rates (systematic review of minimum 10y studies): ie. “no life-time guarantee”

- cumulative mean values of 94.6%
- mean marginal bone resorption values 1.3mm

[Moraschini V Int J Oral Maxillofac Surg.](#) 2015 Mar

- suprastructure success 78- 85%

Meta-analysis after 5 years of function

- Single Crowns 96.363%,
- Implant bridges 94.525%
- implant tooth-supported prostheses 91.27%

• [B.C Muddugangadhar J Int Oral Health.](#) 2015 Sep

Surgical Candidates

Medical History

Medical ASA type 1-2 surgery can be conducted in-office

- ASA type 1 (normal)
- ASA type 2 (consider antibiotics prophylaxis)
 - bisphosphonates or bone affective disorder
 - Diabetes HbA1c of up to 8
 - Smoking (Dose response) (F Strietzel JOCF May 2007)
- ASA type 3 (requires in-patient hospital access)

Controlled or actively treated periodontitis

- informed consent

Smoking as Peri-implantitis Risk Factor

- significant differences in survival and success rates in smokers (89% and 75%) vs non-smokers(93% and 92%)
- in smokers, greater differences seen in maxilla than in mandible
- Bain's cessation protocol- stop 1 week prior and 8 weeks after surgery

- creates similar implant survival rate as non-smoker

(I personally recommend 2 weeks prior and 4-6 weeks after)

[C Bain Aug 2002 CCED]

Risk with oral Bisphosphonates: Osteonecrosis

Osteonecrosis

- The inability of bone to heal following a surgery or possibly during normal function (spontaneous)
- try to be pre-emptive and treat prior to starting bisphosphonate
- Be alert of time and dosage history



Derivatives of Bisphosphonates and Safety

Safe (oral)

- Etidronate (**Didronel**) and Tiludronate (skelid)

Caution (oral)

- Alendronate (**Fosamax**) .7/100 000 cases of necrosis (15 reported; 4% of all cases)

Dangerous (iv)

- Pamidronate (Aredia), Zoledronate (.8-12% of patients; 94% of total cases)

Supportive care of Osteonecrosis

- Refer to an OMFS
- Use chlorhexidine rinse [0.12%]
- Prescribe Penicillin (500mg tid) or Tetracycline (250mg qid)
- Removal of osseous particles with minimal invasive surgery
- No requirement to debride or hyperbaric O₂

Periodontal Disease as a Risk Factor

Informed consent must include the possibility for peri-implantitis

- Survival rates of implants with patients of treated periodontitis are similar to those with no history of periodontal disease
- Success rates are often lower (11% difference) due to increased peri-implantitis (P Klokkevold, 2007 IJOMI)

Occlusal Trauma and Peri-Implantitis

Bruxism (parafunctional clenching/grinding)

- ensure bruxism splint covering the implant supported prosthesis is relieved by 1mm internally or out of occlusion
- inform patient of difference between implant (osseointegration without ligament), versus dentition (visco-elastic PDL)
- occlusal overload on implants may increase the incidence of marginal bone loss (C. Misch Implant Dentistry June 2005)

Treatment of Peri-implantitis

- Current peri-implantitis regimine approximates periodontitis treatment yet surface decontamination of a TPS surface is not predictable
- Implantoplasty is treatment of choice for surface decontamination
- Long-term maintenance is determined by removal of factors which may include occlusion, passivity of suprastructure, and change in local biological factors

Dental RISK

- Risk-possibility that a person will get a disease in a specified amount of time
- Risk Factors- the characteristics that increase risk
- Risk Mitigation: the process of developing a plan to respond to or deal with risk on a project
- Financial and legal risk evaluation: costs of supportive care and repair

(Summarized from Dr.Urs Bragger lecture NYC ITI 2007)

Treatment plan

- Type of desired restoration
- Bone situation
- Number of implants
- Imaging procedure
- Estimated total fees and time of treatment including maintenance



Treatment
plan:
Prosthetic
and Surgical



CT Scanning



Software
based
planning



Fabrication
of surgical
template



Surgery

Prosthetic Plan

Assess Patient's goals

- Functional requirements
 - fixed/removable/hybrid
 - Level of occlusal load
- Esthetics- level of expectations
- Modifiers
 - Timing- does the patient request immediate placement or loading due to time constraints or lack of willingness for multiple procedures
 - Level of surgical complexity
 - **Straightforward** (adequate soft and hard tissue)
 - **Advanced** (required grafting, medical concerns)
 - **Complex** (required multiple grafting, medical concerns)

Please visit www.ITI.org : home page, SAC classification for review of further modifiers

Prosthetic Planning: traditional wax up



Plan from ideal occlusion and work towards the ideal implant positional placement. There will most likely be adjustments during treatment

Cantilever Prosthetics

- Bone between implants will resorb if inadequate inter-implant bone is present
- 7 y follow-up
 - Two implants with cantilever
 - M (97%)
 - D (100%)
 - 5 y survival 95%
 - Single implant and cantilever
 - survival (89%)

Pre-surgical planning

Ø4.8mm



Ø3.3mm



Ø4.1mm

Ø2.9mm

Surgical Consult

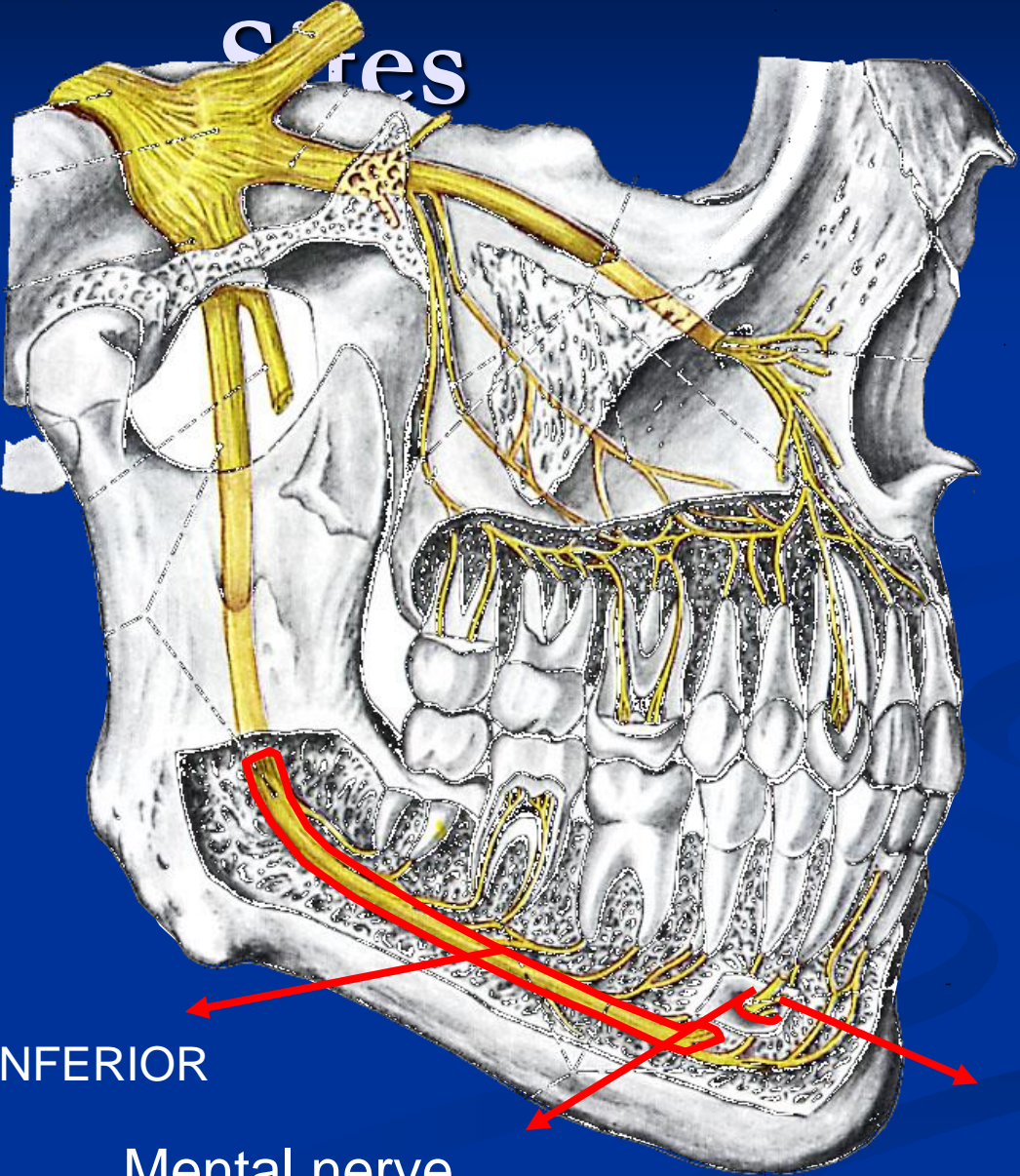
Assess ridge width

Options include:

- Intra-Surgical assessment
- Ridge Mapping Calipers
- CBCT
- traditional CT scan

Ideal 1.5mm circumferential alveolar bone after implant placement

Local Anatomic Mandibular

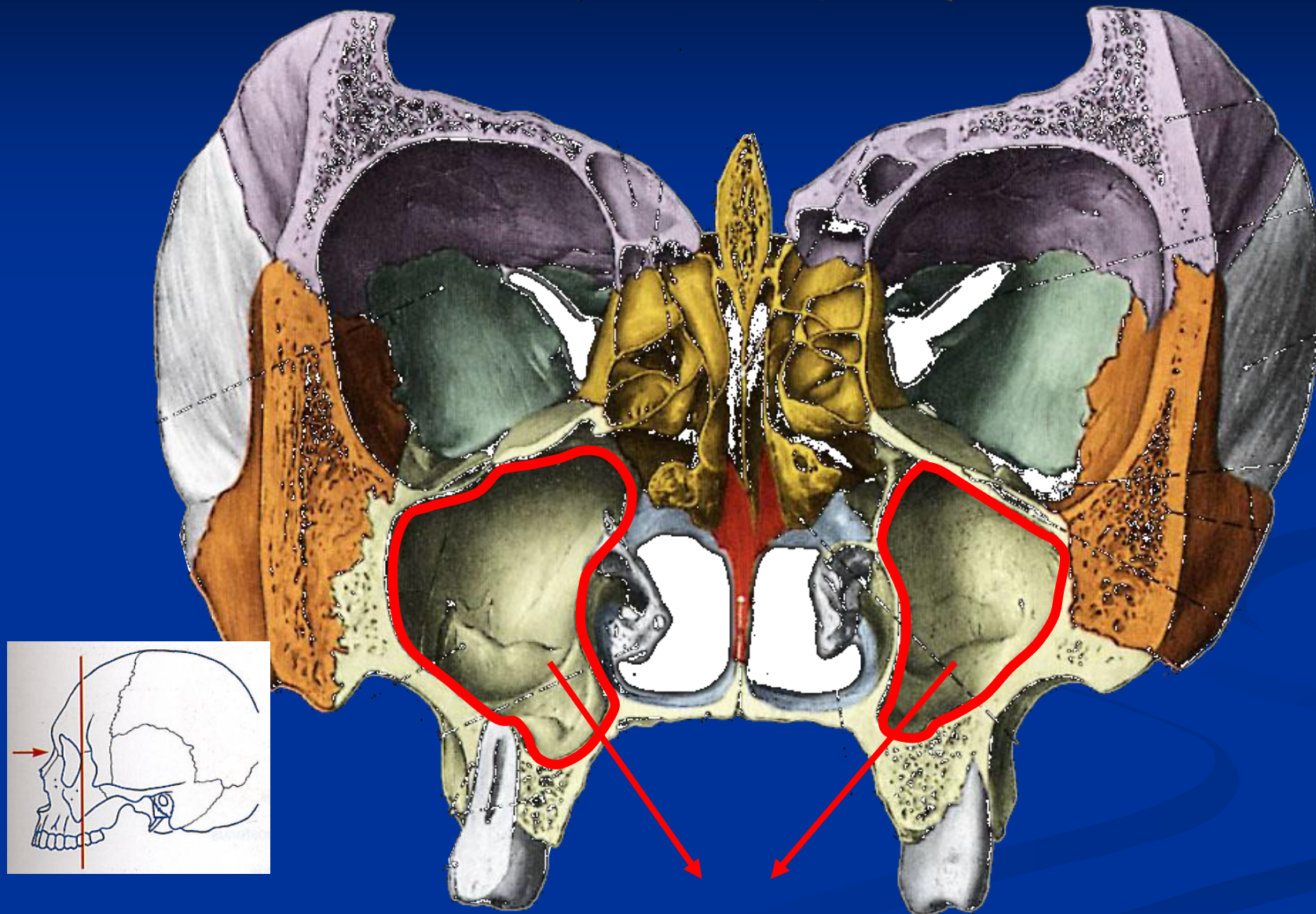


Mandible nerve
NERVUS ALVEOLARIS INFERIOR

Mental
foramen
FORAMEN
MENTALE

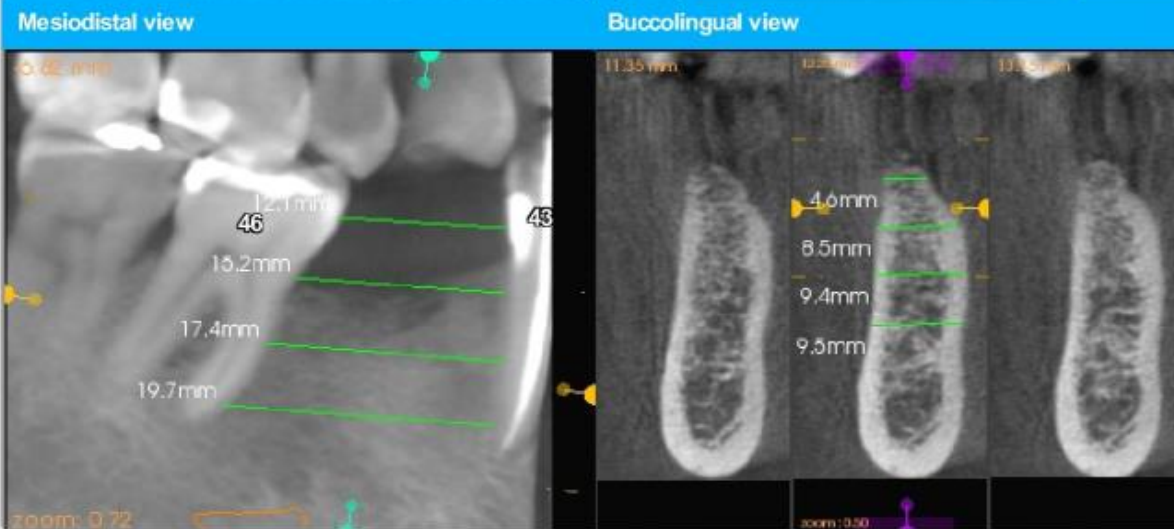
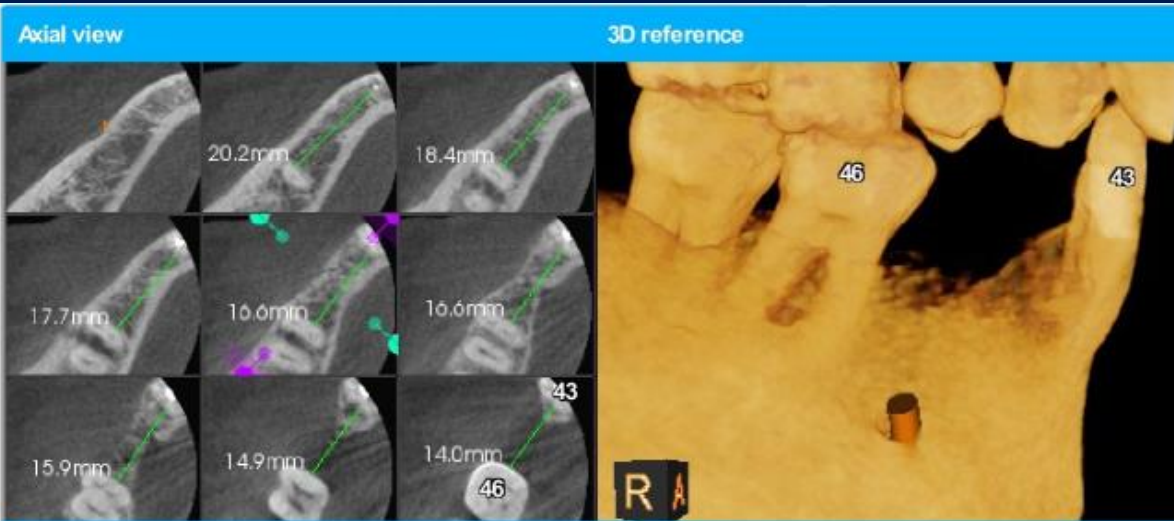
Mental nerve
NERVUS MENTALIS

Local Anatomic Maxillary Sites



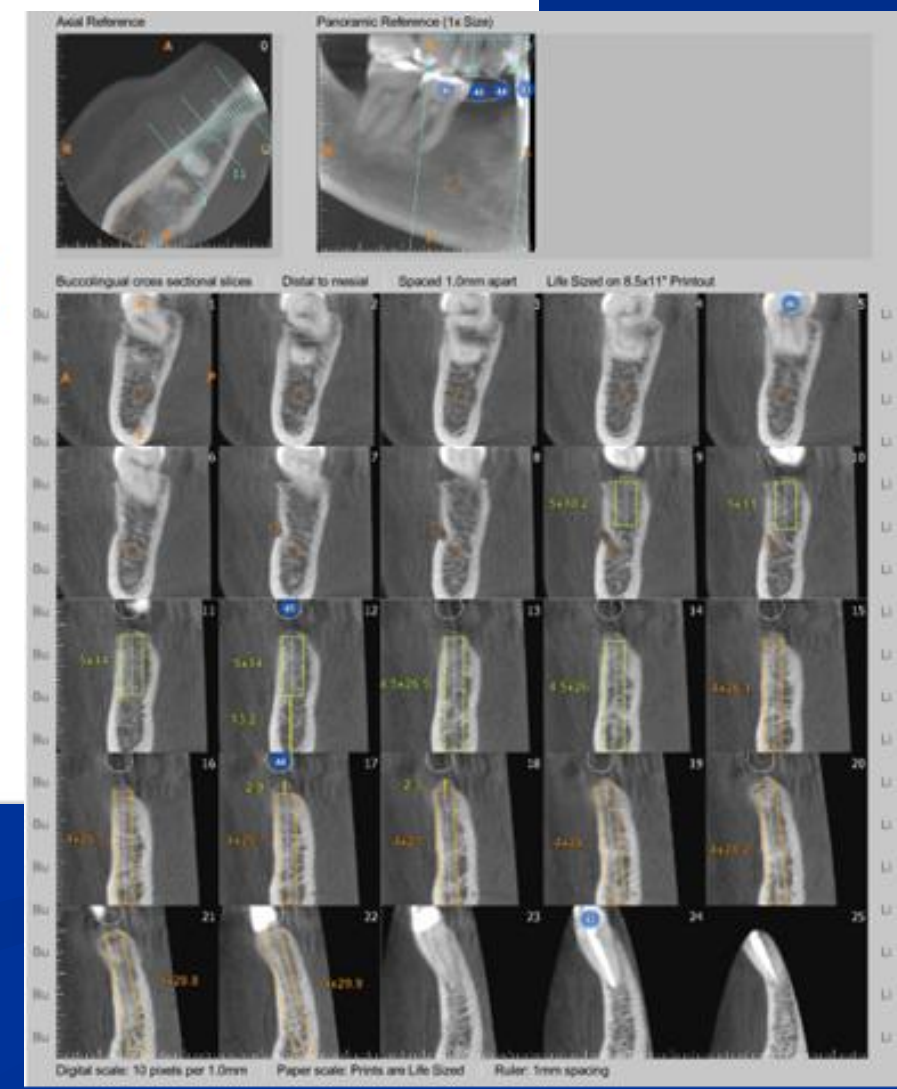
Maxillary sinus / Schneiderian membrane
Sinus maxillaris

Pre-surgical Planning

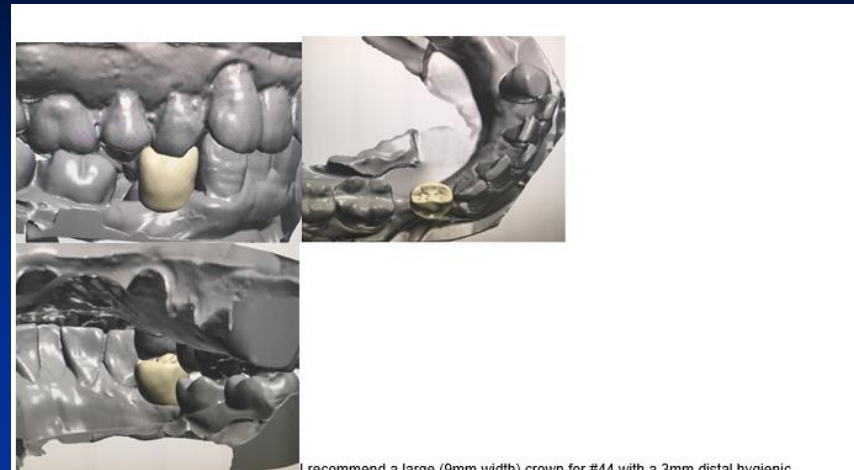


Orthogonal measurements at sites 44/45

These orthogonal cross sectional measurements demonstrate the available space at sites 44 and 45 to accommodate implant placement.



Pre-surgical planning: Digital Wax-up and Digital CAD



I recommend a large (9mm width) crown for #44 with a 3mm distal hygienic diastema for improved hygiene anterior to #46.

Single Implant Crown scenario B



A normal 7mm crown is an option which could allow for a second implant placement for site #45 without a new crown for #44 if Edward wishes.

Option 1: Single Implant

Implant details PDR Revision (2020 Dental Federation)

Plant: Mandible - Alternative Plan
Position: 44

Implant:
 - Generic: Generic
 - Green: no limitations for implant placement
 Article number: 4415 green
 Length: 15.00 mm
 Diameter 1: 4.00 mm
 Diameter 2: 5.00 mm

Comments:
 Suboptimal positioning of virtual implant due to a lingual bevel at the alveolar crest

Option2: Two Implants

Implant details PDR Revision (2020 Dental Federation)

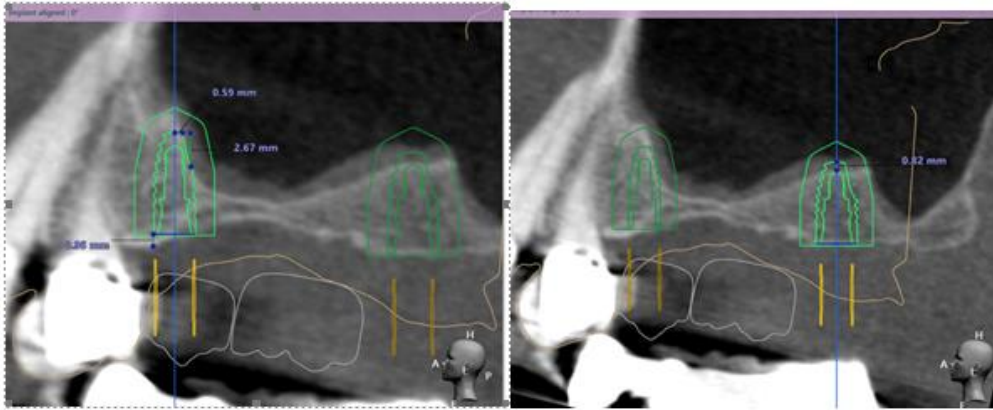
Plant: Mandible
Position: 44

1 Implant:
 - Generic: Generic
 - Green: no limitations for implant placement
 Article number: 4415 green
 Length: 15.00 mm
 Diameter 1: 4.00 mm
 Diameter 2: 4.00 mm

Comments:
 Note that there is less than a 3.0mm safety zone from the virtual implant placed at site #45

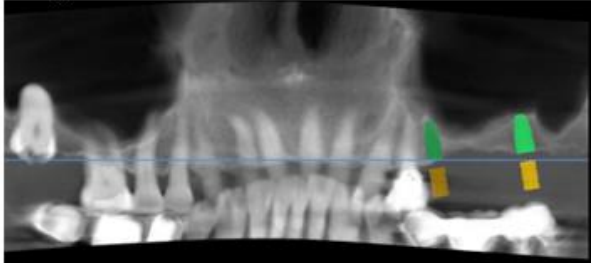
Single Implant Crown scenario A

Pre-surgical planning: Radiographic Stent

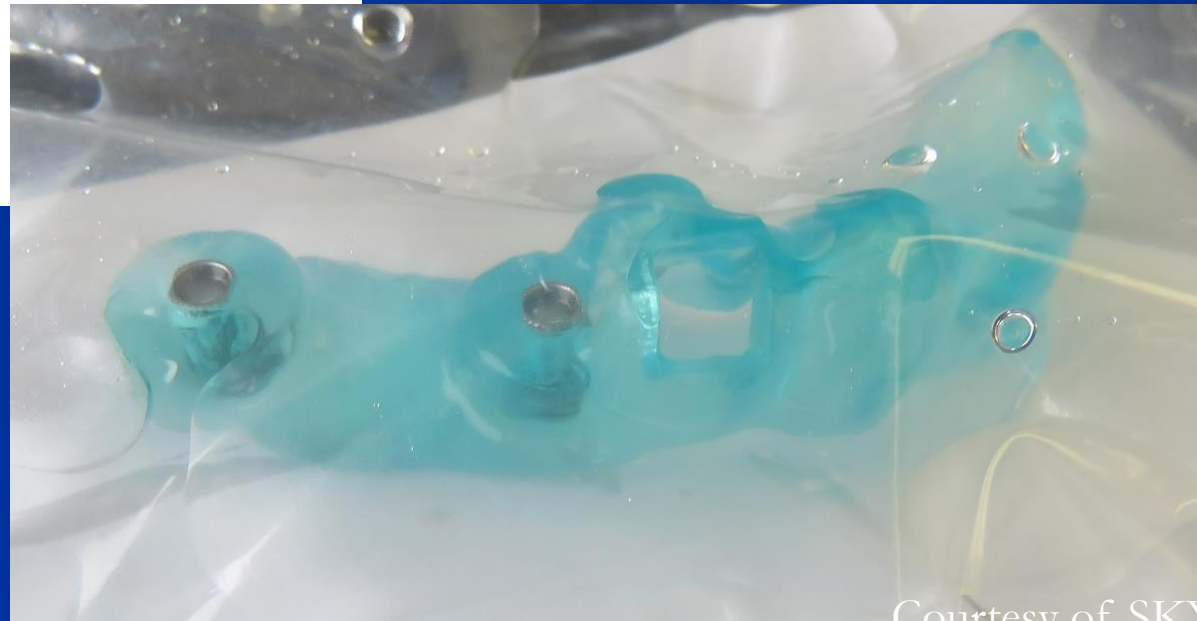


Parasagittal with 25 sinus lift

27 sinus lift recommended



CLINICAL FINDINGS:



Minimal crest widths for Implant Placement

BL 3.3 mm

ridge ≥ 5.3 mm

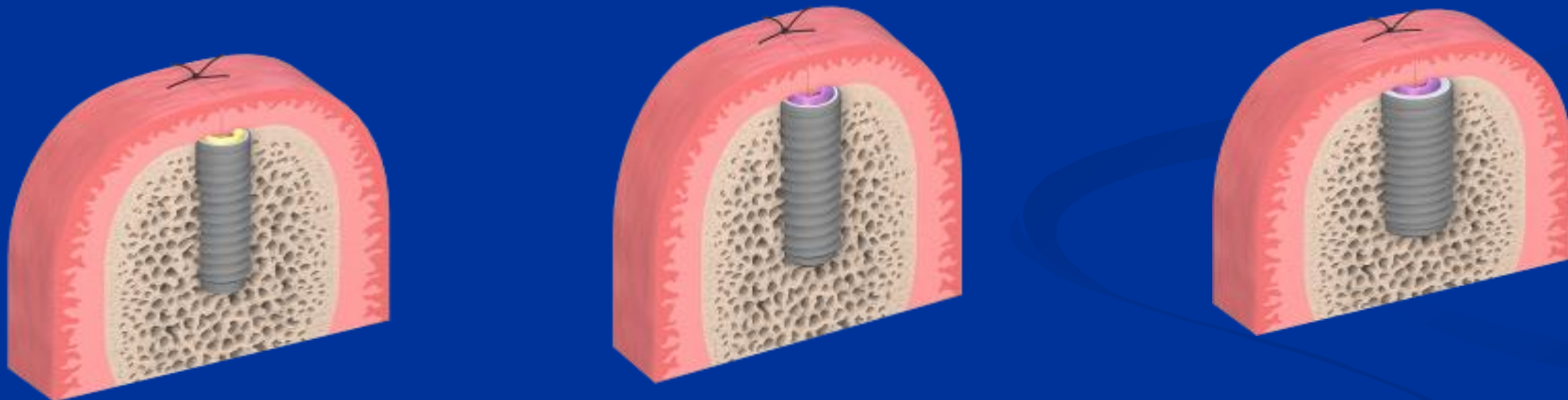
(3.3mm + 1mm+1mm)

BL 4.1 mm

ridge ≥ 6.1 mm

BL 4.8 mm

ridge ≥ 6.8 mm



If the ridge is ≤ 5.3 mm, GBR or conventional restoration is recommended

Dentition to be extracted near the time of implant placement

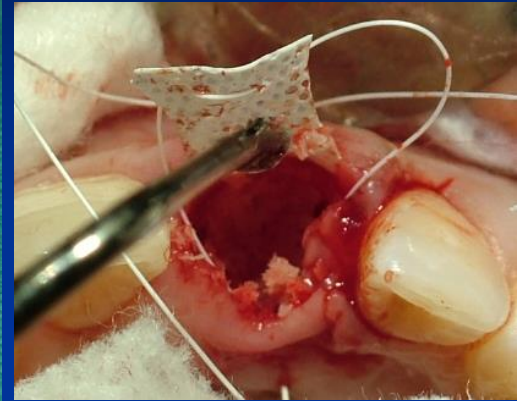
- Options for maintenance of alveolar structure is increased when the tooth is still in place or if a recent extraction (within 6-8 weeks)
- After 6-8 months, grafting options begin to approach that of extractions over 1 year
- If the dentition is actively infected
 - make all attempts to remove infection
 - have an emergency surgical consult with a specialist
 - or extract and graft in-office

Socket Type Classification used to assess when socket grafting is required

- Type 1- soft tissue and +2mm buccal plate present
- Type 2- thin scalloped soft tissue or thin to no Buccal plate

Graft material may be particulate bone (allograft or xenograft)

Extraction with Ridge Augmentation/ Guided Bone Regeneration and Implant

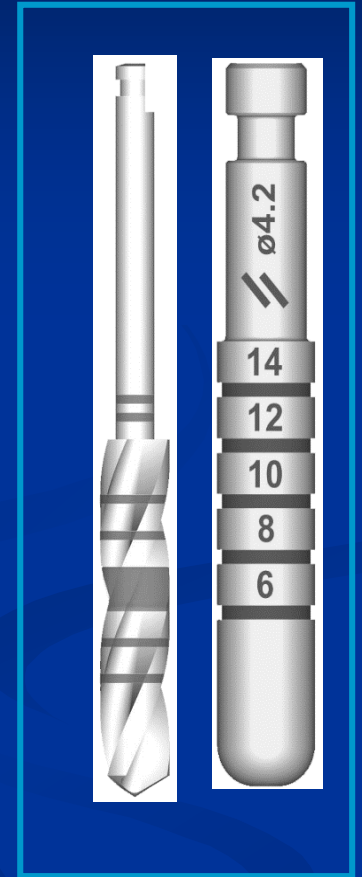
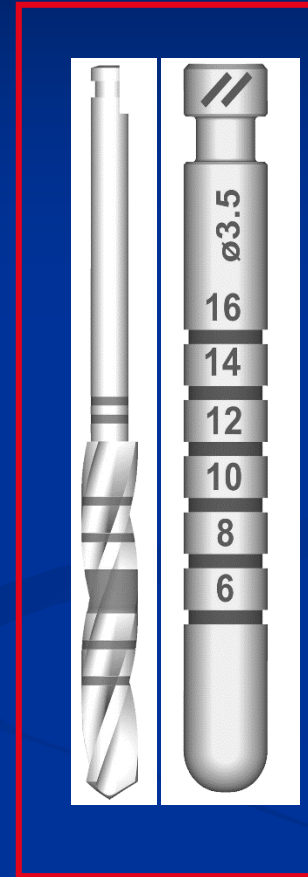
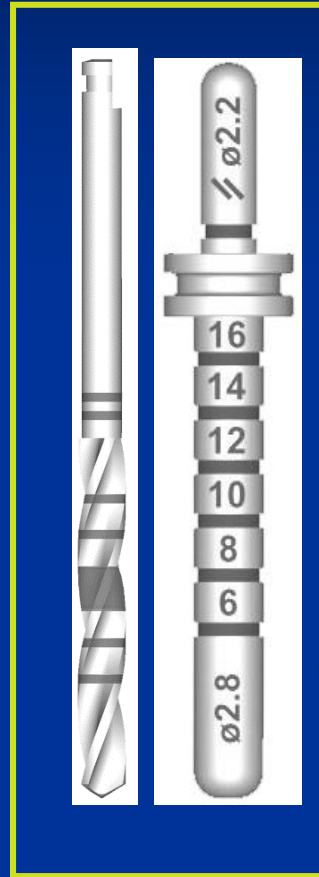
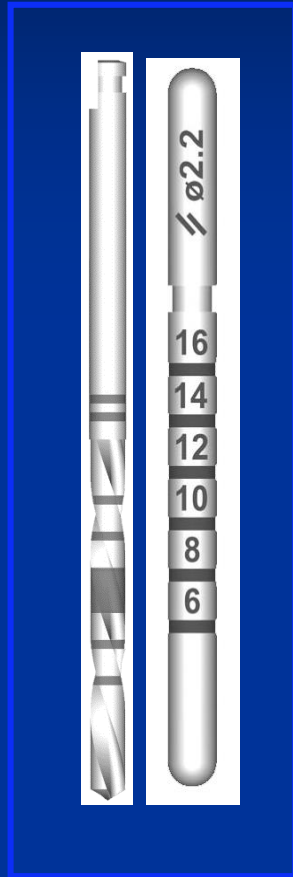
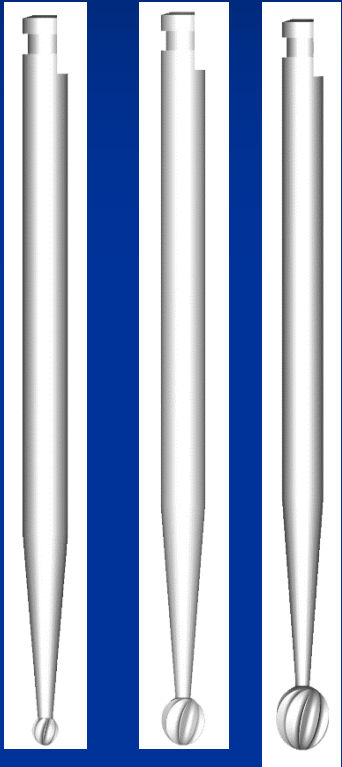


Surgical Consult

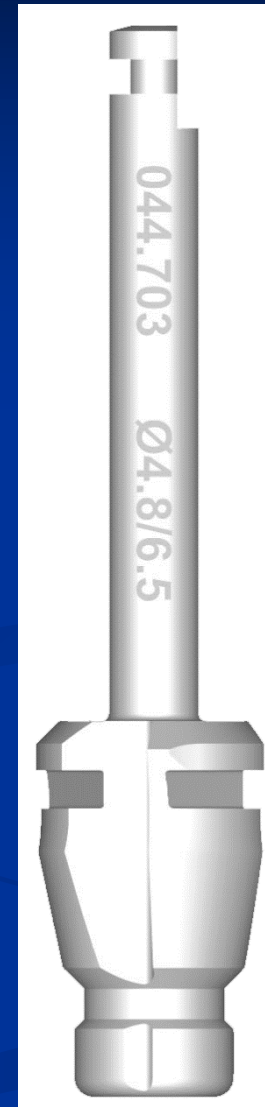
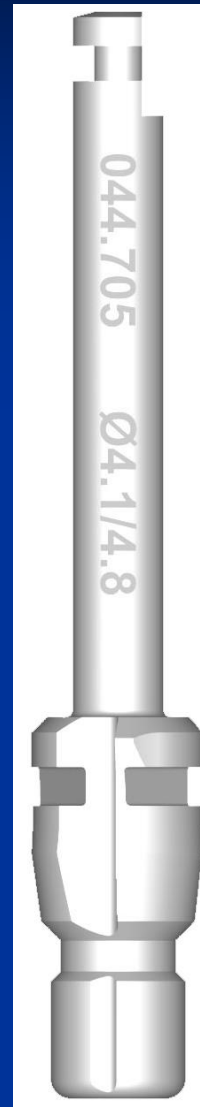
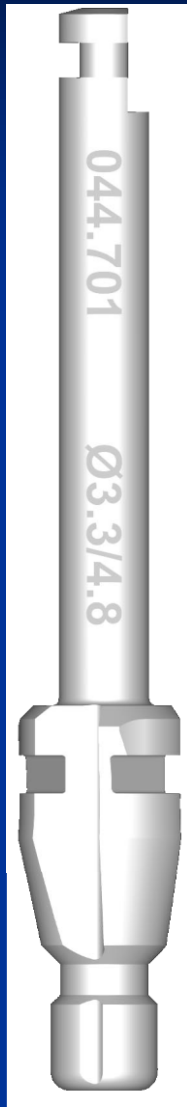
Floor of mouth

- due to advanced ridge resorption, mandibular ridge has migrated lingually,
- placement of implants in adequate bone, but misplaced to lingual will create long-term prosthetic concerns as well as minimal keratinized tissue for hygiene
- Assess lingual undercut , placing implant in lingual region may impinge or lacerate lingual artery,
 - hemorrhage may become life-threatening with advanced mandibular swelling of minor anatomic triangles
 - direct external vessel ligation

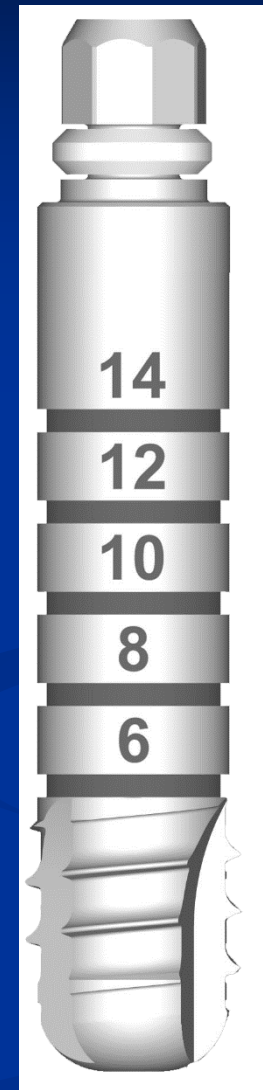
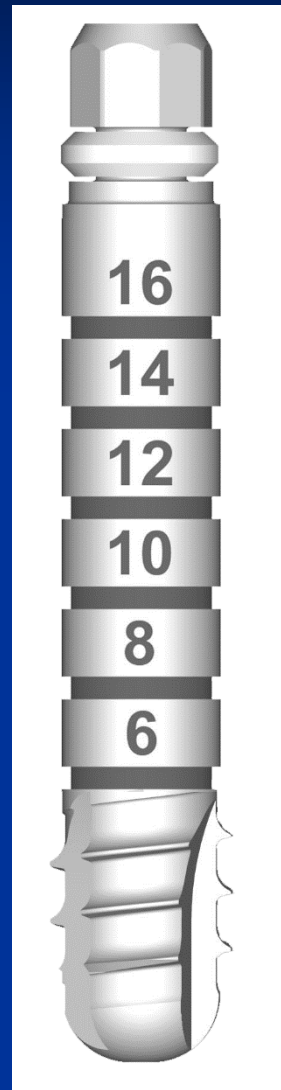
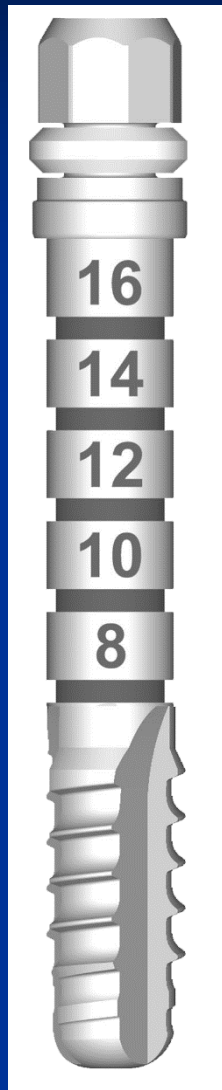
Drilling sequence



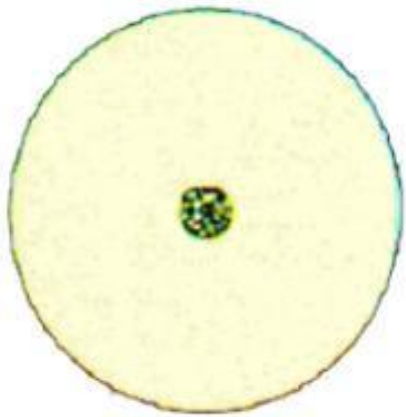
Profile drills



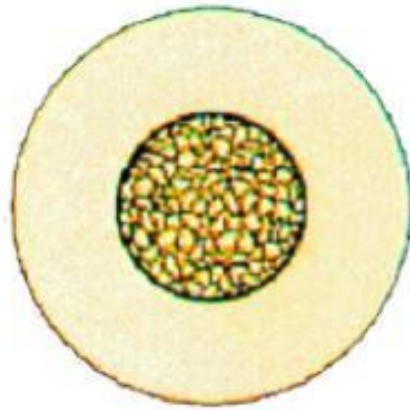
Thread-Tap for handpiece



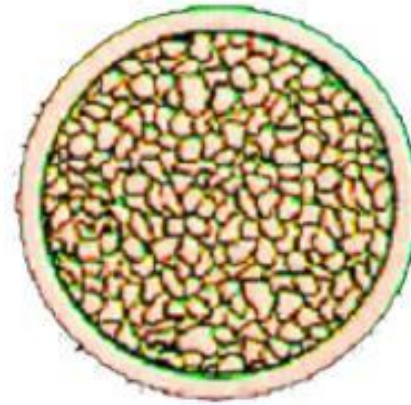
Quality of bone can be Classified during surgery: possible preliminary assessment with CT scan



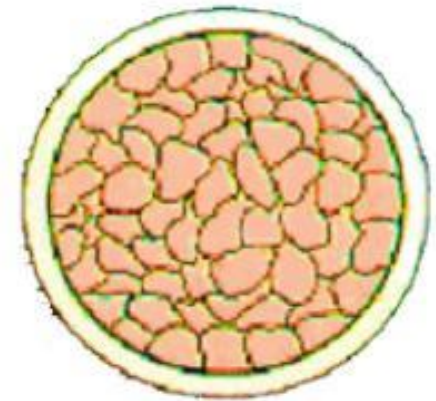
Class I



Class II

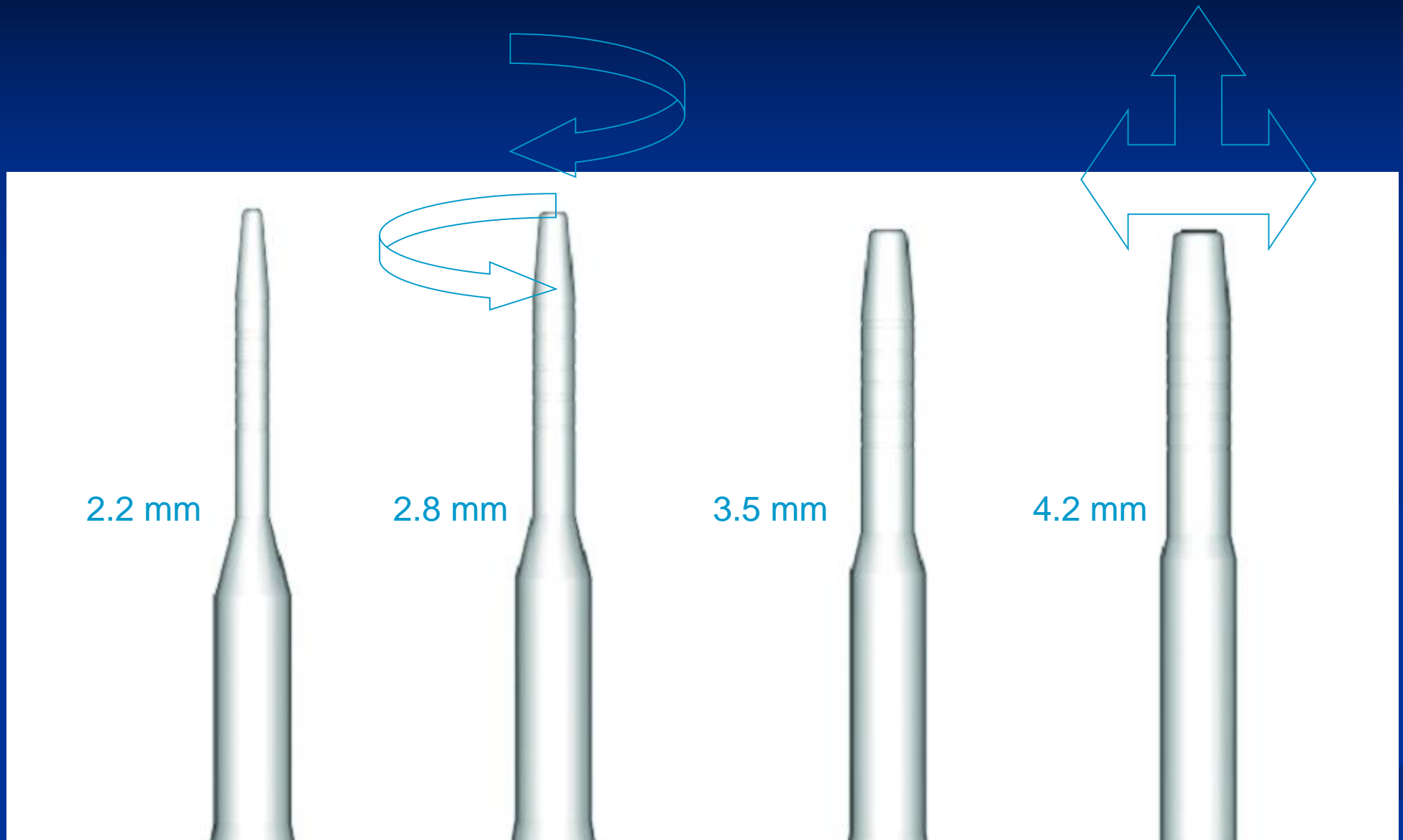


Class III

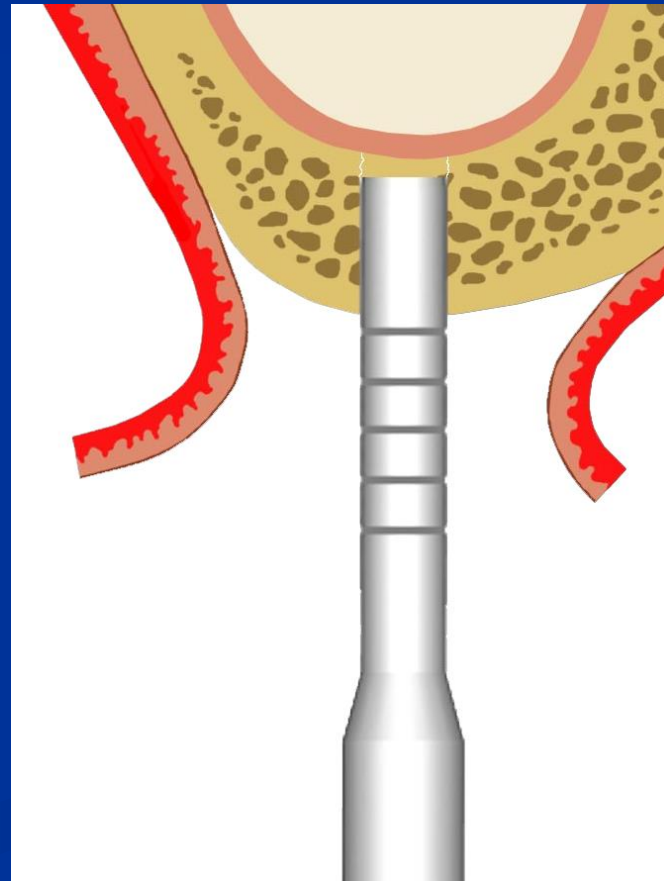
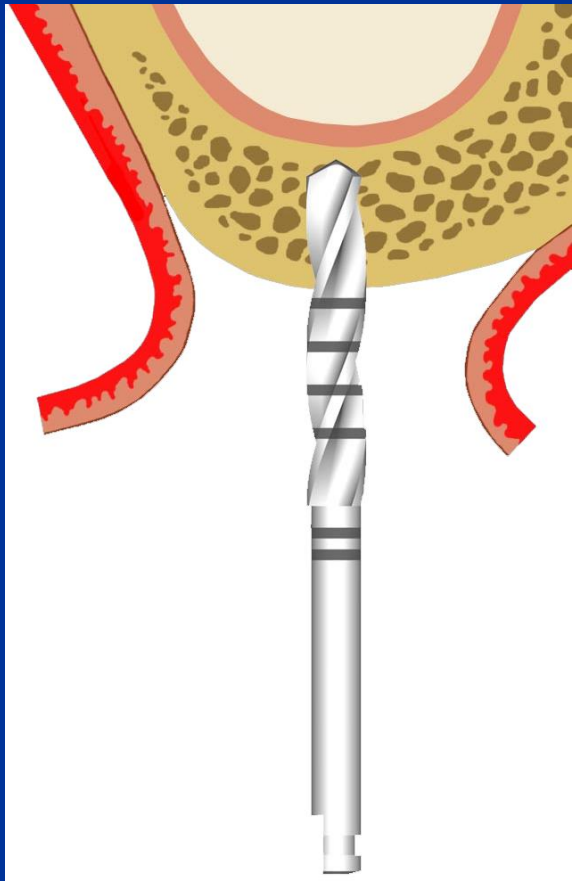


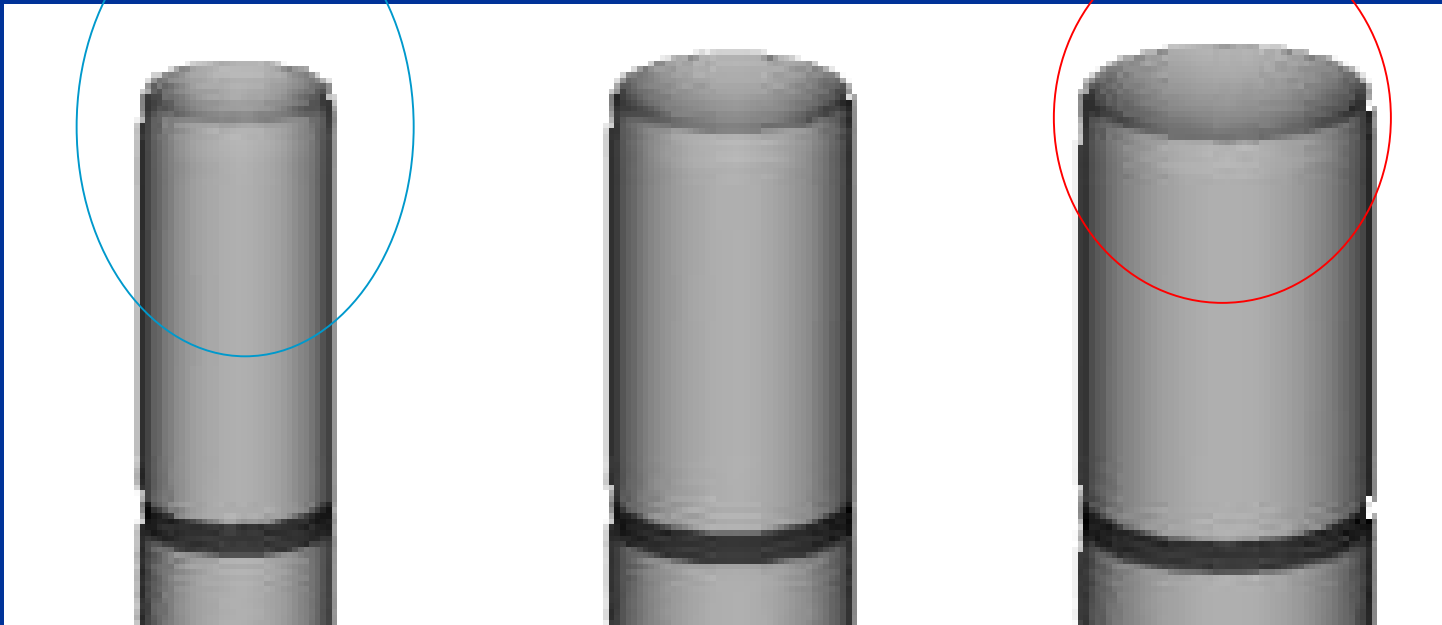
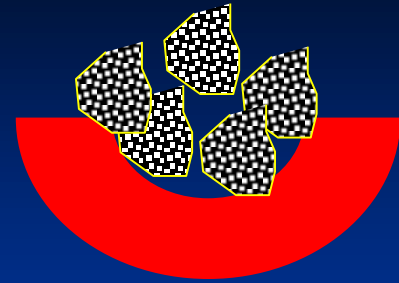
Class IV

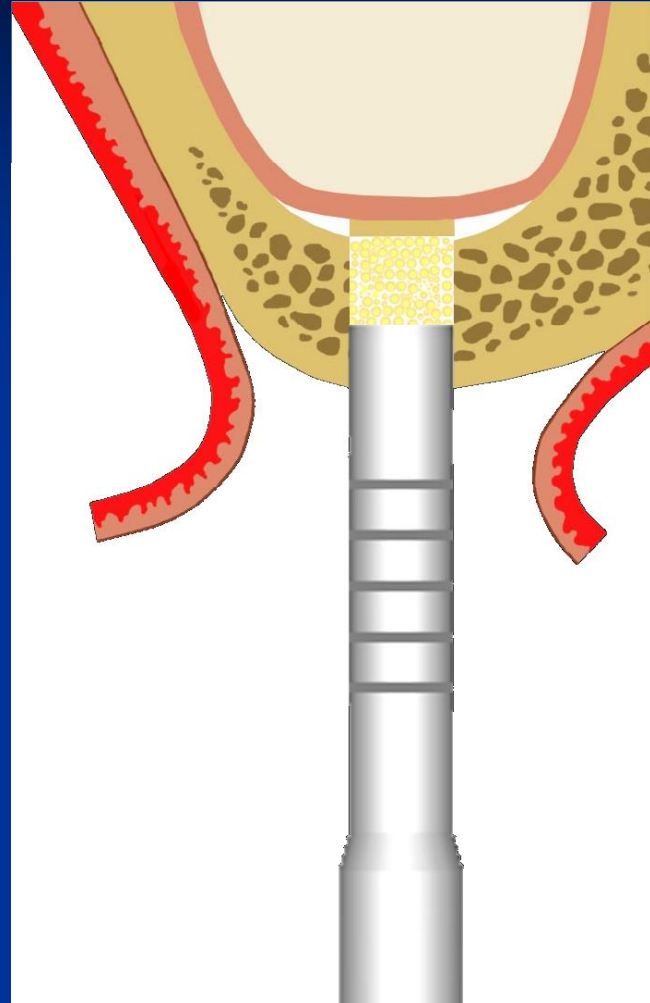
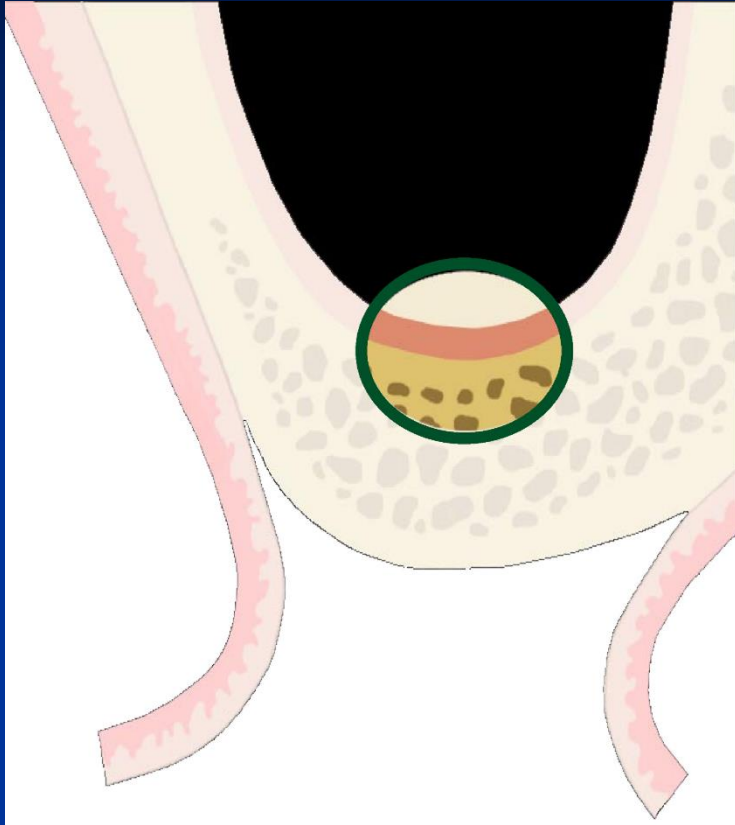
Osteotomes for bone condensation

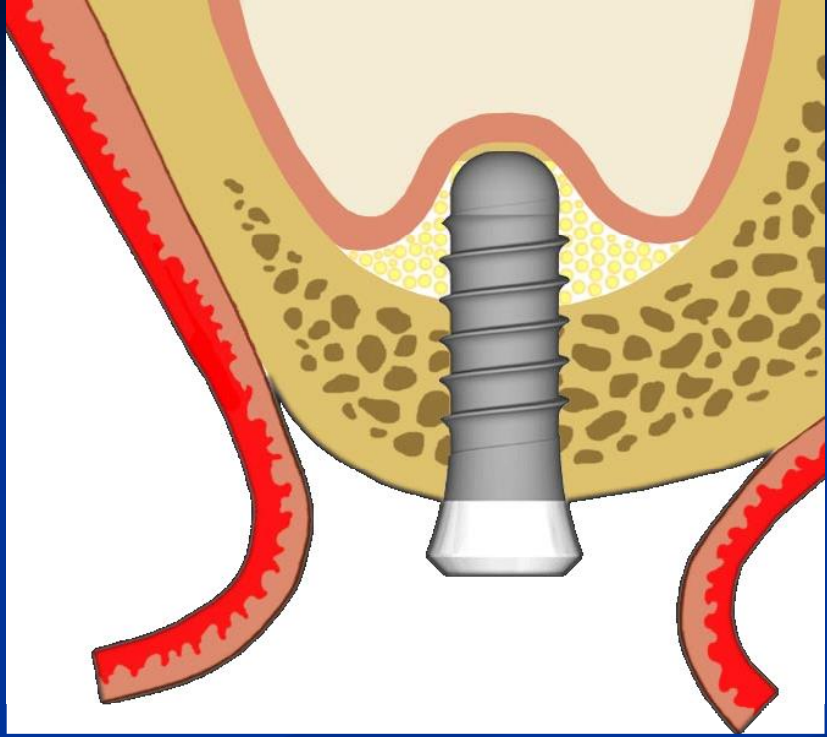
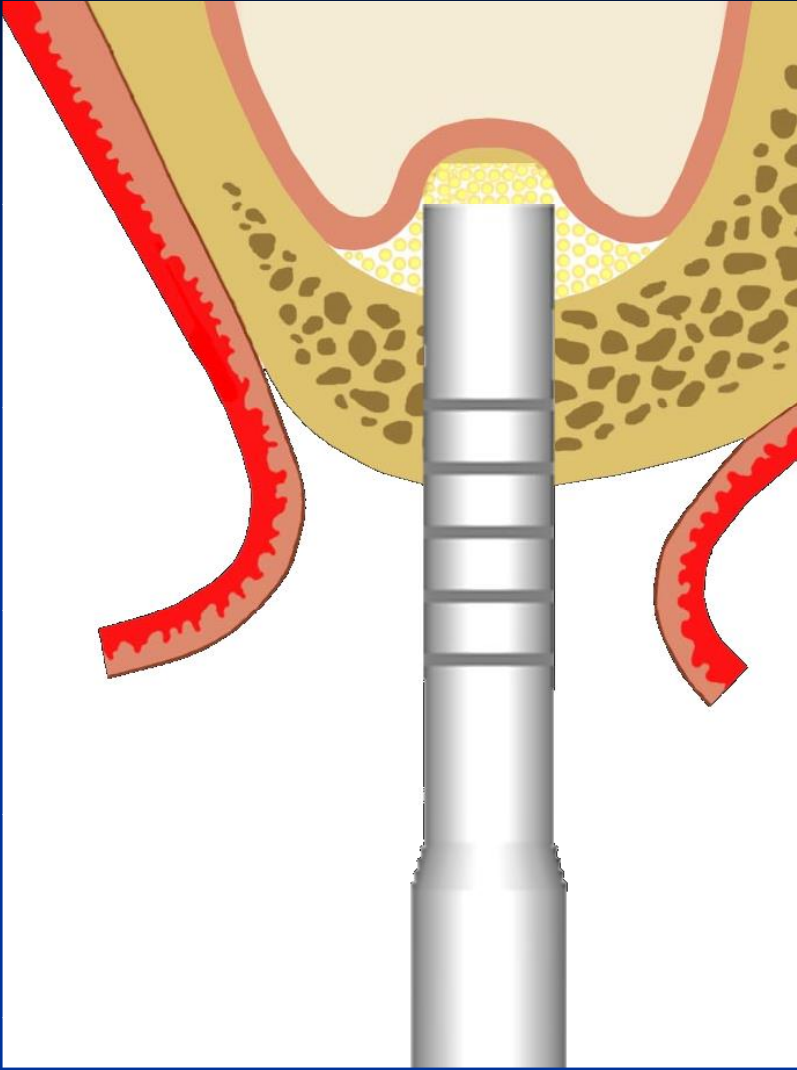


Indirect Sinus Lift

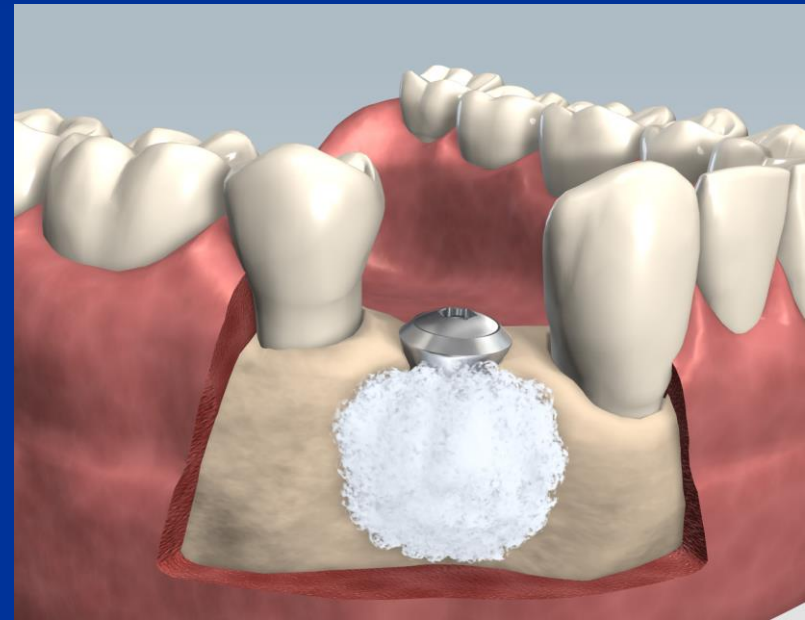
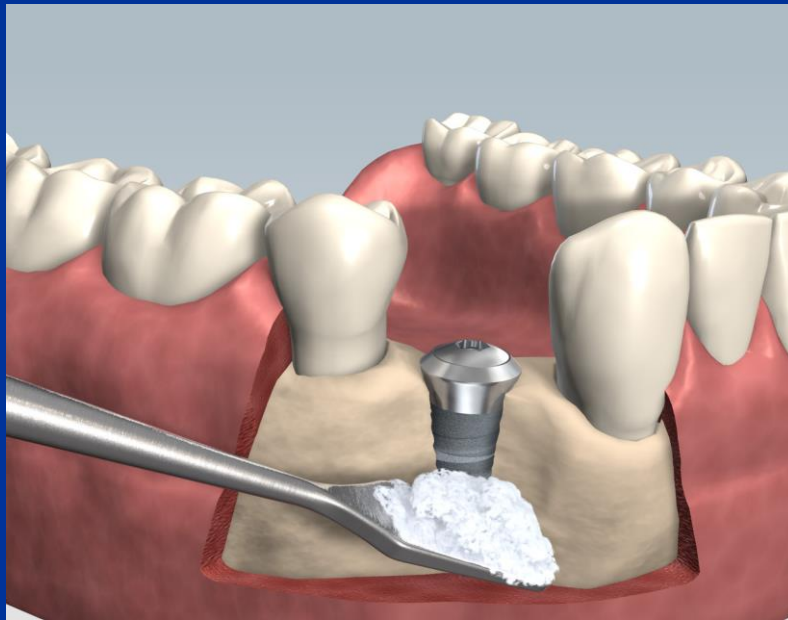








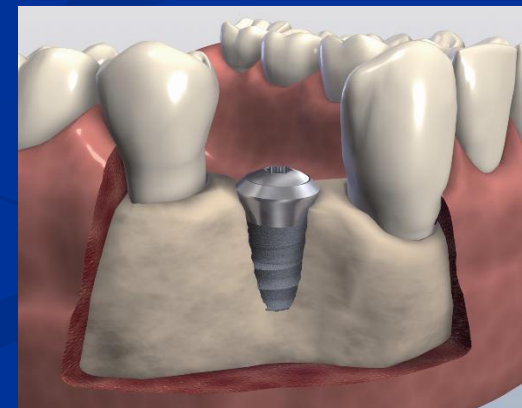
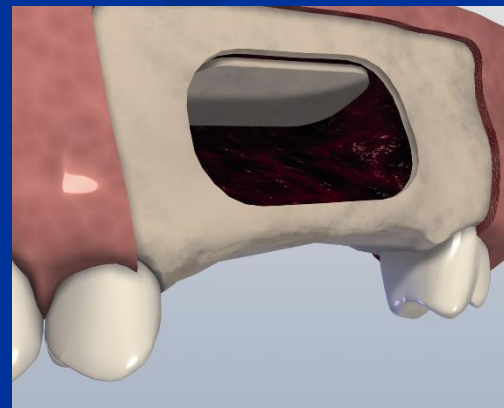
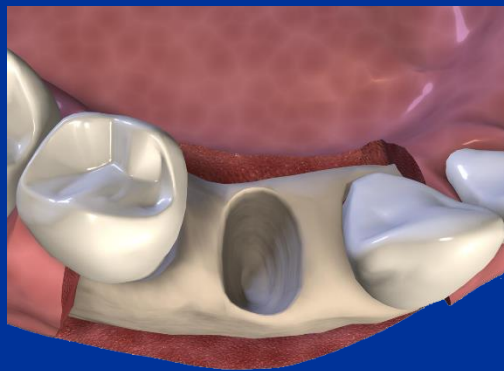
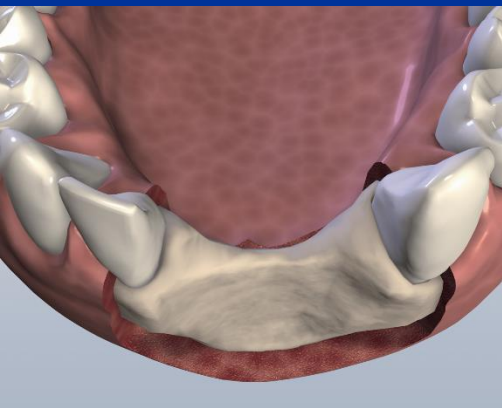
Advanced to Complex cases With Ridge Graft



Grafting – Indications

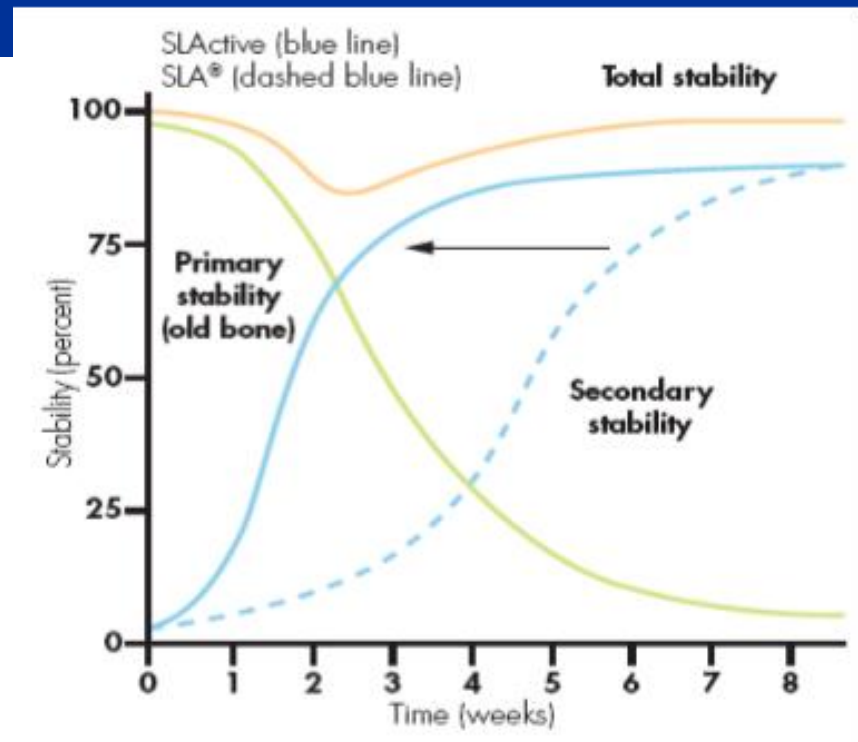
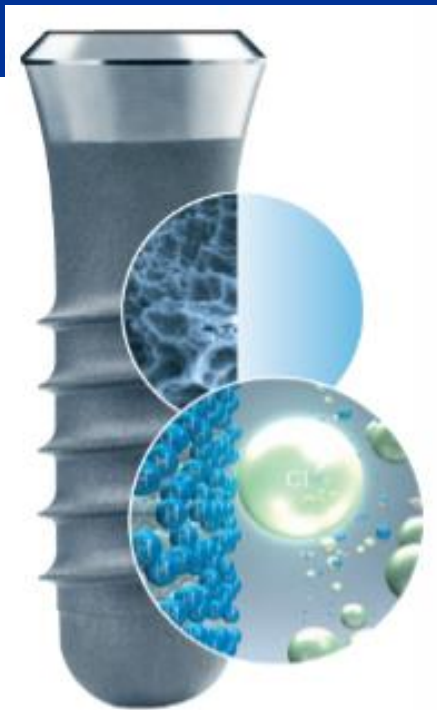
Filling and/or augmenting intraoral / maxillofacial osseous defects such as:

- Intrabony periodontal osseous and furcation defects
- Augmentation of bony defects of the alveolar ridge
- Fill of tooth extraction sites
- Sinus elevation grafting



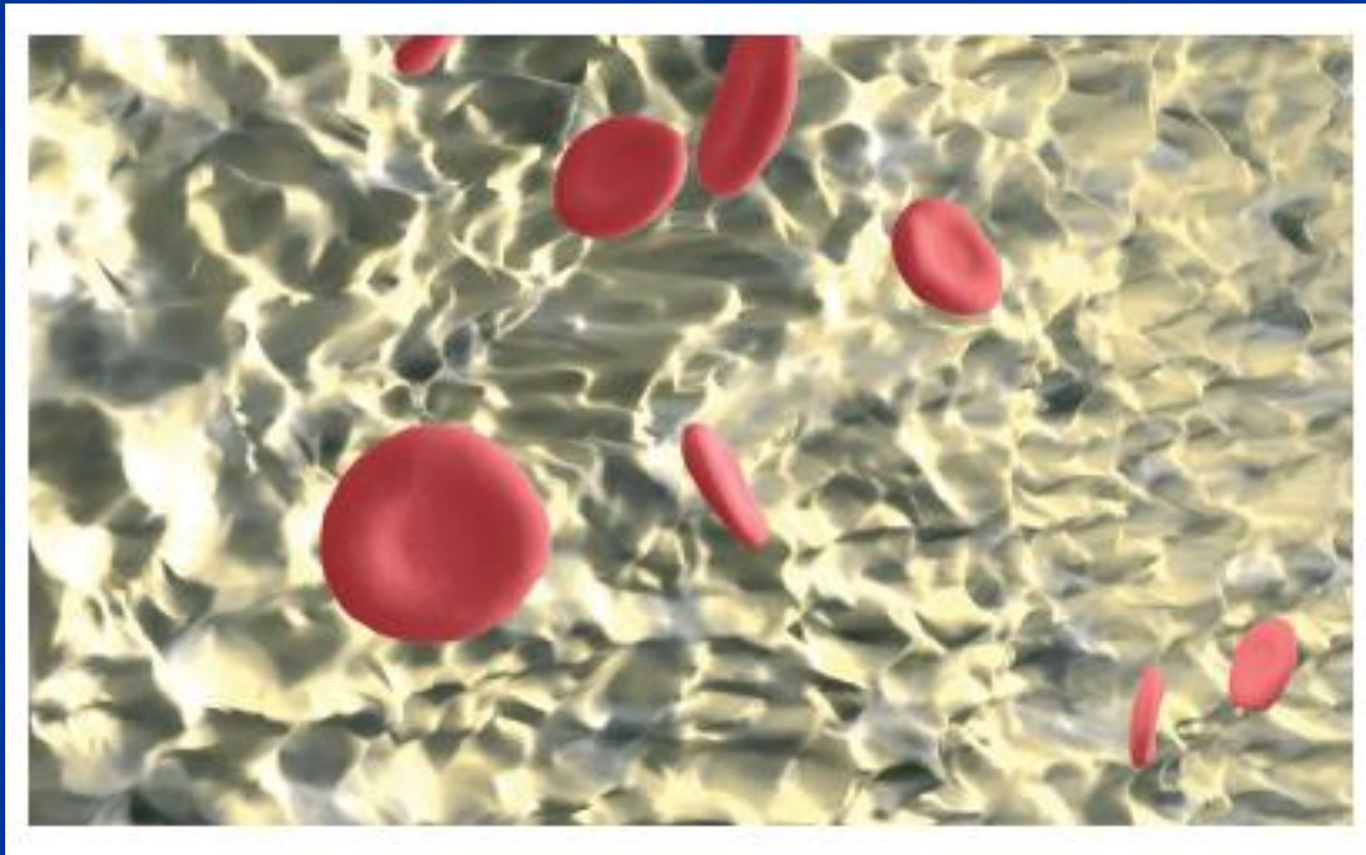
Shift of Biological induced stability

SActive's™ unique properties of hydrophilicity and chemical activity promote faster osseointegration, leading to earlier achievement of secondary stability



SLActive inert micro-sponge surface

The chemical activity attracts blood and proteins to the micropores of the implant surface, initiating the osseointegration process

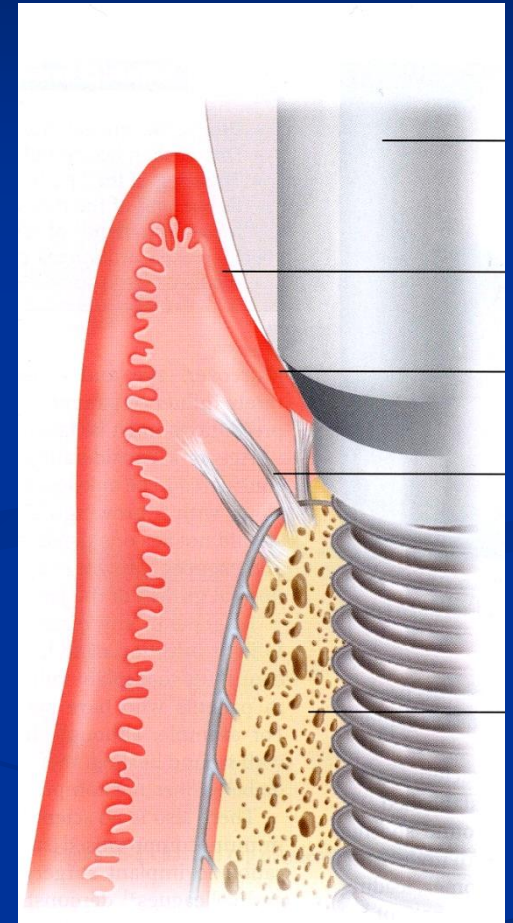
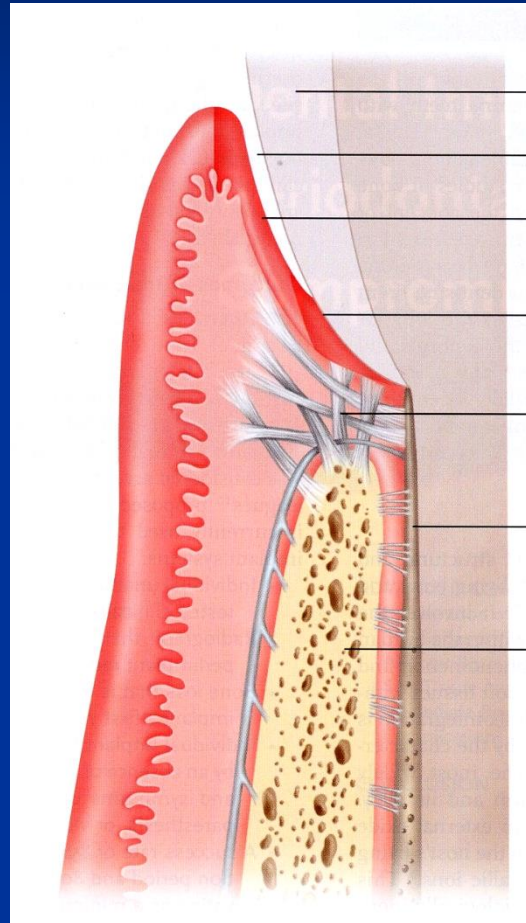


Soft tissue healing around the implant surface

Comparison of tooth vs implant attachment

(Rose and Mealy, 2004)

- Unlike teeth osseointegrated implants lack a periodontal ligament
- At the coronal end soft tissues form a tight collar around implant neck
- Fibers run parallel to implant surface (No Sharpey's fibers)



Hands-On Surgical Option (not in Hawaii, Aloha)

- Please familiarize yourself with the motor settings
- The round burs may have settings up to 1000rpm
- Ideal twist drill settings will vary according to density of bone and sharpness of burs; ensure irrigation is adequate
- Attempt to maintain temperature of surgical site to $< 40^{\circ}\text{C}$ to ensure viable cellularity
- Options include slow RPM (250-500) near final bur width
- Profile at 300 RPM
- Tap at 40ncm implant setting

Provisionalization techniques

Realize that micro-movement or soft tissue impingement may lead to early peri-implantitis or unesthetic soft tissue results

Essix retainer:

- recommended since tooth borne, high esthetic value and ability to adjust during surgical procedure
- Drawback is patient will not be able to chew with the retainer in

Removable denture: see PDF attachment

- Ovate pontic (C3-style) is recommended versus ridge lap
 - Open gingival embrasure, C-shaped M-D and B-L
- Soft tissue may be remodeled by acrylic pressure

Time of Loading

- Be conscious of the difference of bone quality and segment at which loading can take place
- Generally, implant design and surface technology such as sharp threads, and SLActive surface will allow for early loading due to improved primary and secondary stability

Early occlusal loading (48 h – 3months)

- 6-8 weeks or even 3 -4 weeks after implant placement (SLA active) for early protocol with similar histologic findings (Gonzales 2007)
- If full arch fixed >4 implants splinted in type 1-3 bone
- ISQ>49 (Cochrane IJOMI 2004)
- Avoid flapless surgery due to lack of visual and grafting options; use early loading and educate patient to know outcome and expectations (Dr. H. Katsuyama)
 - Over-augment in anterior region

Delayed loading (3-6months) [Adell et al]

- Branemark protocol: submerged w/o radiographs
- Schroeder protocol– transmucosal healing abutment
- Approximately 3 visits to surgical completion (benefit of complete sequence/management)

Complications

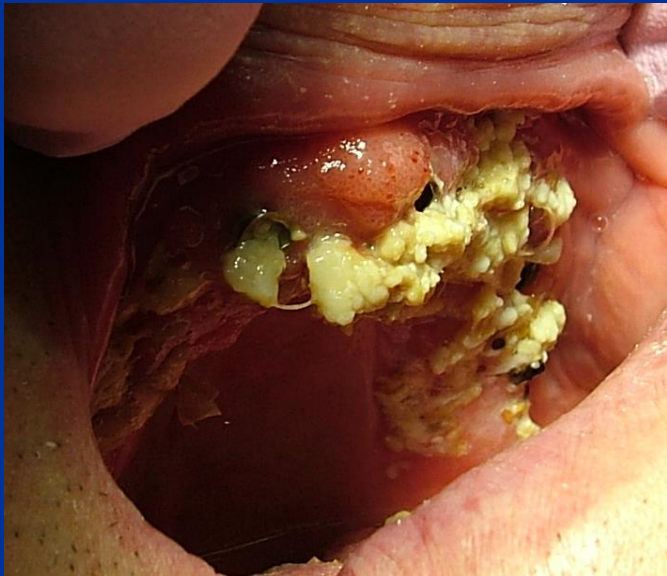
- Soft tissue complications
- Maintenance problems
- Failure of the retentive system
- Fracture of the dental prosthesis
- Bone loss due to peri-implant infection
- Bone loss due to overload or absence of a passive fit
- Implant fracture

Fracture of the dental prosthesis



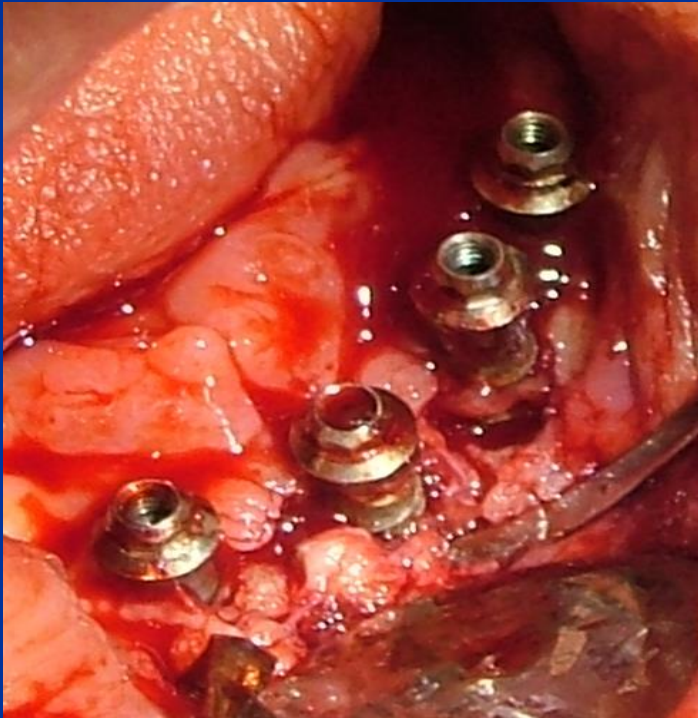
Maintenance Complication:

An example of challenging ridge lap acrylic denture



Bone loss due to peri-implant infection

Bone loss due to overload (A-P spread)



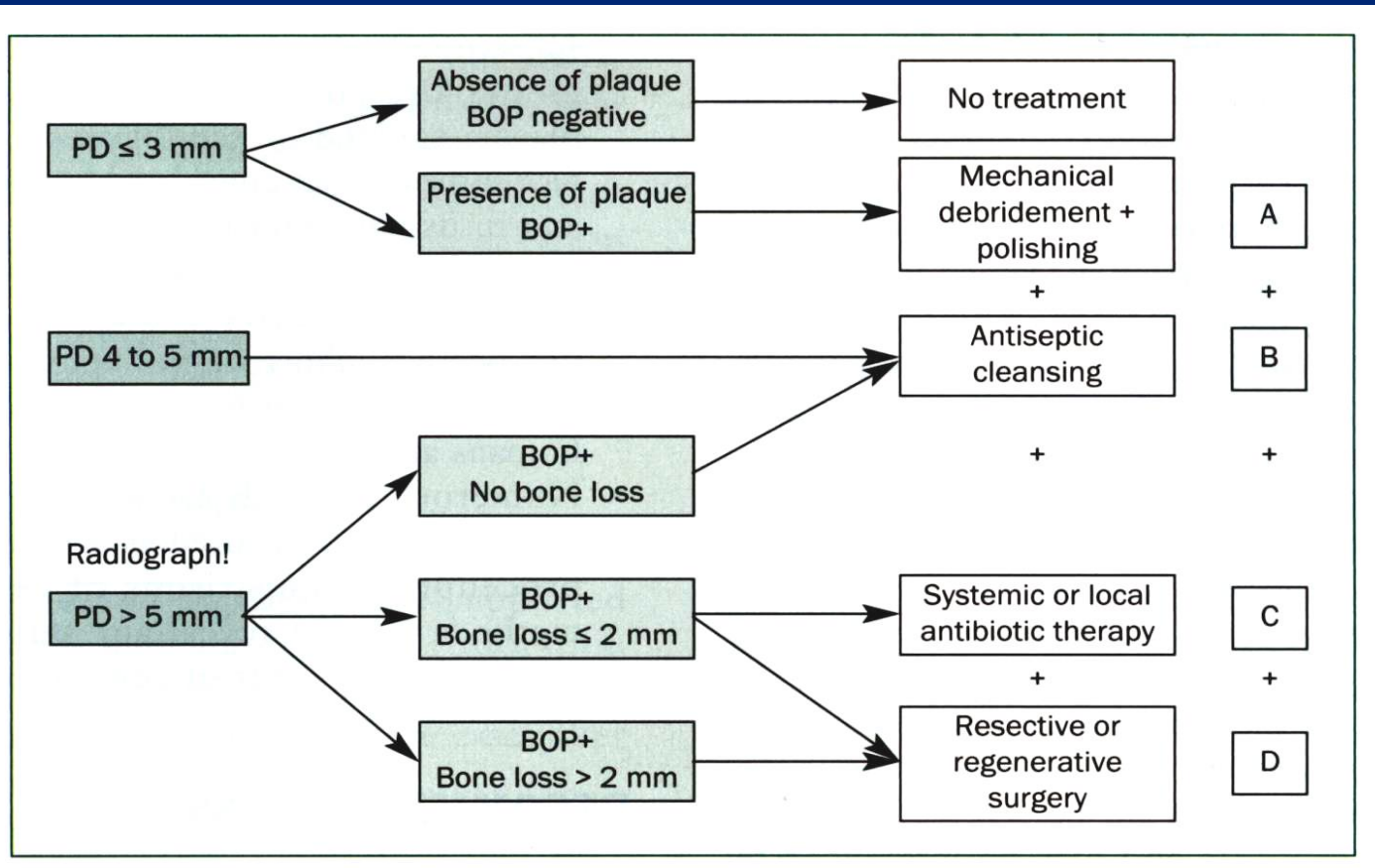
Maintenance and Monitoring

- Systematic and continuous monitoring of the peri-implant tissues for stability is required
 - Plaque and calculus removal on a 3-6 month interval with either implant scalers or normal stainless steel scalers (do not use plastic tip scalers/cavitron)
 - Radiographs on a 6 month interval for 2 years following placement and a yearly follow-up the next 5 year
- Superstructure
 - Occlusion, Denture retention, attachment loosening, abutment status with the superstructure removed

Maintenance Protocol

Monitoring peri-implant tissues is recommended for early diagnosis of peri-implant disease

- Update medical history
- Plaque and calculus assessment
- Mucosal conditions
 - soft tissue assessment
 - probing depth
 - bleeding on probing
 - width peri-implant keratinized mucosa
- Bone-implant interface
 - mobility
 - radiographic interpretation



- Lang N, et al.
 Consensus statement
 and recommended
 clinical procedures
 regarding implant
 survival and
 complications *JOMI*
 2004 19: 150-154.

Maintenance Protocol

Soft tissue assessment

- Visual signs of gingival inflammation
 - Shape
 - Color
 - Contour
 - Texture
- Soft tissue complications
 - Fistula
 - Excessive swelling
 - Enlargement

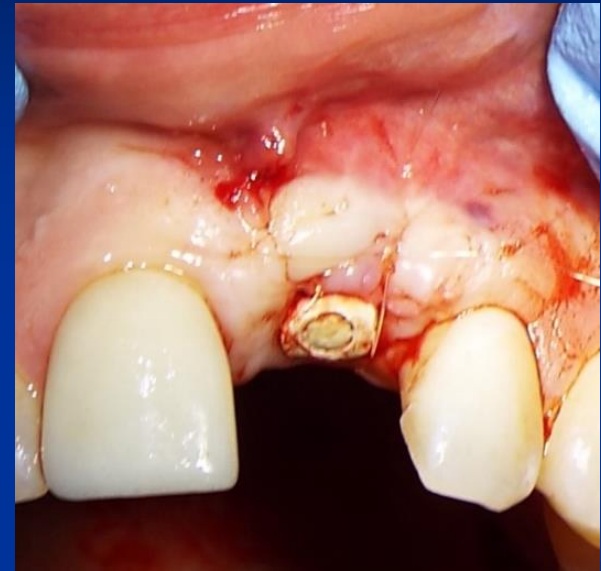


Maintenance Protocol

Width Peri-implant Keratinized mucosa

- Based on current evidence, a lack of keratinized tissue around an implant is associated with more plaque accumulation, tissue inflammation, recession and attachment loss.
- Indications for soft tissue grafting depends on a case-by-case evaluation
- Meta-Analysis shows improved marginal bone levels and reduced inflammation (Mar 2018 D. Thoma COIR)

Subepithelial Connective Tissue Graft



Maintenance Protocol Radiographic Interpretation

- **Absence of clinical signs of infection:**

Radiographs on a 6 month interval for 2 years following placement and a yearly follow-up the next 5 year

Implant Maintenance Treatment

Home care

- Devices to clean: customized to design and accessibility
 - Soft bristled brushes + fine abrasive pastes
 - End-tuft brushes
 - Nylon-coated interproximal brushes
 - Dental floss or gauze



Design for Ideal Maintenance

- The design of a superstructure must allow for adequate hygiene
- The superstructure should be designed to facilitate access with standard oral hygiene tools
- The ovate pontic design is recommended with no inaccessible concave areas
- A ridge lap must be avoided if possible

Conclusions

- **Delayed placement** in extraction site of 12-20 weeks
- **Early loading** is reasonable 6-8 weeks
- Protocol for number of surgical visits includes:
patient (informed) expectations (short/long term) ;
prognosis (short/long term); cost analysis(short/long term);
- **B.R.A.I.N**

Benefits (short/long term); Risk (short/long term);
Alternatives(FPD, RPD, No treatment), Intuitive
Decision, Not Now

Bye For Now

