DENTAL IMPLANT TREATMENT PLANNING; SURGICAL PERSPECTIVE

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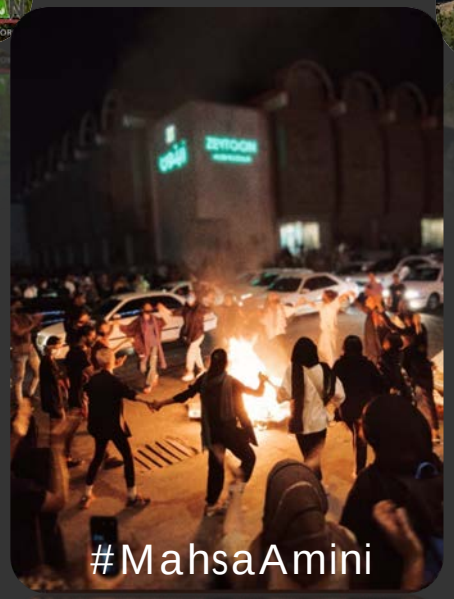
Alborz Mountain



Damavand summit:
5,609 meters (18,402 ft)

Medical and dental history

Intra/extra oral examination

Phases of treatment

Anatomical consideration

3D Planning

Limitation of augmentation

Imaging tools

Accuracy of Fully guided

Standard protocol for implant placement

3D implant planning

Timing of implant placement

Implant in esthetic area

Medical and Dental History

Medical: Risk for patient's health

Absolute contraindication: (ASA class > III)

After major medical incidents (MI and CVA) or major surgeries (Up to 6 months)
Active cancer therapy (Radiation and IV bisphosphonate)
Severe mental or psychological disorders

Relative contraindication

Bleeding disorders, anticoagulants, antiplatelet
Radiation
Antiresorptive medication

Medical: Risk for implant success

Uncontrolled diabetes
Smoking (dose dependent)
Autoimmune diseases

Dental History:
Reason for tooth loss; Trauma, congenital, caries, periodontal disease or fractured

ITI consensus 2018:
SSRI and PPI ~ higher risk of implant failure

Citalopram, fluoxetine, sertraline, ...
Omeprazole, pantoprazole, ...

Medical and Dental History

Major risk indicators for peri-implantitis: *(AAP 2017 World Workshop)*

History of severe periodontitis
Poor plaque control
No regular maintenance

Strong evidence

Submucosal cement
Not cleansable restoration

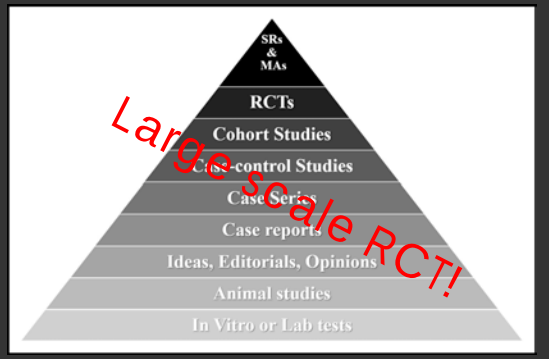
Limited evidence

Smoking
Diabetes

Inconclusive

Keratinized mucosa
occlusal overload
titanium particles
bone compression necrosis,
Overheating
Micromotion
biocorrosion

To be determined

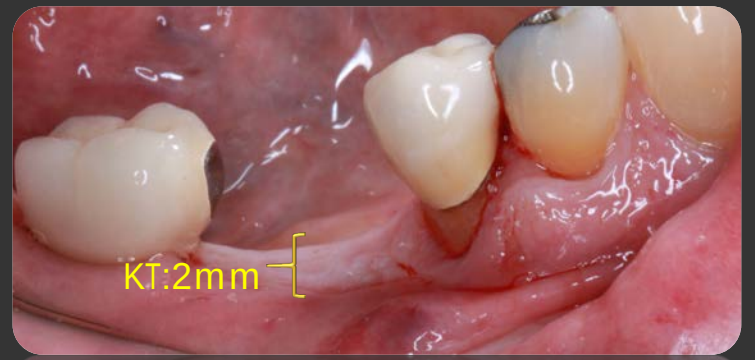


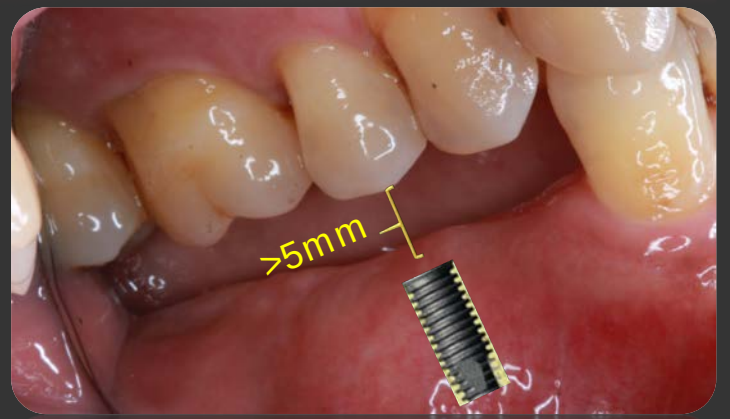
Intra/Extra Oral Exam

What are we looking for?

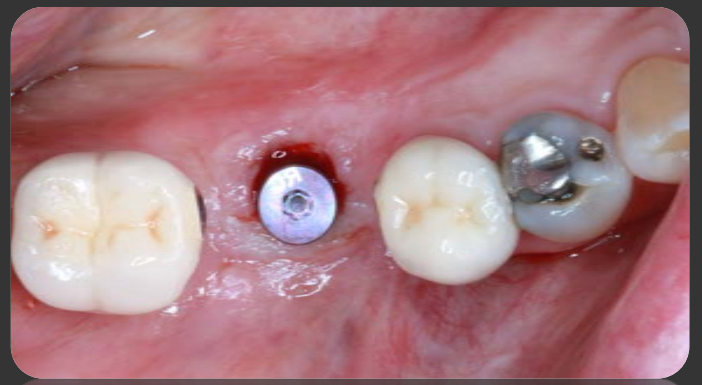
- Pathology
- Condition of adjacent teeth
- Opposing dentition and restorative space (min 5mm)
- Patient's bite: cross bite, open bite
- Limited mouth opening

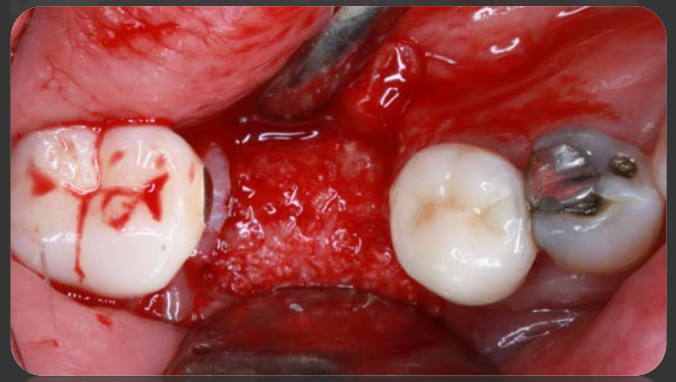
- Soft tissue : Keratinized tissue, high frenum attachment

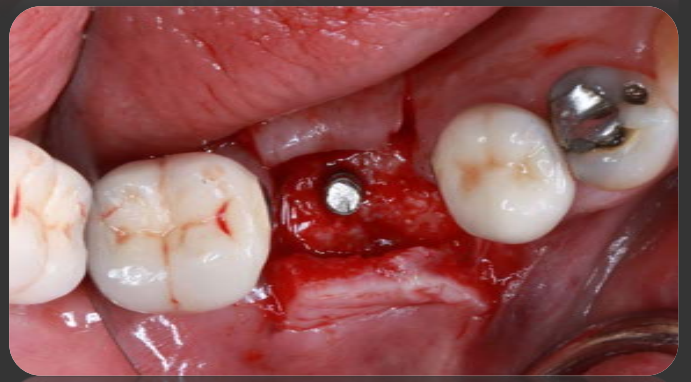


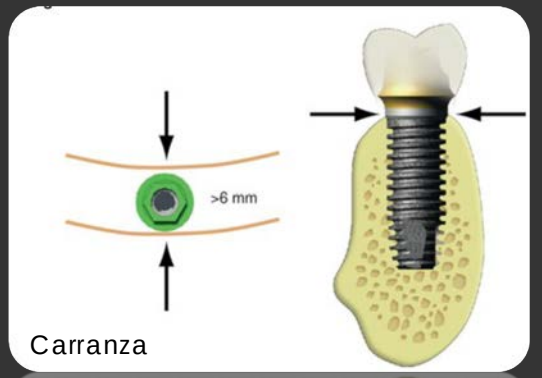


Intra/Extra Oral Exam

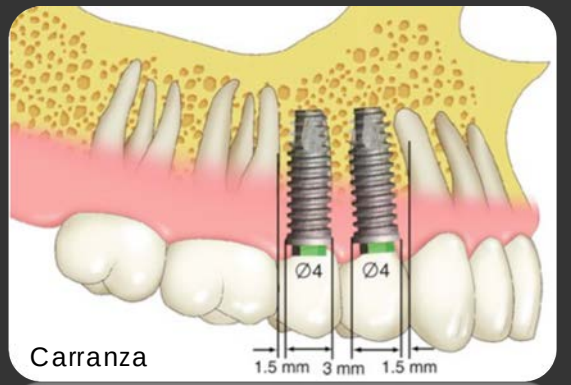






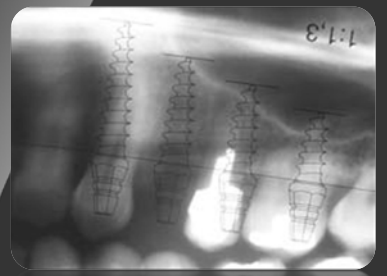


Minimum 1mm lingual and facial bone

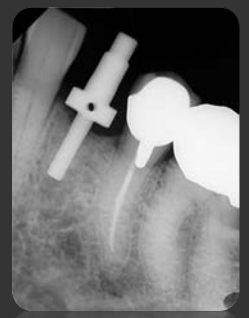


1.5mm from adjacent teeth

Diagnostic Image



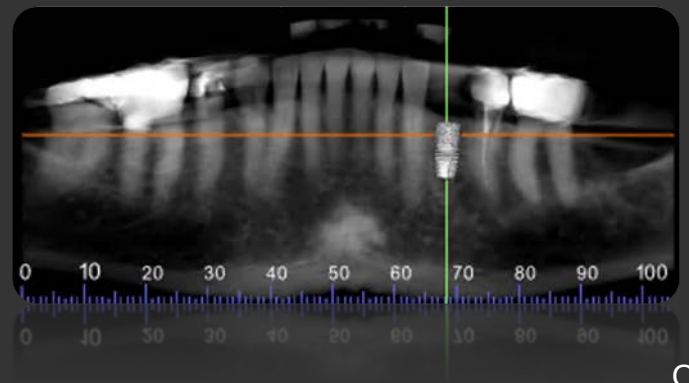
Implant template

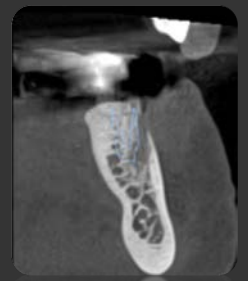


Peri-apical

Panoramic

Radiographic stent

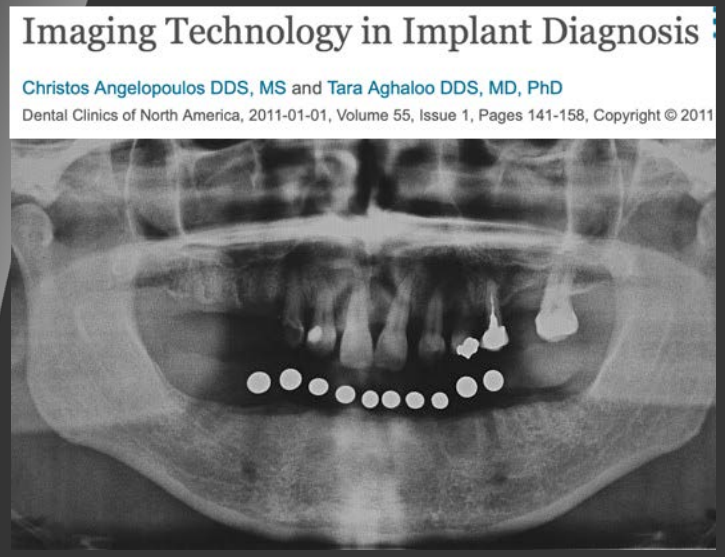




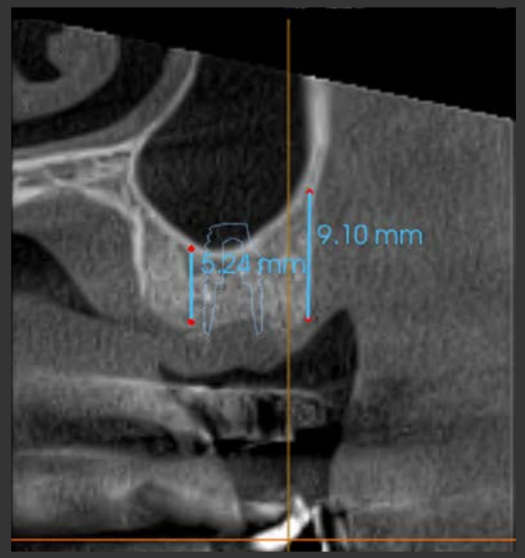
CBCT

How accurate is the image?
How accurate it should be?

Diagnostic Image



Enough height for 9mm implant ☺



☹ 2-D lies

Panoramic radiograph: Flattened, spread-out image of curved structure
10-30% magnification within the same image
Peri-apical radiograph: It is not parallel, distortion of the image.
For single-tooth implants in areas of abundant bone height and width

Phases of Treatment

Phase I: Disease control; Extraction, Caries control, SRP, Endodontic tx

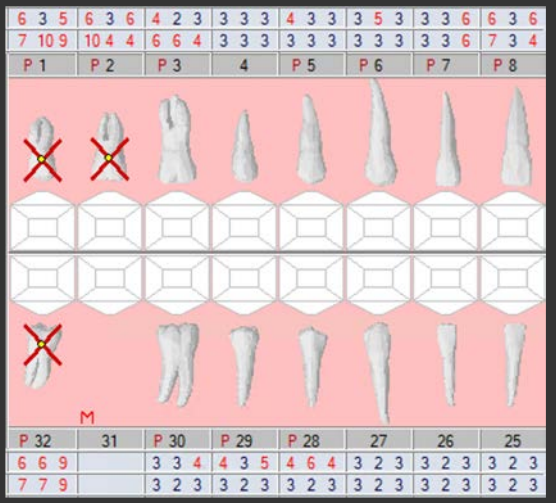
Phase II: Periodontal surgical treatment

- Socket preservation
- Regenerative procedures

Phase III: Restorative phase

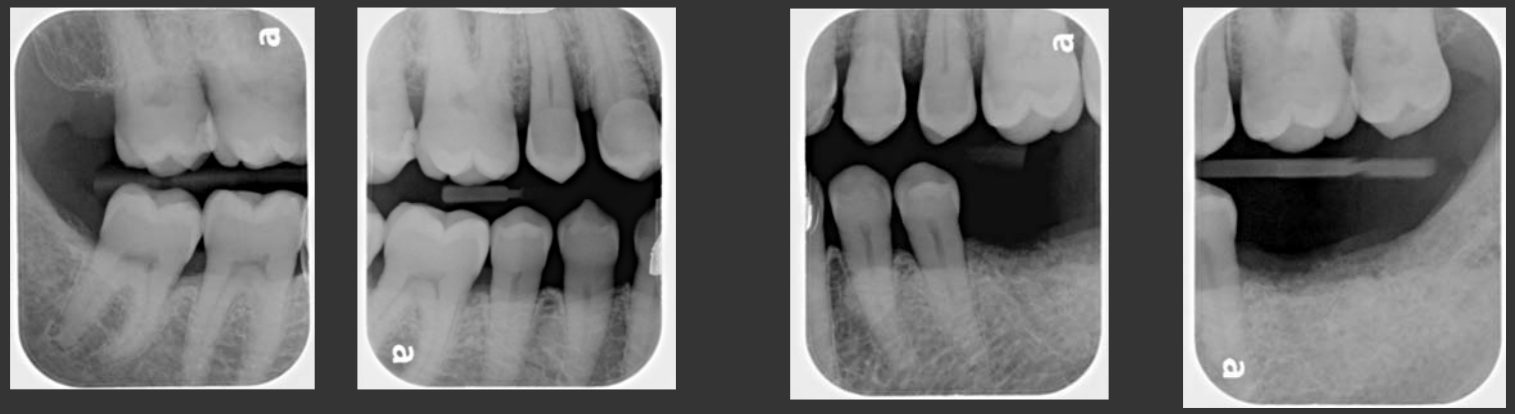
- Crown
- Bridge
- RPD

Phase IV: Maintenance



Any orthodontics consults should be done before implant placement

Phases of Treatment



No implant placement in patient's with active periodontitis

Periodontitis and Peri-implant Diseases

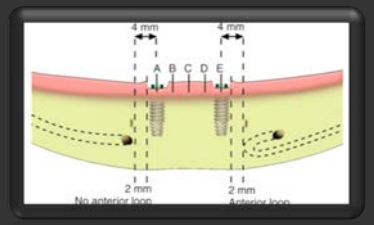
	Periodontitis	Stage I	Stage II	Stage III	Stage IV
Severity	**Interdental CAL** *(at site of greatest loss)*	1 – 2 mm	3 – 4 mm	≥5 mm	≥5 mm
	RBL	Coronal third (<15%)	Coronal third (15% - 33%)	Extending to middle third of root and beyond	Extending to middle third of root and beyond
	Tooth loss *(due to periodontitis)*	No tooth loss		≤4 teeth	≥5 teeth
Complexity	**Local**	• Max. probing depth ≤4 mm • Mostly horizontal bone loss	• Max. probing depth ≤5 mm • Mostly horizontal bone loss	In addition to Stage II complexity: • Probing depths ≥6 mm • Vertical bone loss ≥3 mm • Furcation involvement Class II or III • Moderate ridge defects	In addition to Stage III complexity: • Need for complex rehabilitation due to: – Masticatory dysfunction – Secondary occlusal trauma (tooth mobility degree ≥2) – Severe ridge defects – Bite collapse, drifting, flaring – < 20 remaining teeth (10 opposing pairs)
Extent and distribution	**Add to stage as descriptor**	For each stage, describe extent as: • Localized (<30% of teeth involved); • Generalized; or • Molar/incisor pattern			

Usually manageable in GD's office with regular maintenance

Refer to periodontist, usually needs surgical phase and complex tx

Anatomical Considerations

Mental foramen:



- 25mm from midline
- 14mm from the alveolar crest (non resorbed ridge) (Agthong 2005)
- 61% coronal to the apex of 2nd premolar (Gershenson 1986)

Lingual fossae:

- 52%, 2 to 3 mm, 28% >3 mm (Parnia 2012)

Sublingual and submental arteries:

- Branches can enter accessory foraminae

Anatomical Considerations

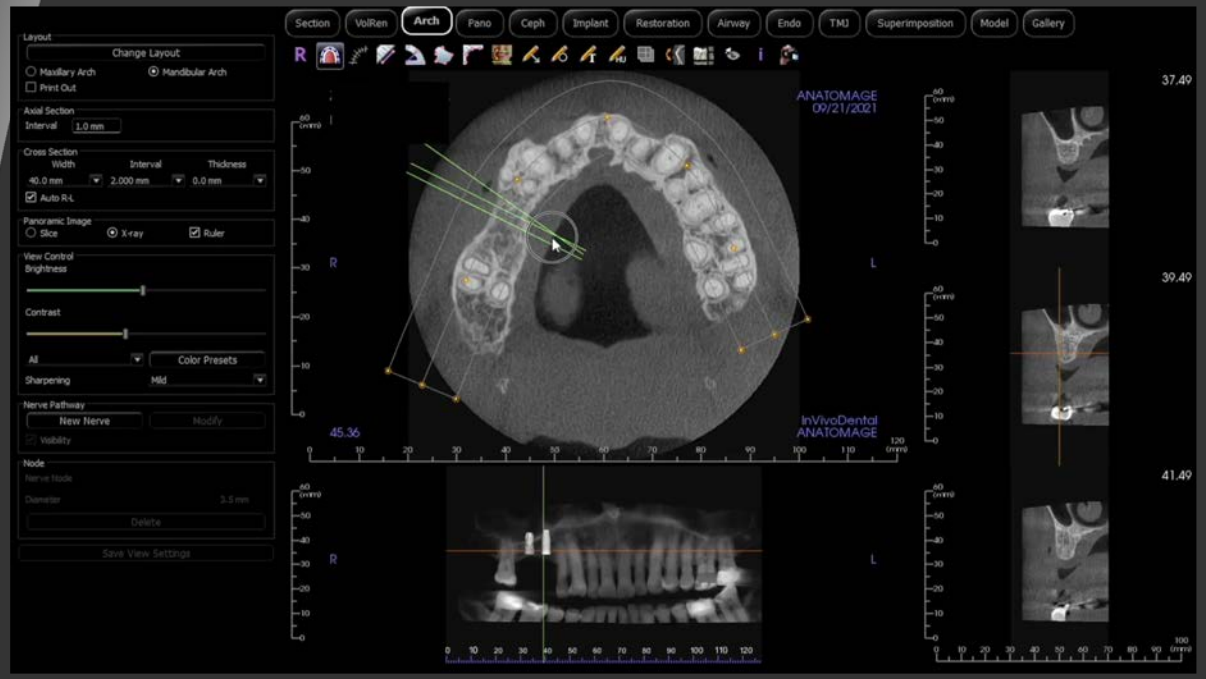
Maxillary sinus:

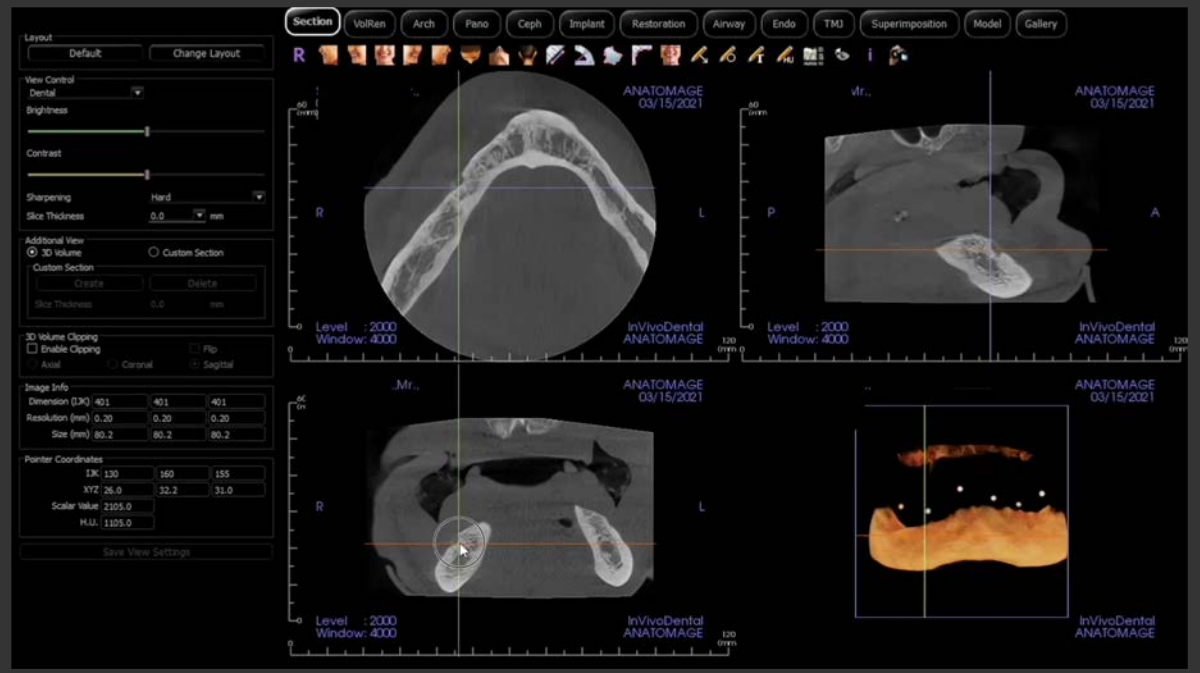
- Exclude pathology
- Intraosseous artery; ~16mm from the crest (Elian and Wallace 2005)

Mandibular canal :

- ~3.4mm diameter
- Anterior loop in 71% of patients, and 5% of the time it is ≥5 mm (Uchida 2009)
- Osteotomy 2mm from the nerve (Greenstein and Tarnow 2009)

Implant drills are 0.5mm longer than the size of implant





3D Implant Planning

Mesio-distal:

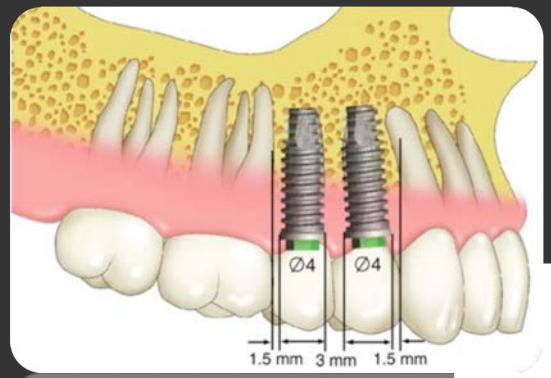
- 1.5mm from natural teeth
- 3mm between implants

Bucco-lingual:

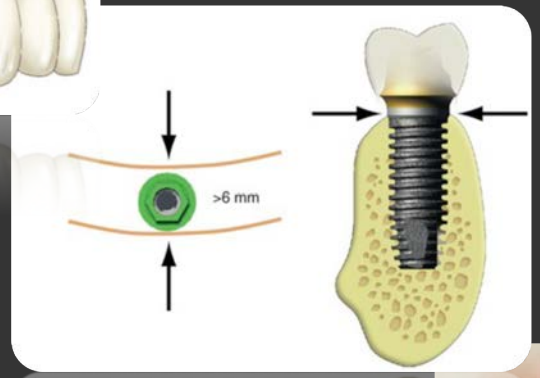
- Min 1 mm facial and lingual
- 2mm facial of ant teeth

Apico-coronal:

- Platform min 3mm apical to gingival margin for ant teeth
- Platform min 2mm apical to gingival margin for post teeth
- (3mm apical to adjacent CEJ)



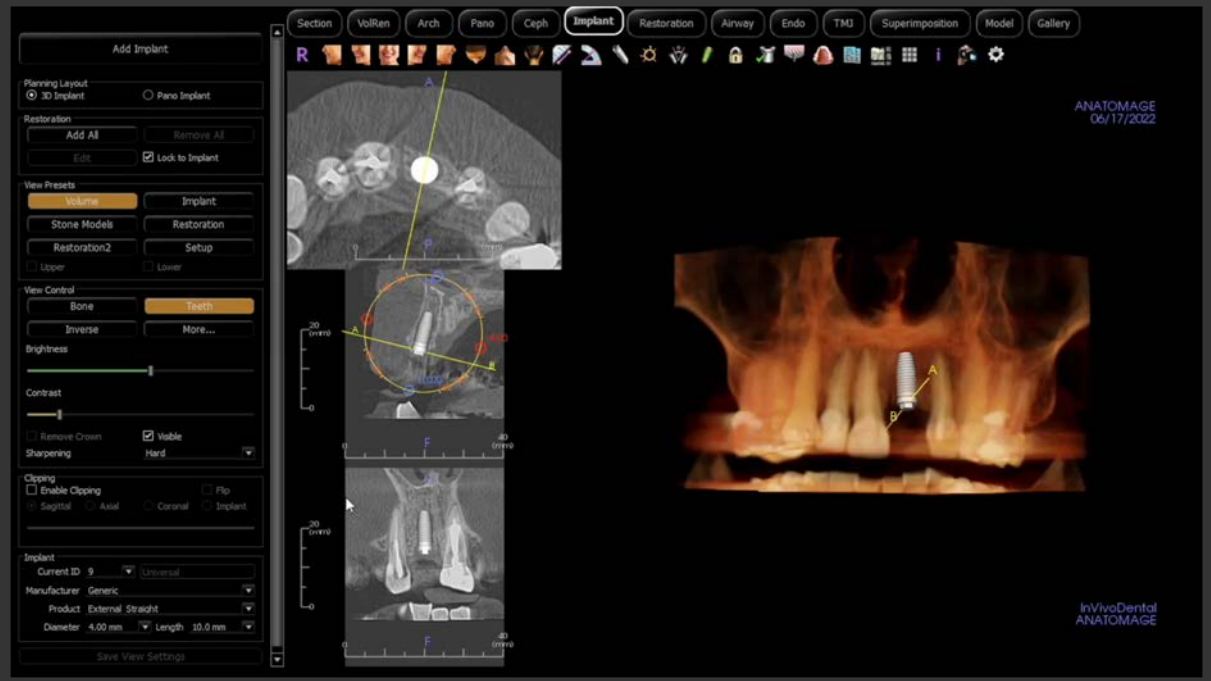
2mm safety zone from anatomical structures
8mm long implant, 10 mm from IAN canal



4D implant planning: +Time

3D Implant Planning

Limitation of height



Limitation of width

Short and Narrow Implants

Received: 8 May 2018 | Revised: 22 May 2018 | Accepted: 26 May 2018
DOI: 10.1111/clr.13342

CONSENSUS REPORT

WILEY CLINICAL ORAL IMPLANTS RESEARCH

Group 1 ITI Consensus Report: The influence of implant length and design and medications on clinical and patient-reported outcomes

Narrow implant: $\leq 3.5mm$

Category 1: <2.5mm "mini implants"
Category 2: 2.5-3.3mm
Category 3: 3.3-3.5mm

Some evidence of comparable survival
Protocols are different in different studies
Insufficient evidence of survival

Short implant: $\leq 6mm$

Consensus

1-5 year survival rate: 86.7-100% vs 95-100%
Time in function reduces survival rate with short implants

Recommendation

Long implants are the first option if possible
Recommended to splint adjacent short implants
Caution for single molars and parafunctional habits

Over denture
Single ant teeth
Transitional prosthesis

Fracture?!

If up to 2mm bone loss is consider normal remodeling, for 6mm implant 2mm is 1/3 of the length! 3mm is already 50% bone loss. Failed implant!

How Much Realistically We Can Augment?

SUPPLEMENT ARTICLE

WILEY Journal of Clinical Periodontology

Effectiveness of vertical ridge augmentation interventions: A systematic review and meta-analysis

Istvan A. Urban[1] | Eduardo Montero[2] | Alberto Monje[3,4] | Ignacio Sanz-Sánchez[2]

Review > Int J Oral Maxillofac Implants. 2018 May/Jun;33(3):622-635.
doi: 10.11607/jomi.6290.

The Fate of Lateral Ridge Augmentation: A Systematic Review and Meta-Analysis

Basel Elnayef, Cristina Porta, Fernando Suárez-López Del Amo, Lorenzo Mordini, Jordi Gargallo-Albiol, Federico Hernández-Alfaro

Clinical vertical bone gain: Complications

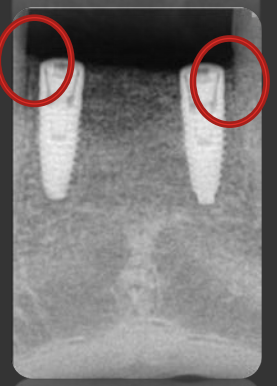
All techniques: 4.16mm
Distraction osteogenesis: 8.04mm 47%
Guided bone regeneration (GBR): 4.18mm 12%
Bone block: 3.46mm 23.9%

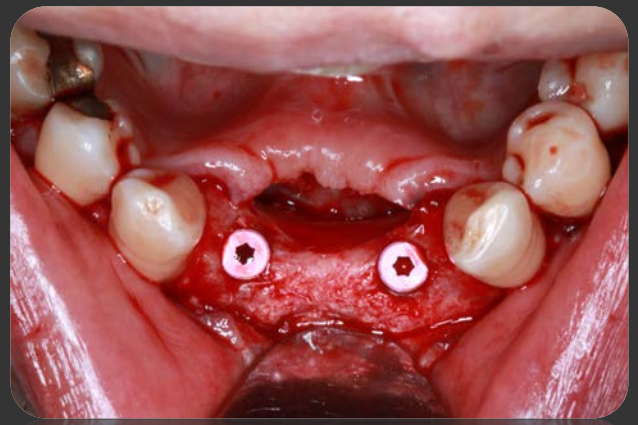
Horizontal bone gain: Simultaneous placement

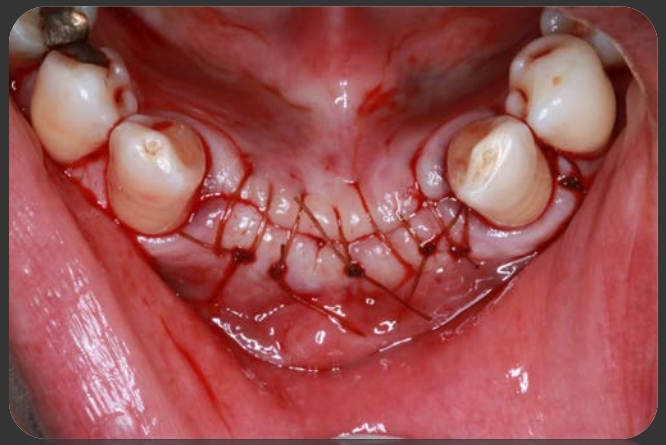
All techniques: 3.71mm
Guided bone regeneration (GBR): 3.61mm
Bone block: 4.18mm

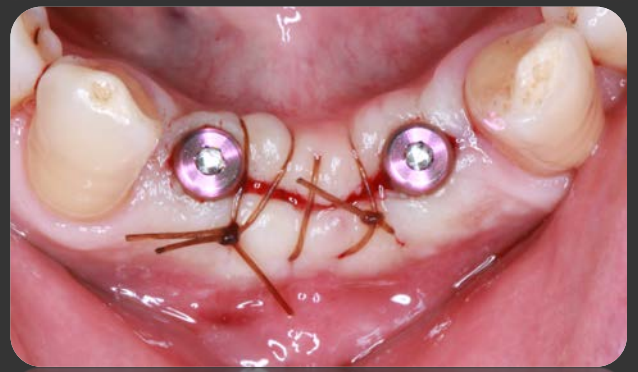
~1mm resorption in 6ms

How Much Realistically We Can Augment?



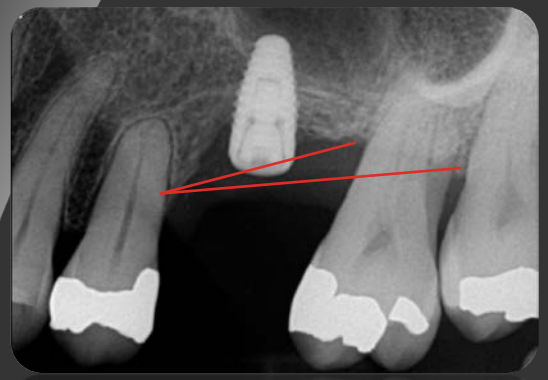


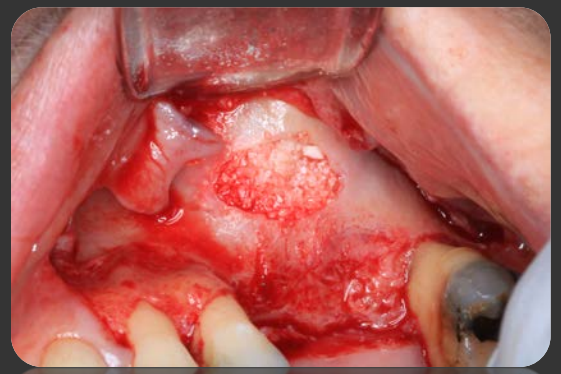


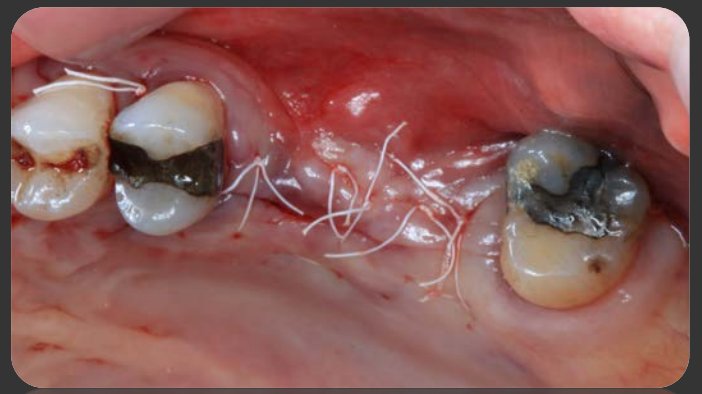


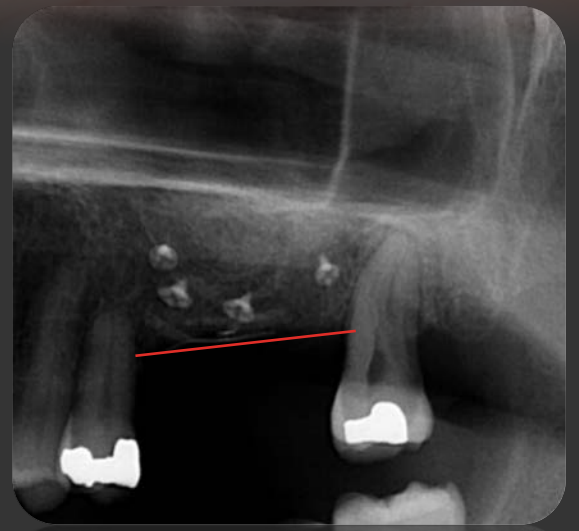
Interproximal height of bone

How Much Realistically We Can Augment?





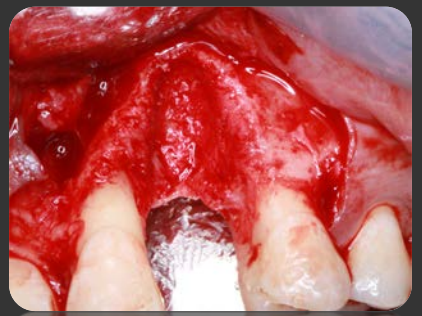
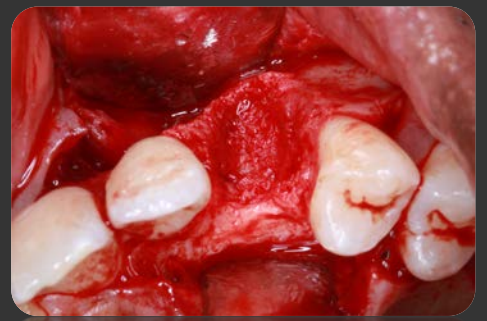


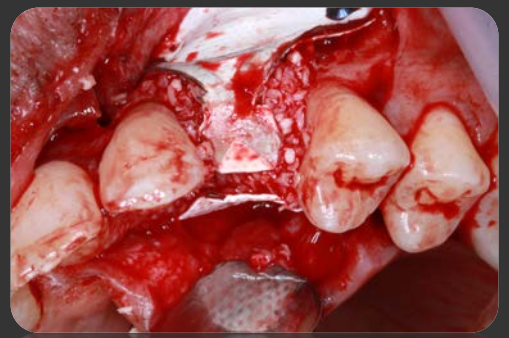
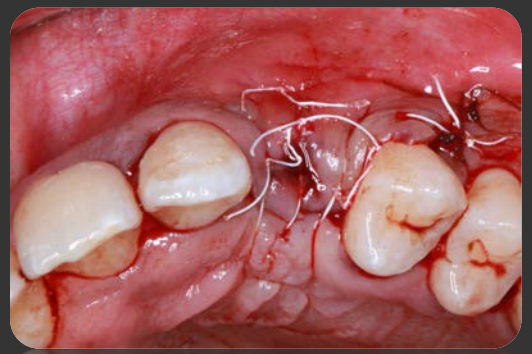


GBR and sinus augmentation 6 weeks after extraction

How Much Realistically We Can Augment?



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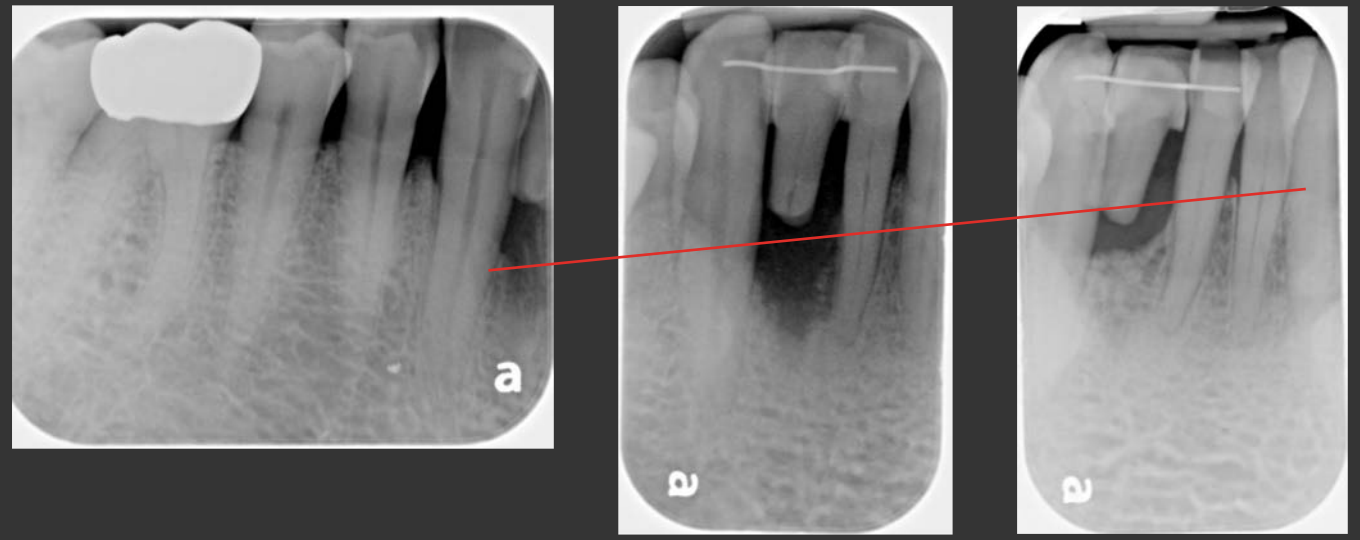
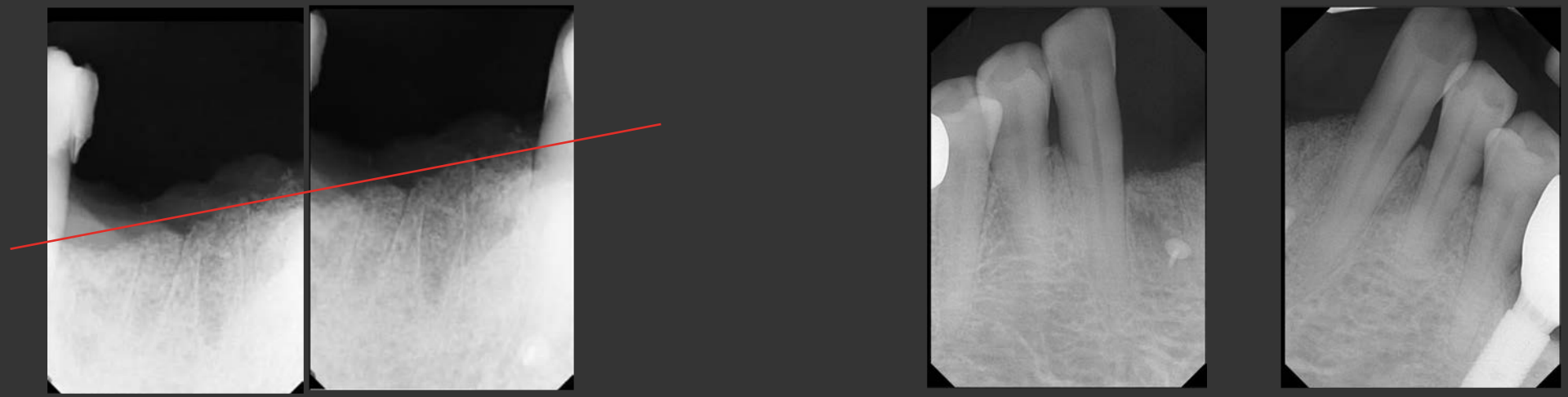




How Much Realistically We Can Augment?

- $\geq 5mm\ height$: Internal sinus augmentation
- $5 - 3mm$: Lateral sinus simultaneous with implant placement
- $\leq 3mm$: Lateral sinus augmentation

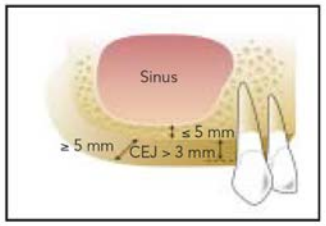
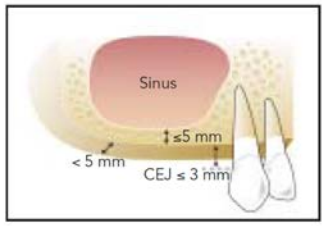


Fig 3a (left) *Sinus Class C.*

Fig 3b (right) *Sinus Class C-h.*



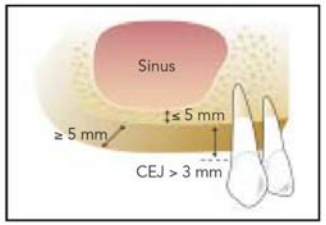


Fig 3c (left) *Sinus Class C-v.*

Fig 3d (right) *Sinus Class C-c.*

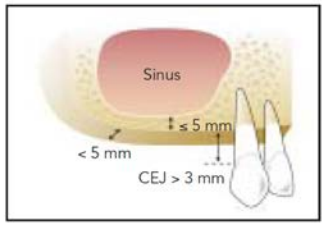


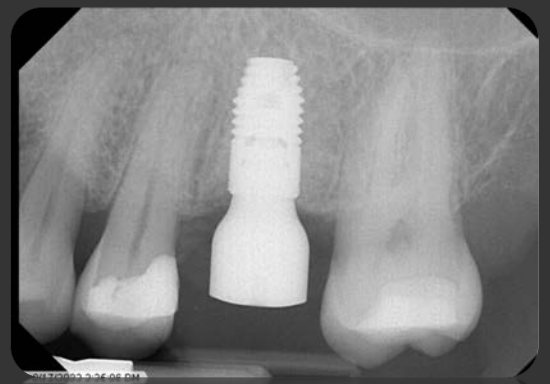
Table 1 ABC classification and recommended treatment options

Class	Recommended procedure(s)	Immediate/delayed
A	Implant placement	Immediate
B	Osteotome	Immediate
B-h	Osteotome and ridge expansion	Immediate
	GBR/onlay graft	Delayed
B-v	GBR followed by osteotome	Delayed
B-c	GBR and/or onlay graft followed by osteotome	Delayed
C	Lateral wall sinus elevation	Immediate with implant stability Delayed without implant stability
C-h	Lateral wall sinus elevation and GBR/onlay graft	Delayed
C-v	Lateral wall sinus elevation and GBR, followed by onlay graft if indicated	Delayed
C-c	Lateral wall sinus elevation and GBR, followed by onlay graft if indicated	Delayed

GBR = Guided bone regeneration.

Hom-Lay Wang 2008

Ridge Preservation: Prevention Better than Treatment



The key is to preserve buccal bone, the thinnest wall!

Video ridge preservation

Ridge Preservation

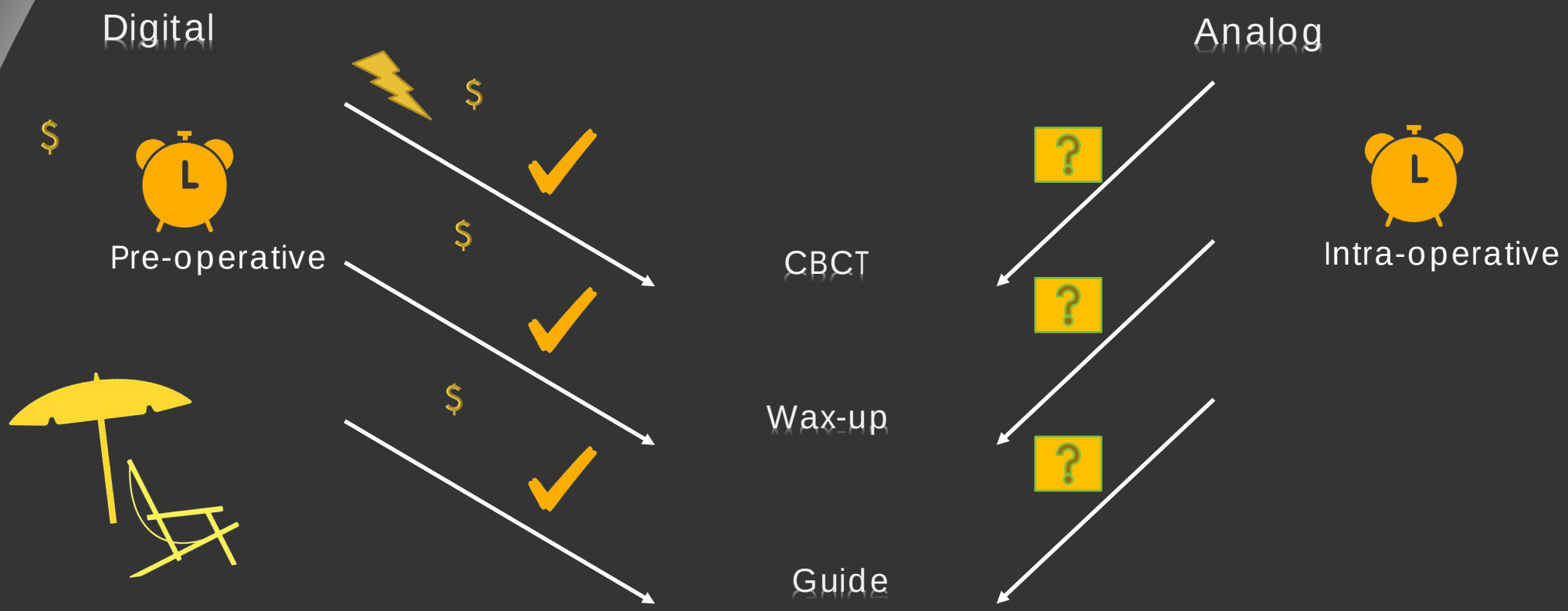
Location	Width	Height
All sites (46 teeth)	-6.1	-0.2
Premolar	-4.9	-0.3
Molar	-7.2	-0.2
Maxilla	-5.8	-0.1
Mandible	-6.4	-0.4

Schropp et al., IJRPD, 2003

Extraction	Width Range		
	Initial	Final	Change
With Preservation	7.3 to 10.6	6.0 to 10.4	-2.6 to 0.4
Without preservation	7.8 to 11.0	2.7 to 9.6	-8.3 to -0.1

Iasella et al., Predictability

Implant Treatment planning



Everyone is involved: radiologist, restorative dentist and surgeon
Less chance of injury of critical structures
Reduce chairside time
Option for flapless

Is Fully Guided More Accurate?

Studies show guided surgeries are more accurate!

The accuracy of single-tooth implants placed using fully digital-guided surgery and freehand implant surgery

Palita Smitkarn, Keskanya Subbalekha, Nikos Mattheos, Atiphan Pimkhaokham

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The accuracy of implant placement with computer-guided surgery in partially edentulous patients and possible influencing factors: A systematic review and meta-analysis

Ramadhan Hardani Putra [1,2], Nobuhiro Yoda [1], Eha Renwi Astuti [2], Keiichi Sasaki [1]

Median deviation:

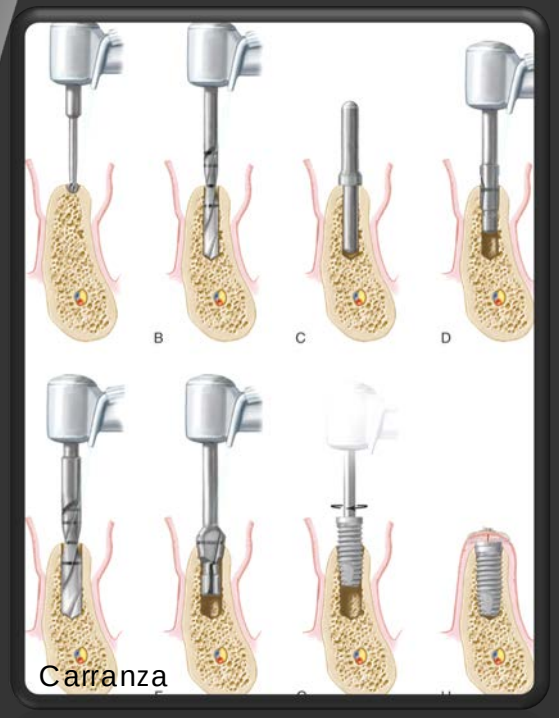
Guided:
- Angle: 2.8°
- Shoulder: 0.9mm
- Apex: 1.2mm

Freehand:
- Angle: 7.0°
- Shoulder: 1.3mm
- Apex: 2.2mm

Fully guided: Statistically significant higher accuracy in
Angular, coronal and apical deviation
compare with pilot-drill

Standard Protocol for Implant Placement

- Aseptic
- Chlx rinse before
- keep sterile environment
- No contamination of surface of the implant
- 2g amoxicillin 1 hour before, significantly reduce failure of dental implants *Esposito, sys review 2008*



Carranza

A. Marking with round bur (through cortical bone)
B. 2mm Twist drill
C. Guide pin for position and angulation (Radiograph)
D. Pilot drill (not all implant systems have)
E. Follow the sequence until final drill
F. Countersink to widen the entrance for sub-crestal placement (Optional bone taping for dense bone) 20-40 rpm

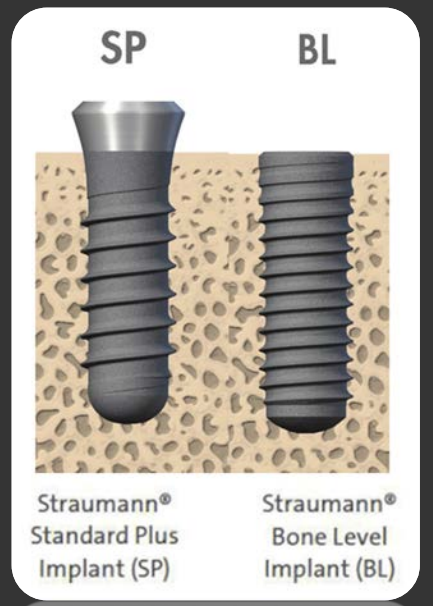
A. Implant placement 20-40 rpm
B. Cover screw and suture

Copious water with pumping motion

Incremental drill diameter, sharp drills 800 to 1500 rpm

Standard Protocol for Implant Placement

Know the manufacturer recommendation



Bone level implants should be 360° covered by bone, or grafted

Standard Protocol for Implant Placement

Installation procedures	Recommended torque
Implant installation	≤45 Ncm 
Healing components	Manual/light finger force (5-10 Ncm)
Temporary restorations on all levels	15 Ncm 
Final restorations on implant level	25 Ncm 
Final restorations on abutment level	15 Ncm 

Astra EV

Recommended torque

Post-op Instruction

Antibiotics: (Amoxicillin tid for 7-10 days)
If graft material is being used
If patient is immune compromised
If the surgery is extensive (large flap or flap was exposed for a long time)

Chlorhexidine: (0.12% bid, 30 sec)

Ice pack if swelling is expected

Instruction should be modified based on the case

Ibuprofen 600-800mg tid or qid for 2-3 days.
Patient may add Acetaminophen 500mg for pain management

Cold soft food for the first day and warm soft food for one week.
No chewing and no pressure on the surgical site

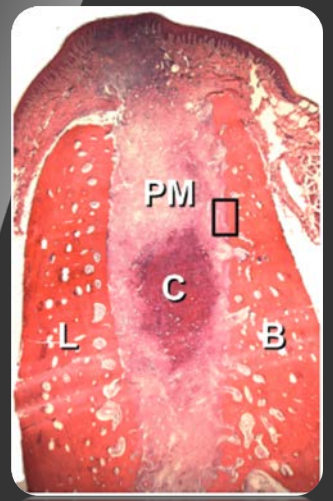
Patient may brush the other area of the mouth but not around the surgical site

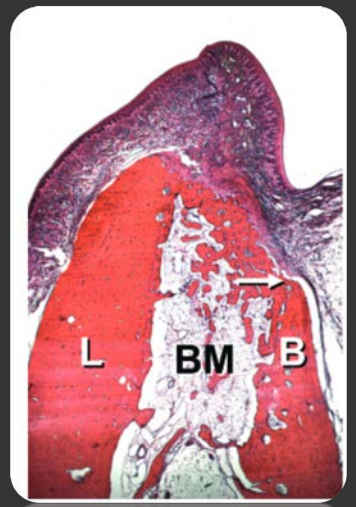
Temporary restorations should be adjusted, no pressure. Compensate for swelling

Timing of Implant Placement

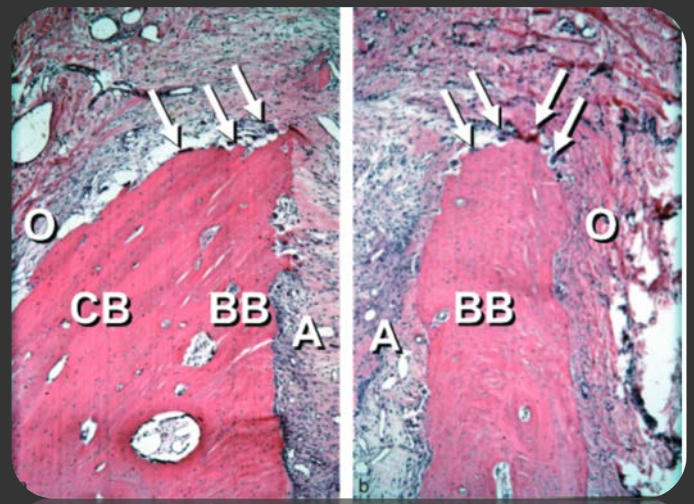
Type 1 Immediate	Type 2 Early	Type 3 Delayed	Type 4 Late
	Early		
Immediately after extraction	4-8 weeks Soft tissue healing	12-16 weeks Partial hard tissue healing	>6 months after extraction
0	1-2 ms	3-4 ms	> 6 ms

Implant in Esthetic Zone: Bundle Bone Resorption After Tooth Extraction

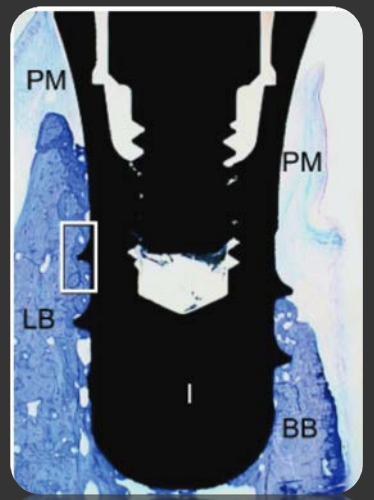




8 weeks



Bundle bone will be resorbed when the tooth is extracted



Same result for immediate implant

Bundle bone replaced by woven bone

Araujo and Lindhe 2005: Dog study

Implant in Esthetic Zone

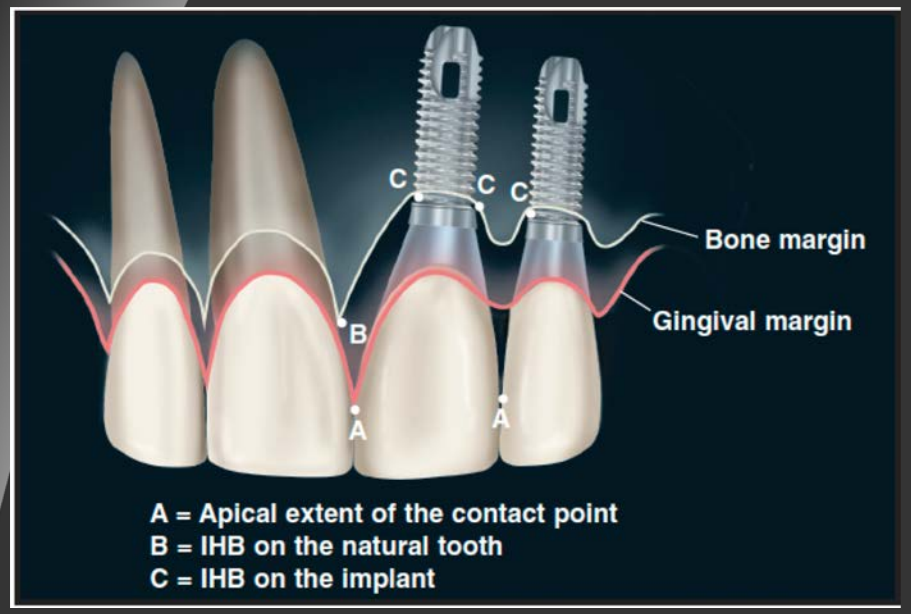
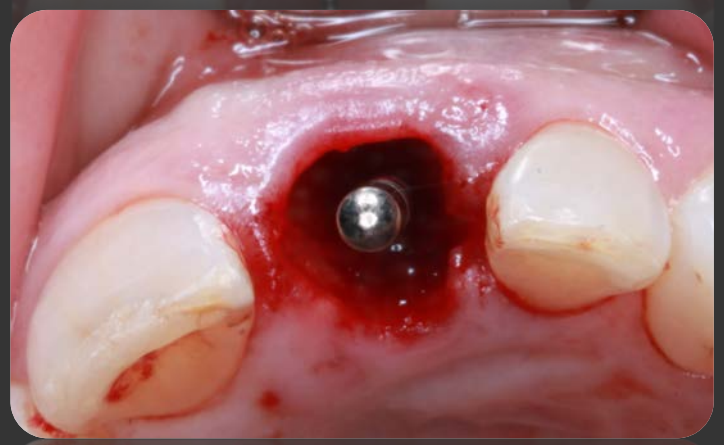


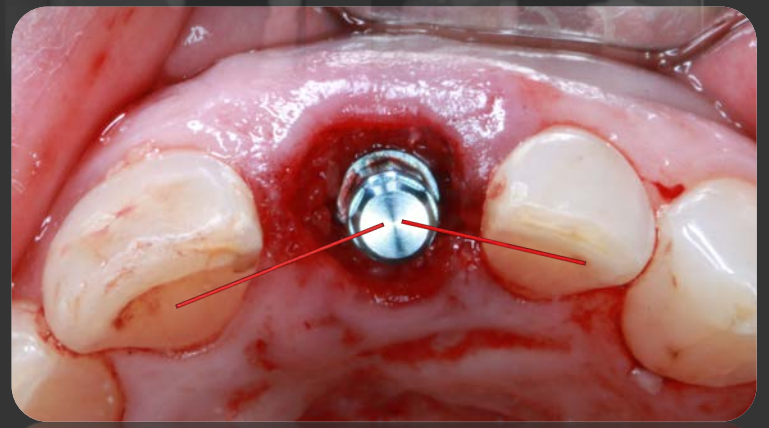
Table 1 Salama et al[11] classification of predicted height of interdental papillae

Class	Restorative environment	Proximity limitations (mm)	Vertical soft tissue limitations (mm)
1	Tooth-tooth	1.0	5.0
2	Tooth-pontic	N/A	6.5
3	Pontic-pontic	N/A	6.0
4	Tooth-implant	1.5	4.5
5	Implant-pontic	N/A	5.5
6	Implant-implant	3.0	3.5

The mean height of papillary tissue between two adjacent implants was 3.4 mm. (Tarnow 2000)

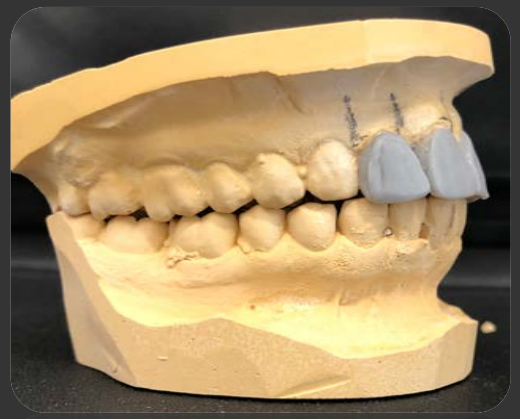
Implant in Esthetic Zone





Implant in Esthetic Zone






Thank you for your attention