Overcoming Challenges:

Management of Dental Implants in the Aesthetic Zone

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Faculty: Dr. Gonzalez, Dr. Sadowsky

Patient

71- year old male

Medical History: no remarkable findings

Medications: none reported

Allergies: none reported

ASA I

Chief Concern: “I want a new front tooth (#8), my two previous implants have failed”

Clinical Findings

Head and Neck exam: hematoma on upper lip 2mm x 2mm above site #8 (soft, nontender)

EOE: no CLAD, no trismus, no crepitus, no tenderness to palpation, low lip line

CRA: low caries risk (ATP < 1,500)

Perio: Stage II, Grade B

Caries: none

History of Chief Concern

Patient had come into UOP for screening in **2013** with the wish of extracting #8 root tip and replacing with a Zirconia implant.

- Patient was told that our school does not offer Zirconia implants.

Patient had received 2 different Zirconia implants placed at site #8 from outside the school.

- **Both implants failed.**

Zirconia vs Titanium Implants

In a systematic review,

Zirconia implants may have a **lower survival rate** and a **significantly lower success rate than titanium implants**. [1]

1) Duan C, Ye L, Zhang M, Yang L, Li C, Pan J, Wu Y, Cao Y. Clinical performance of zirconium implants compared to titanium implants: a systematic review and meta-analysis of randomized controlled trials. PeerJ. 2023 Mar 17;11:e15010. doi: 10.7717/peerj.15010. PMID: 36949758; PMCID: PMC10026713

Periodontal Findings

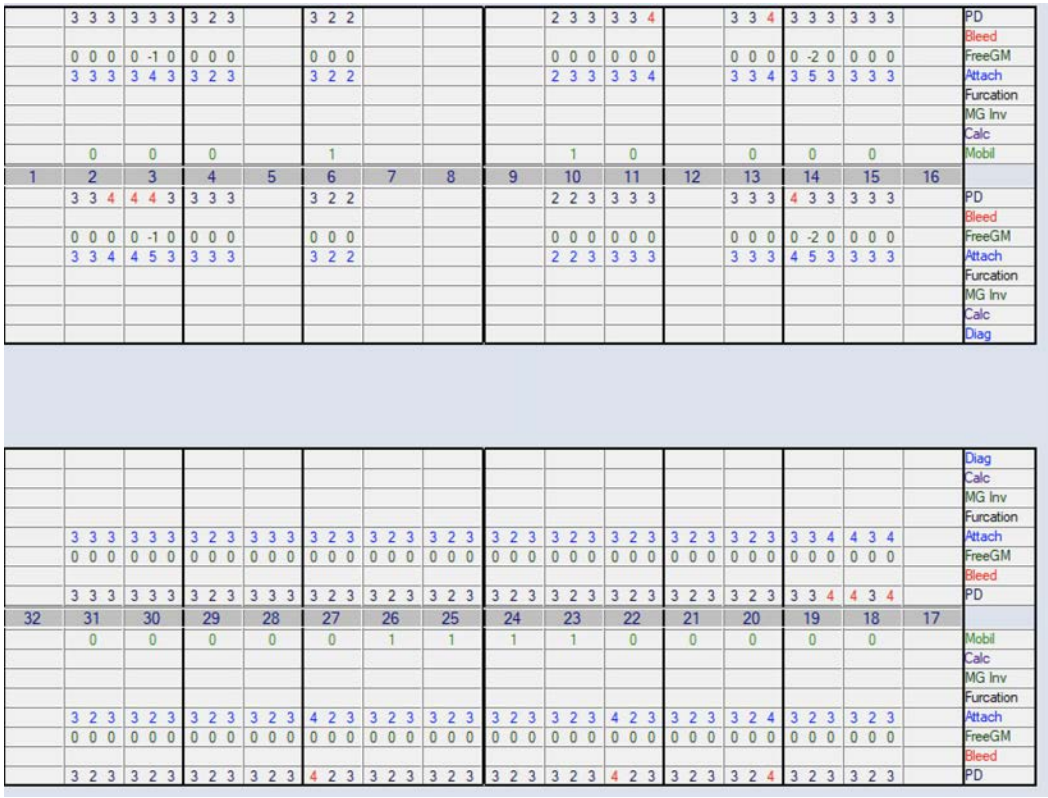
Perio: Stage II, Grade B

Furcation: none

Mobility: none

Etiology: bacterial plaque, calculus

Tx Plan:
OHI, SPT maintenance



Panoramic - 2013

PA - 2013

History of Chief Concern

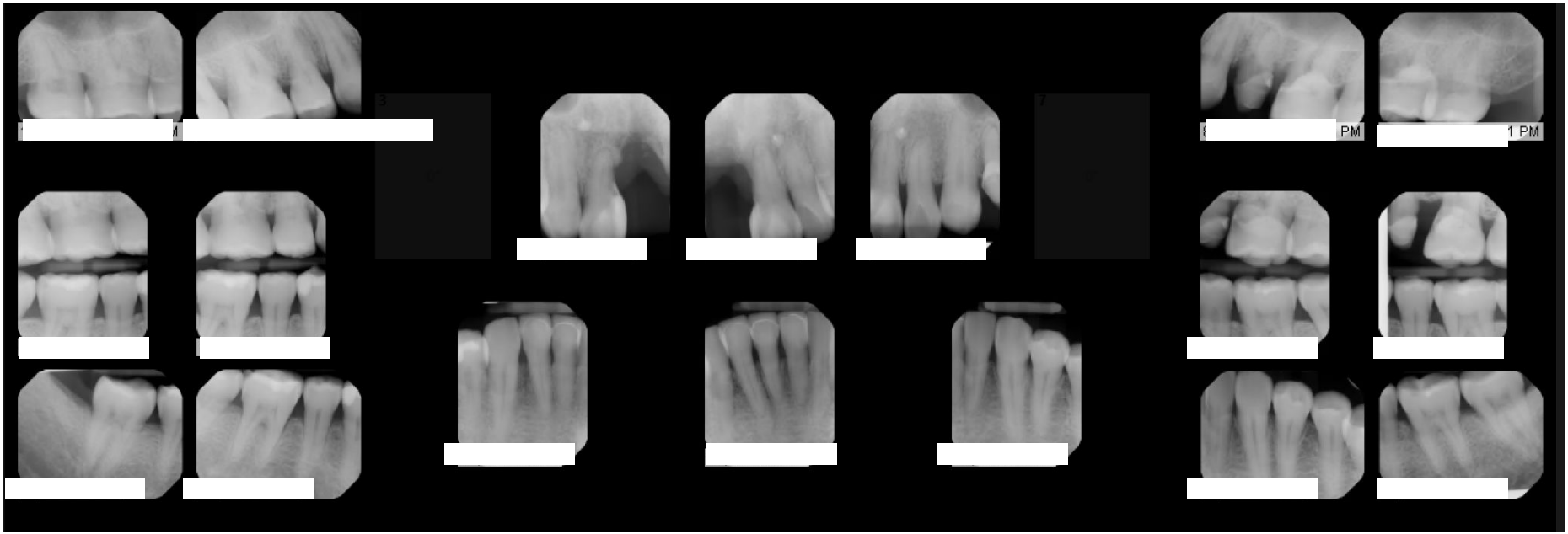
Patient came back to school in 2021 seeking care.

Vertical bone loss was observed clinically at sites mesial #7 and mesial #9 with grade 1 mobility.

Implant consult: diagnosed #7 and #9 as poor prognosis.

Extraction of #7 and #9 in fall of 2021.

FMX - 2021



PA - 2021

Intraoral Images

Interim RPD

Treatment Plan Option #1

Urgent

- EXT #7 and #9
- Guided Bone Regeneration
    - titanium mesh w/ allograft + platelet-rich fibrin mixture

Disease Control

- SPT

Reconstructive Phase

- Provisional restoration: acrylic partial denture to replace #7- #9
- Implant placement #7, #8, #9
    - 3-month osseointegration check
- Implant provisional restorations
- Definitive zirconia crowns

Maintenance Phase

- Occlusal guard
- Periodontal maintenance

Alternative Treatment Plan Option #2

Urgent

- EXT #7 and #9

Disease Control

- SPT

Reconstructive Phase

- **Fixed Bridge #6 - #10**

Maintenance Phase

- Occlusal Guard
- Perio maintenance

Alternative Treatment Plan Option #3

Urgent

- EXT #7 and #9

Disease Control

- SPT

Reconstructive Phase

- **Partial denture to replace #7- #9**

Maintenance Phase

- Occlusal Guard
- Perio maintenance

Why 3 Implants instead of 2 implants?

History of implant failure (2x) at site #8

Placing 3 implants gives us a **“Plan B”** option if an implant fails.

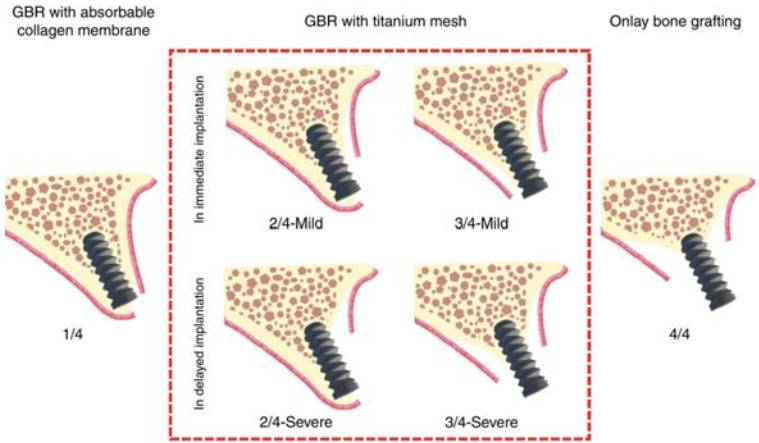
- If #8 implant fails → Fixed 3-unit bridge from #7-#9
- If #7 implant fails → #7 cantilever from #8
- If #9 implant fails → #9 cantilever from #8

Guided Bone Regeneration: Titanium Mesh vs. Collagen Membrane

In a comparison of collagen membrane and titanium mesh in vertical bone augmentation:

- Collagen membrane group gained 2.77 mm bone height
- **Titanium mesh** group gained **4.56 mm bone height.**[1]

A titanium framework is necessary to hold grafting materials when there is a case of severe resorption, especially in vertical defects.[2]



Classified according to the buccal and palatal relationship between the **expected implant placement** and the bone defect.[1]

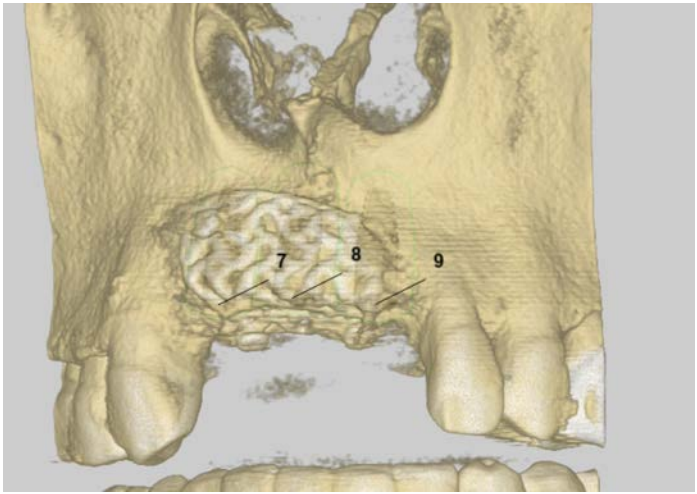
1) Xie, Y., Li, S., Zhang, T., Wang, C., & Cai, X. (2020, December 30). *Titanium Mesh for bone augmentation in Oral Implantology: Current application and progress*. Nature News. https://www.nature.com/articles/s41368-020-00107-z

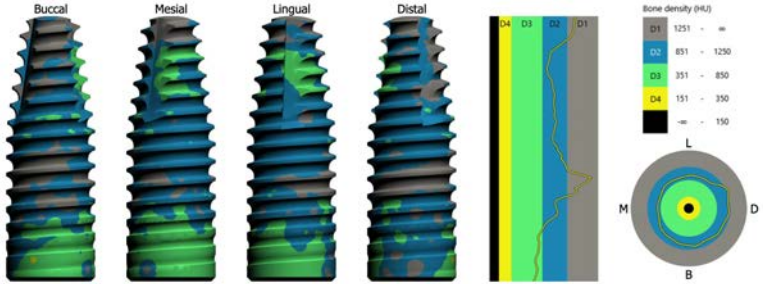
2) Cunha, G., Carvalho, P. H. de A., Quirino, L. C., Torres, L. H. S., Filho, V. A. P., Gabrielli, M. F. R., & Gabrielli, M. A. C. (2022b, December). *Titanium mesh exposure after bone grafting: Treatment approaches-A systematic review*. Craniomaxillofacial trauma & reconstruction. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC9647381/

Vertical Augmentation

Guided bone regeneration (GBR) is an effective and simple method for bone augmentation, which is often used to reconstruct the alveolar ridge when the bone defect occurs in the implant area.[1]

- Full thickness flap from #7-#10
- Allograft + PRF mixture was placed to ridge sites #7-#9
- Titanium mesh placed and hand tightened with screws
- Collagen membrane placed over mesh matrix
- Mesh was removed 6 months later
- Prescribed Azithromycin post-op





1) Xie, Y., Li, S., Zhang, T., Wang, C., & Cai, X. (2020, December 30). *Titanium Mesh for bone augmentation in Oral Implantology: Current application and progress*. Nature News. https://www.nature.com/articles/s41368-020-00107-z

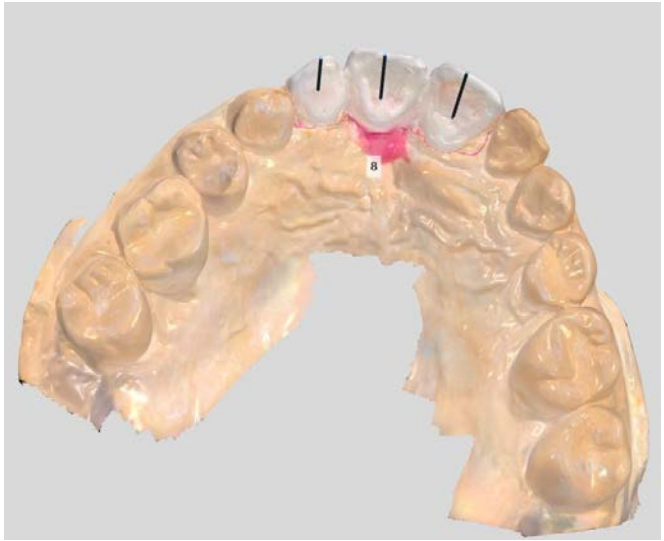
Post-op Photo from Surgery - Spring 2022

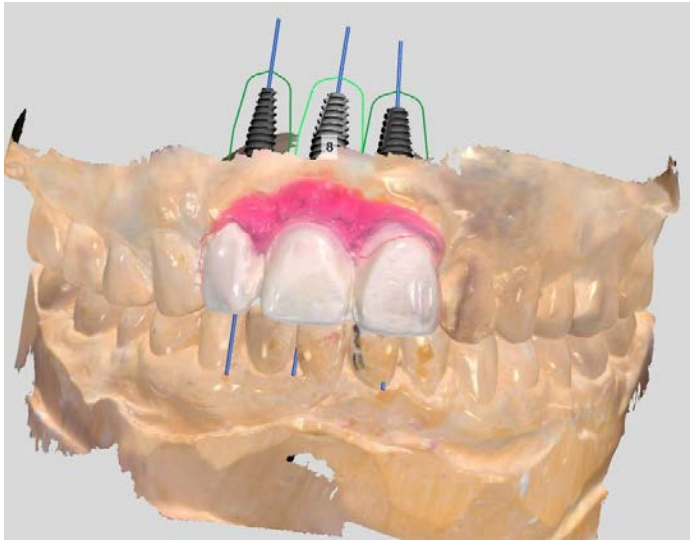
Removal of Custom Titanium Mesh - Fall 2022

- Crestal incision with #15 blade scalpel
- Full thickness flap with releasing incision reflected from #7-#10
- 3 screws removed with screwdriver
- Titanium mesh was sectioned mesial-distal
    - Removed in 2 pieces; palatal and facial
- Mucograft collagen membrane placed

Implant Planning: Cement-retained vs Screw-retained

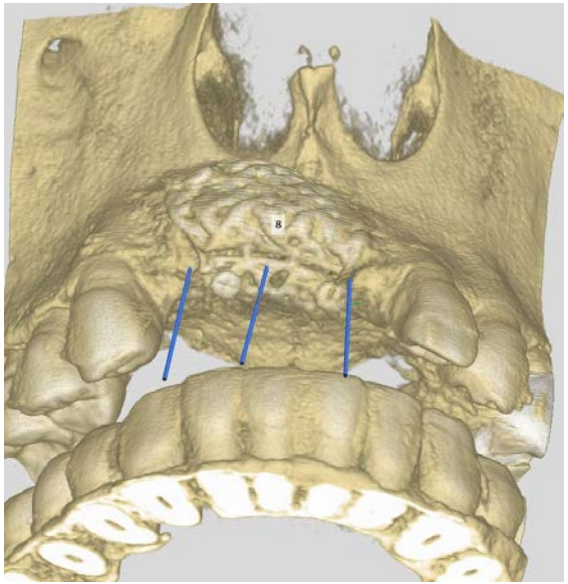
In a systematic review, using a **screw-retained design lowered the presence of peri-implantitis and mucositis.**[1]

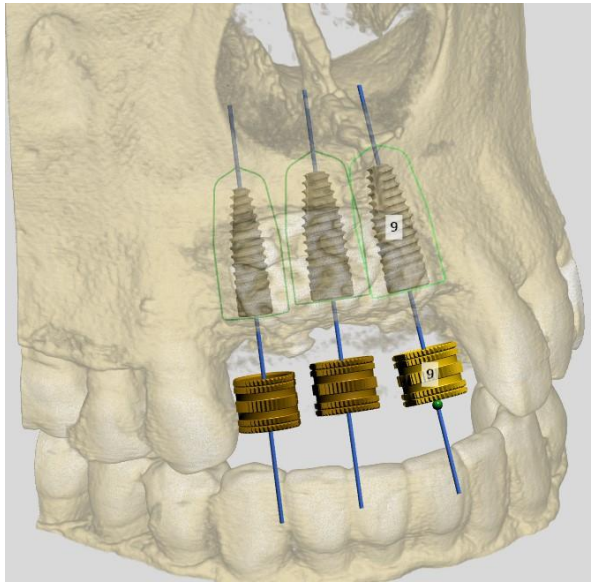


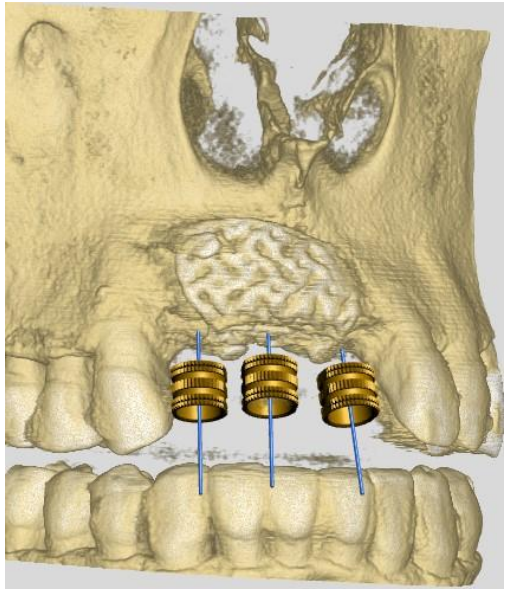


1) Hamed, M. T., Abdullah Mously, H., Khalid Alamoudi, S., Hossam Hashem, A. B., & Hussein Naguib, G. (2020, January 14). *A systematic review of screw versus cement-retained fixed implant supported reconstructions*. Clinical, cosmetic and investigational dentistry. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6969698/

Implant Planning - CBCT

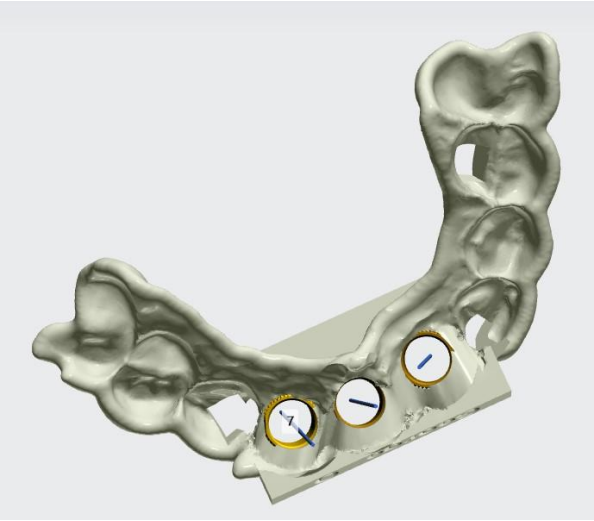


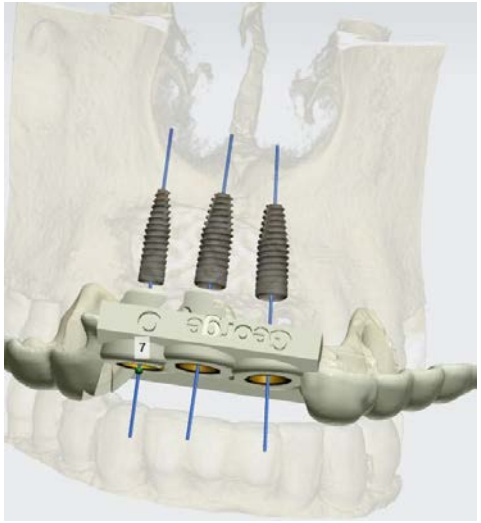


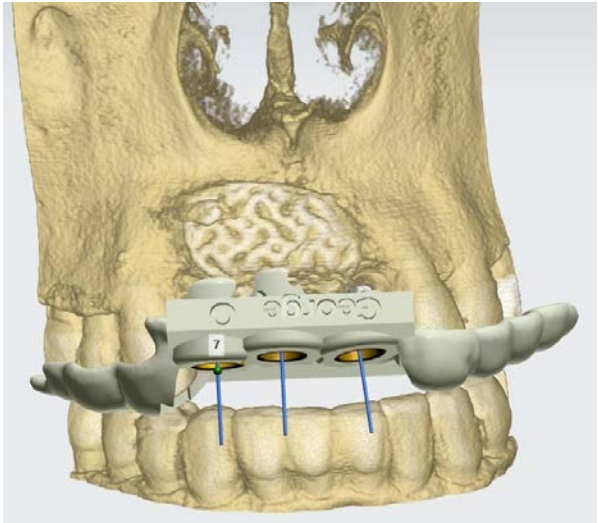


Implant Planning - Surgical Guide

In a systematic review, the use of **guided implant surgery showed higher implant survival percentages.**[1]

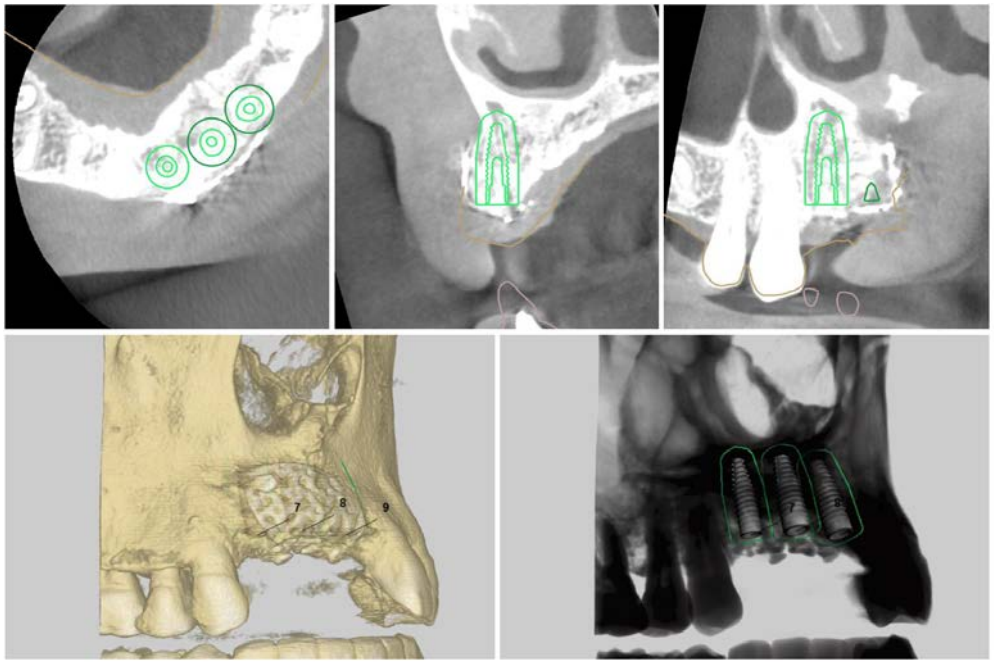






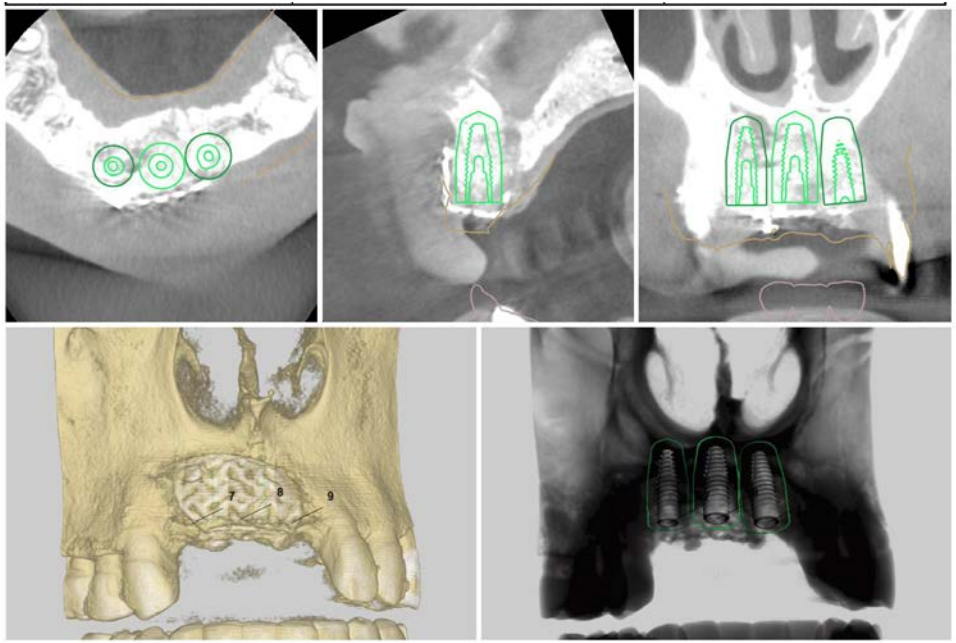
1) Dioguardi, M., Spirito, F., Quarta, C., Sovereto, D., Basile, E., Ballini, A., Caloro, G. A., Troiano, G., Lo Muzio, L., & Mastrangelo, F. (2023, February 13). *Guided Dental Implant Surgery: Systematic Review*. Journal of clinical medicine. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC9967359/

Implant Planning for Tooth #7



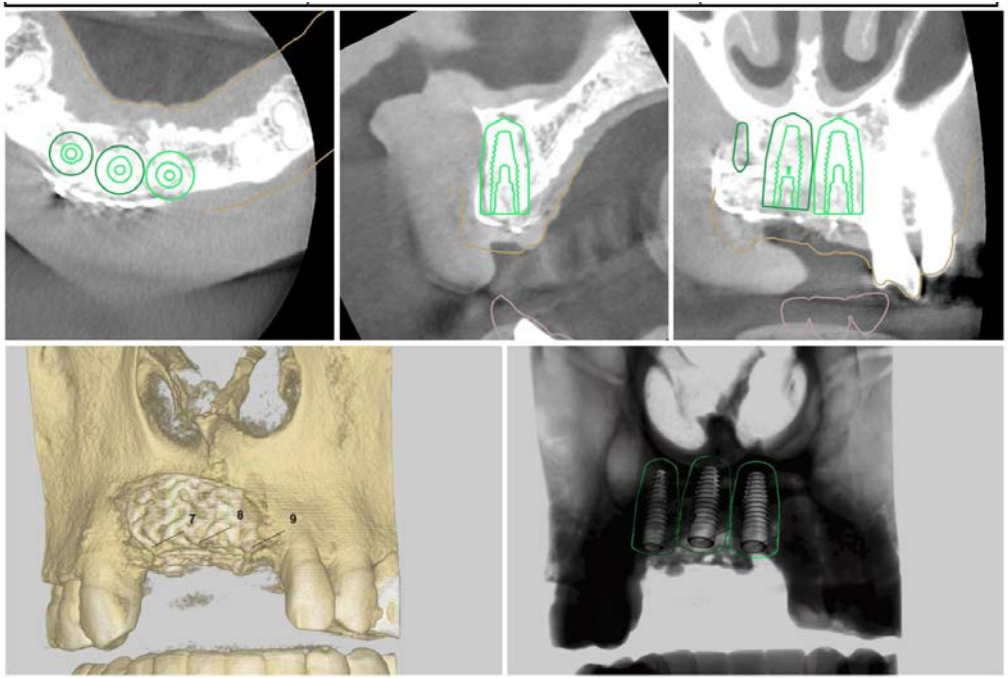
Implant information	
Implant position (UNN)	7
Manufacturer	Straumann
Type	BLT, Ø 3.3 mm NC, SLA® 12 mm, Roxolid®, Loxim®
Order number	021.3512
Length, mm	12
Diameter (Ø), mm	3.3
Color	Yellow

Implant Planning for Tooth #8



Implant information	
Implant position (UNN)	8
Manufacturer	Straumann
Type	BLT, Ø 4.1 mm RC, SLA® 12 mm, Roxolid®, Loxim®
Order number	021.5512
Length, mm	12
Diameter (Ø), mm	4.1
Color	Red

Implant Planning for Tooth #9



Implant Information	
Implant position (UNN)	9
Manufacturer	Straumann
Type	BLT, Ø 4.1 mm RC, SLA® 12 mm, Roxolid®, Loxim®
Order number	021.5512
Length, mm	12
Diameter (Ø), mm	4.1
Color	Red
Safety zone - apical distance	2.0
Safety zone - radial distance	1.5

Drilling Protocol

							Basic implant bed preparation		
Implant position	Implant Art. No.	Implant	Sleeve Art. No.	Sleeve	Sleeve height	Sleeve position	Milling cutter	Guided drill	Cylinder of drill handle
7	021.3512	BLT, Ø 3.3 mm NC, SLA® 12 mm, Roxolid®, Loxim®	034.050V4	Ø 5.0 mm Sleeve	5 mm	H6	Ø 2.80 mm	Long 24 mm	+1 mm
8	021.5512	BLT, Ø 4.1 mm RC, SLA® 12 mm, Roxolid®, Loxim®	034.050V4	Ø 5.0 mm Sleeve	5 mm	H6	Ø 3.50 mm	Long 24 mm	+1 mm
9	021.5512	BLT, Ø 4.1 mm RC, SLA® 12 mm, Roxolid®, Loxim®	034.050V4	Ø 5.0 mm Sleeve	5 mm	H6	Ø 3.50 mm	Long 24 mm	+1 mm

Implant Surgery - Winter 2023

Implant components

- **Straumann BLT SLActive Implants**

  #7 - BLT 3.3 mm x 12 mm NC

  #8 - BLT 4.1 mm x 12 mm RC

  #9 - BLT 4.1 mm x 12 mm RC

- **Abutments**

  #7 - Healing Abutment

  #8 - Healing Abutment

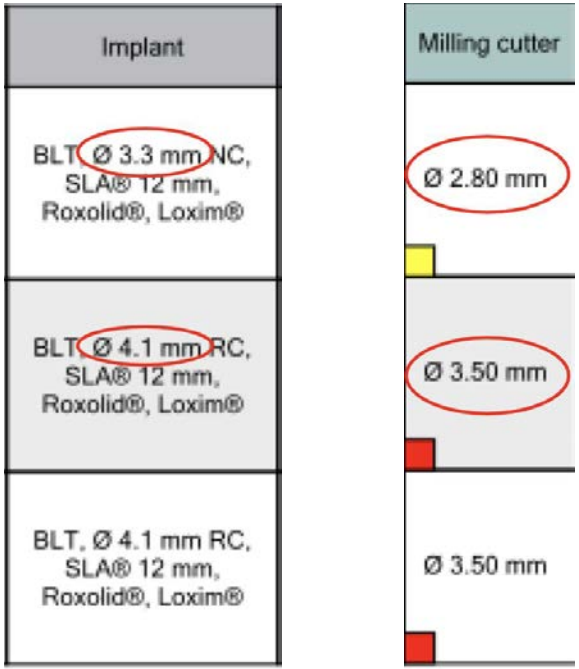
  #9 - Cover Screw

  A cover screw was placed over #9 in order to maximize the volume of soft tissue so that this tissue can be used in second stage surgery

Implant Surgery: Undersizing

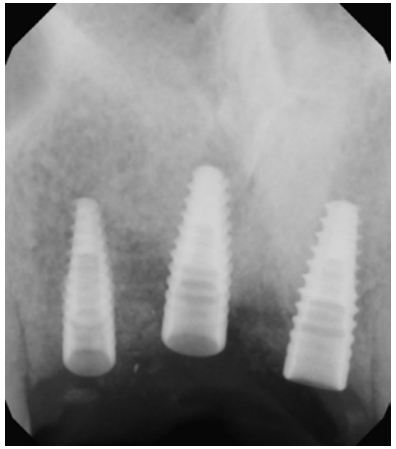
Undersized drilling technique was introduced to locally optimize bone density and subsequently **improve primary stability.**[1]

Implant position	Implant Art. No.	Implant	Sleeve Art. No.	Sleeve	Sleeve height	Sleeve position	Basic implant bed preparation: Milling cutter	Basic implant bed preparation: Guided drill	Basic implant bed preparation: Cylinder of drill handle
7	021.3512	BLT, Ø 3.3 mm NC, SLA® 12 mm, Roxolid®, Loxim®	034.050V4	Ø 5.0 mm Sleeve	5 mm	H6	Ø 2.80 mm	Long 24 mm	+1 mm
8	021.5512	BLT, Ø 4.1 mm RC, SLA® 12 mm, Roxolid®, Loxim®	034.050V4	Ø 5.0 mm Sleeve	5 mm	H6	Ø 3.50 mm	Long 24 mm	+1 mm
9	021.5512	BLT, Ø 4.1 mm RC, SLA® 12 mm, Roxolid®, Loxim®	034.050V4	Ø 5.0 mm Sleeve	5 mm	H6	Ø 3.50 mm	Long 24 mm	+1 mm



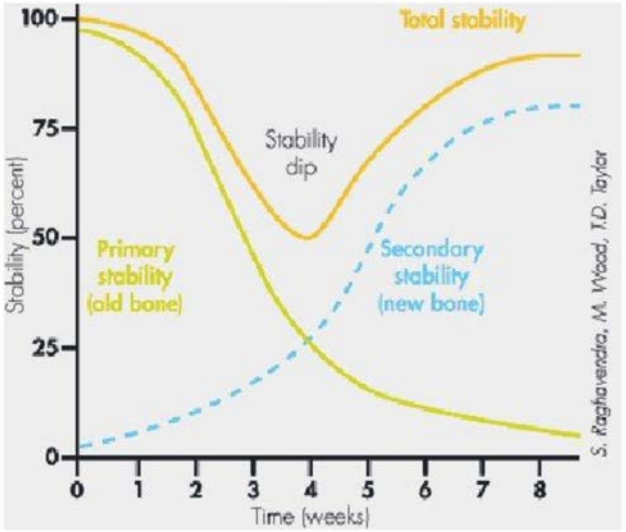
1) Javed, F., Ahmed, H. B., Crespi, R., & Romanos, G. E. (2013, December). *Role of primary stability for successful osseointegration of dental implants: Factors of influence and evaluation*. Interventional medicine & applied science. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3873594/

Implant Surgery



Insertion torque of 30 Ncm is a good indicator of primary stability and suggests that **osseointegration will occur**.[1]

Insertion Torque of all 3 implants ≥ 35 Ncm



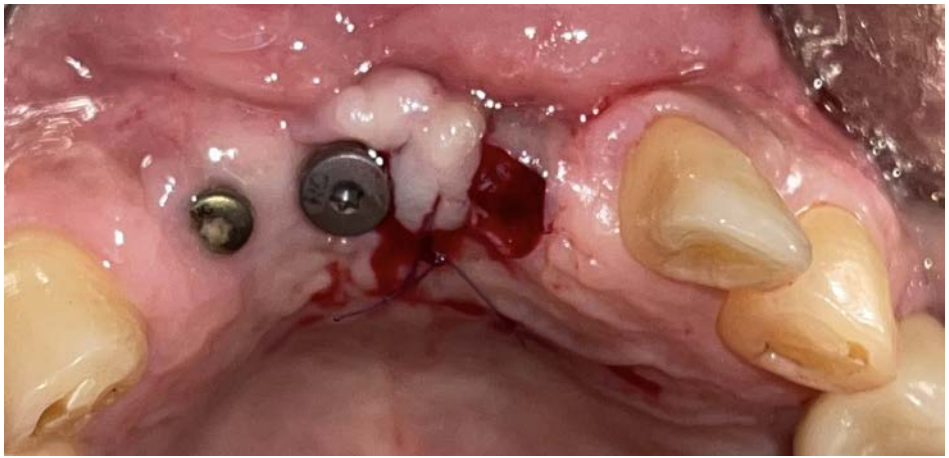
Primary Stability: when the implant is “well-seated” in bone and is allowed to mechanically adapt to the host bone until secondary stability is achieved

Secondary Stability: the biological stability that forms after bone regeneration and remodelling have taken place

1) Sarfaraz, H., Johri, S., Sucheta, P., & Rao, S. (2018). *Study to assess the relationship between insertion torque value and implant stability quotient and its influence on timing of functional implant loading*. Journal of Indian Prosthodontic Society. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5903177/

Second Stage Surgery: Regaining soft tissue

- Soft tissue augmentation to preserve or enhance the peri-implant tissues is consequential for the restorative as well as esthetic outcome.[1]
- A lateral pedicle sliding flap of #9
- The soft tissue was moved laterally and sutured between #8 and #9



1) Akolu, P., Lele, P., Dodwad, V., & Yewale, M. (2023, October 2). *The buccal pedicle sliding flap technique for keratinized tissue augmentation during the second-stage surgery: A report of two cases*. Cureus. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC10619594/

Osseointegration Check

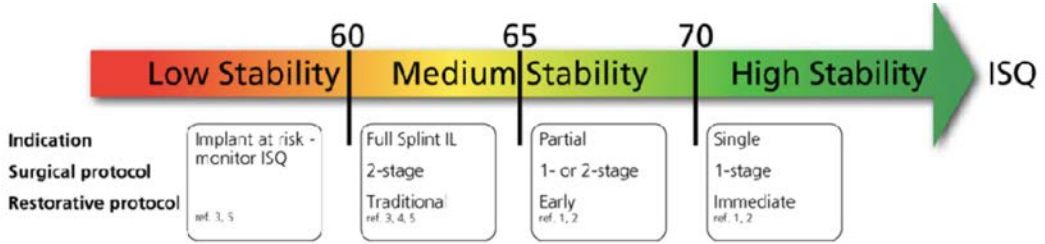
ISQ (Implant Stability Quotient) values:

#7 = 70

#8 = 69

#9 = 74

ISQ values:



Greater than > 65 = most favorable for implant stability.[1]

Less than < 45 = less favorable for implant stability.[1]

1) Javed, F., Ahmed, H. B., Crespi, R., & Romanos, G. E. (2013, December). *Role of primary stability for successful osseointegration of dental implants: Factors of influence and evaluation*. Interventional medicine & applied science. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3873594/

Pink Porcelain

Soft Tissue defects can be challenging to restore.

- Pink materials used as composite with a **provisional prosthesis**

and

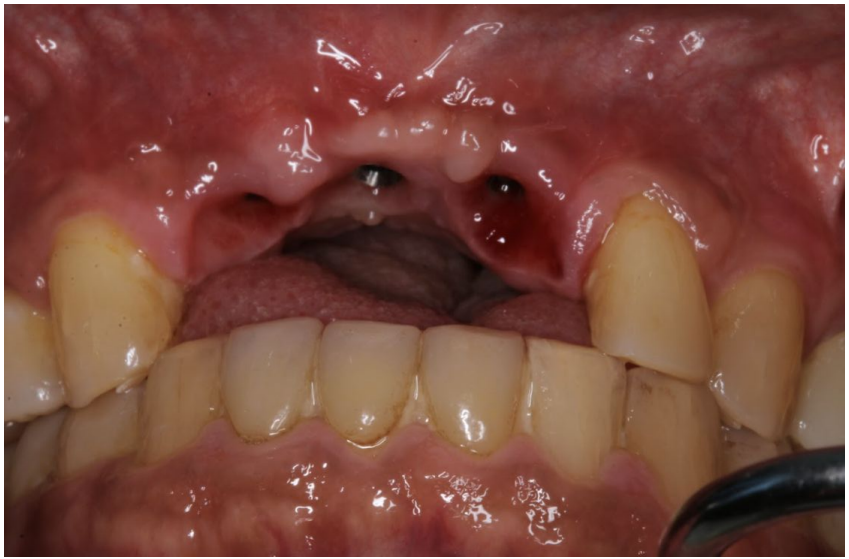
- Pink materials used as **porcelain** with an abutment and **final restoration**,

  Both have the ability to **mask a defect and create a symmetric and esthetic result**, offering resolution for both the patient and clinician.[1]

1) K;, K. L. (n.d.). *The use of pink porcelain to manage a malposed anterior implant: Case report*. Journal (Canadian Dental Association). https://pubmed.ncbi.nlm.nih.gov/24059481/

Provisional Restorations

Emergence Profile after 8 weeks

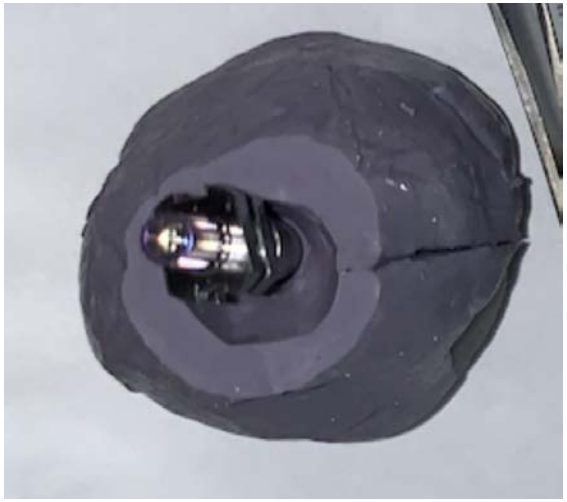


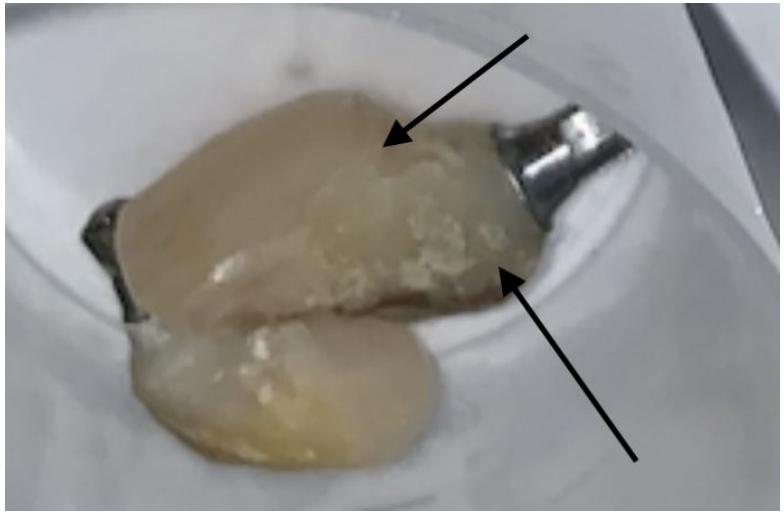
Replicating Emergence Profile for the Laboratory

Adherence of soft tissue to the prosthetic component is a paramount element in the protection of bone from comtanimanion and infection.[1]

1) Fabbri G, Sorrentino R. A Biologically Driven Concept to Design the Emergence Profile Around Dental Implants: Surgical and Prosthetic Considerations to Optimize Hard and Soft Tissue Integration. Int J Periodontics Restorative Dent. 2021 Nov-Dec;41(6):913-921. doi: 10.11607/prd.5063. PMID: 34818401.

Replicating Emergence Profile for Lab



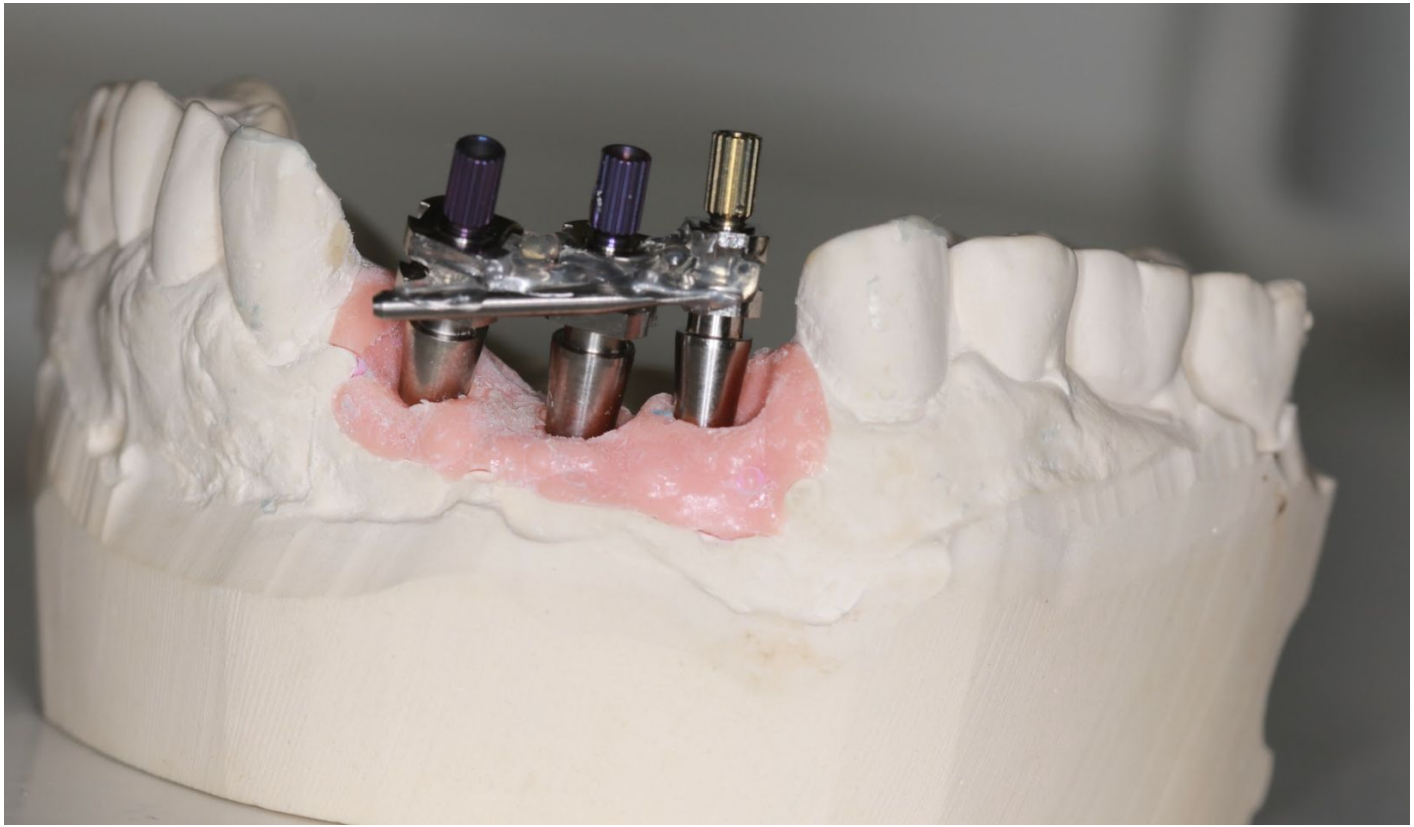


Customized Impression Technique - Open Tray

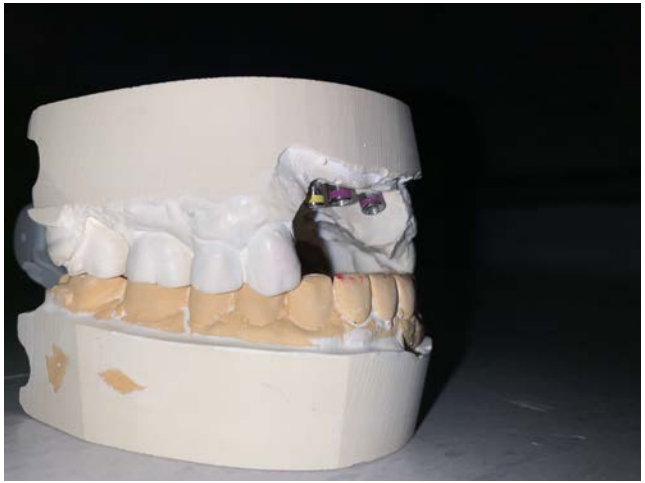
NC

RC

Verification Jig



Mastercast



Restorative Plan - Winter 2024

#7: Single-unit engaging screw-retained zirconia 4M2 crown with CAD/CAM titanium abutment

#8, #9: Splinted non-engaging screw-retained zirconia 4M2 crown with CAD/CAM titanium abutment with pink porcelain at embrasure space

There was **no significant difference** found in screw preload between a **hemi-engaging and a full non-engaging 3-unit fixed partial denture** supported by conical connection implant configurations before and after cyclic loading.[1]

Alzoubi FM, Sabti M, Alsarraf E, Alshahrani FA, Sadowsky SJ. Preload evaluation of 2 implant-supported fixed partial denture abutment designs. J Prosthet Dent. 2022 Nov;128(5):1067.e1-1067.e6. doi: 10.1016/j.prosdent.2022.09.002. PMID: 36460425.

Final Image

Final Image

Acknowledgments

1) **Dr. Sadowsky -** I want to thank Dr. Sadowsky for helping restore this case and specifically for the excitement he brings to implant dentistry. Dr. Sadowsky was involved in osseointegration check, provisional restorations, final impression, and the definitive restorations.
2) **Dr. Gonzalez -** I want to thank Dr. Gonzalez for bringing this case to life. Dr. Gonzalez was very involved in the surgeries for this case and the patient always felt comfortable with Dr. Gonzalez. Dr. Gonzalez was the surgeon that placed the titanium mesh, allograft & PRF, implant placements, and second stage surgery pedicle graft.
3) **Dr. Tina Cun DDS 23' -** I want to thank Dr. Tina Cun for everything she has done on this case for the patient. Dr. Cun was involved in the removal of the titanium mesh, implant planning, and implant placements.
4) **Dr. Ian Fuller DDS 22' -** I want to thank Dr. Ian Fuller for treatment planning this case and helping the patient receive the smile he always hoped to have. Dr. Fuller was involved in the partial denture, extractions, and the titanium mesh bone graft.
5) **PSL -** I want to thank Carlos Correa and Alfredo for helping me communicate with the lab and for the time he spent teaching me the specifics about implant abutments and restorative materials.
6) **Unident Lab -** I want to thank Unident lab for restoring this case.

References

1) K;, K. L. (n.d.). *The use of pink porcelain to manage a malposed anterior implant: Case report*. Journal (Canadian Dental Association). https://pubmed.ncbi.nlm.nih.gov/24059481/
2) https://www.geistlich-pharma.com/dental/products/matrices/mucograft
3) Akolu, P., Lele, P., Dodwad, V., & Yewale, M. (2023, October 2). *The buccal pedicle sliding flap technique for keratinized tissue augmentation during the second-stage surgery: A report of two cases*. Cureus. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC10619594/
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OKU Sutro Excellence Day Project Cover Sheet

Project Title

Overcoming Challanges: Management of Dental Implants in the Aesthetic Zone

Full name(s) and class year(s) of all project collaborators

Example: Jane Smith, DDS 2022; John Smith, DDS 2022

Ian Fuller, DDS 2022; Tina Cun, DDS 2023; Blake Giuliani, DDS 2024

Project Category

DDS/IDS - Clinical Awards: Implant Dentistry

OKU Sutro Excellence Day Project Cover Sheet

Enter your abstract text here (max 300 words)

Project Summary

The patient was seen by two different student dentists before being transferred to me. I came to assist with the implant surgery and continued dental care from there on. The patient presented with missing #8 and a large vertical bone defect from #7-#9. The patient's confidence had gotten worse due to the continuous failure of implants and missing a front tooth. After over 3 years of treatment at the school, the patient felt whole again.

Significance:
Vertical bone defects can be very hard to manage, but espcially hard to manage when they are in the anterior region. Some implants are better than others; Titanium vs. Zirconium. Bone defects can become more difficult to manage when aesthetics are a concern. There are appropriate uses for titanium mesh in GBR. Soft tissue grafts that increase keratinized tissue are beneficial around implants. Pink Porcelain can be used to mimic soft tissue in both provisionals and final restorations. Replication of emergence profile and communication with the lab is important for the functional and aesthetic outcome of the final restorations. The use of guided surgery makes implant success more predictable.

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