



May 8th, 2:15 PM - 5:00 PM

Restoring a Smile: Functional and Esthetic Full Mouth Rehabilitation

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OKU Sutro Excellence Day Project Cover Sheet

Project Title

Restoring a Smile: Functional and Esthetic Full Mouth Rehabilitation

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

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

Rachel Min, DDS 2024

Project Category

DDS/IDS - Clinical Awards: Restorative (Direct or Indirect)



Enter your abstract text here (max 300 words)

Summary of Project: Restoring vertical dimension of occlusion (VDO) involves a complex interdisciplinary approach involving multiple specialties. The patient presented to the clinic with loss of VDO, tooth structure, and multiple posterior teeth leading to a smile and function that she was unsatisfied with. After careful planning, we created a treatment plan that would be carried out in multiple phases: increasing VDO through anterior direct restorations, endodontic treatment, placing implants, and restoring her posterior occlusion through indirect restoration of multiple premolars and implant crowns. This case demonstrates the detailed steps, treatment planning, and care provided to achieve a stable occlusion and restore the patient's beautiful smile.

Significance: The significance of this case was to improve the patient's smile to one that she can proudly display along with increased function in her everyday life. We were able to restore the patient's faith in dentistry, and built and coordinated with an interdisciplinary team to improve the patient's quality of life.

Acknowledgements: Thank you Dr. Wakeel for all your guidance and support in planning and providing treatment for the patient from the beginning of our journey to the end. Thank you Dr. Nguyen, Dr. Ganesh, Dr. Pineda, Dr. Ali, Dr. Tiller, Dr. Hakim, and Dr. Chang for your guidance and help with preparations, procedures, and further treatment planning. Thank you Dr. Lai for your guidance and support, and thank you Dr. On for providing the endodontic retreatment. Thank you Dr. Sadowsky and Dr. Tran for your guidance and wisdom throughout the implant procedures and design. Thank you Carlos for all your wisdom and guidance in the laboratory side of treatment. Thank you Stone, Arlene, Deric, and Jonathan for being a part of this journey and for your help and support along the way. I cannot express my gratitude and appreciation enough.

Restoring a Smile: Functional and Esthetic Full Mouth Rehabilitation

Rachel Min, DDS 2024

Patient Profile

- ❖ 71 year old female
- ❖ Patient presented to UOP on March 15, 2023 for new patient ODTP
- ❖ Chief Concern: “I want to fix my smile and my bite has been feeling wrong for over 10 years. I bite my lips a lot and it bothers me.”
- ❖ Patient is an immunologist
- ❖ Lives in Marin County with husband
- ❖ Lived in Arizona for many years before moving back to California
- ❖ She reports no alcoholic beverages, recreational drugs, or smoking
- ❖ Now that her children are through college and moved away, she wants to focus on improving her dental health and restoring the function she has lost

Health History

- ❖ Medical history: hypothyroidism, Staphylococcal infection of mouth in 2003
 - BP: 110/79 mmHg; HR: 64 bpm, ASA II
- ❖ Medications: NP thyroid (30mg, 1x daily)
- ❖ Allergies: sulfa drugs (hives), seasonal, dust

Dental History

- ❖ Dental history:
 - Moderately restored
 - Missing mandibular molars due to Staphylococcal infection in 2003
 - Previous providers fabricated lower removable partial dentures that did not fit her and she is not happy with removable appliances
 - Patient reports that previous provider removed large amount of tooth structure from incisal of her lower anteriors
 - Patient decided to come to UOP upon recommendation of her friend for implants and to fix her bite
 - Patient has had bad experiences with dentists in the past because she was not well-informed of her treatment rationale and process
- ❖ Dietary habits:
 - Patient enjoys eating acidic foods and reports sucking on lemons often when she was younger
 - Patient eats most of her food with vinegar

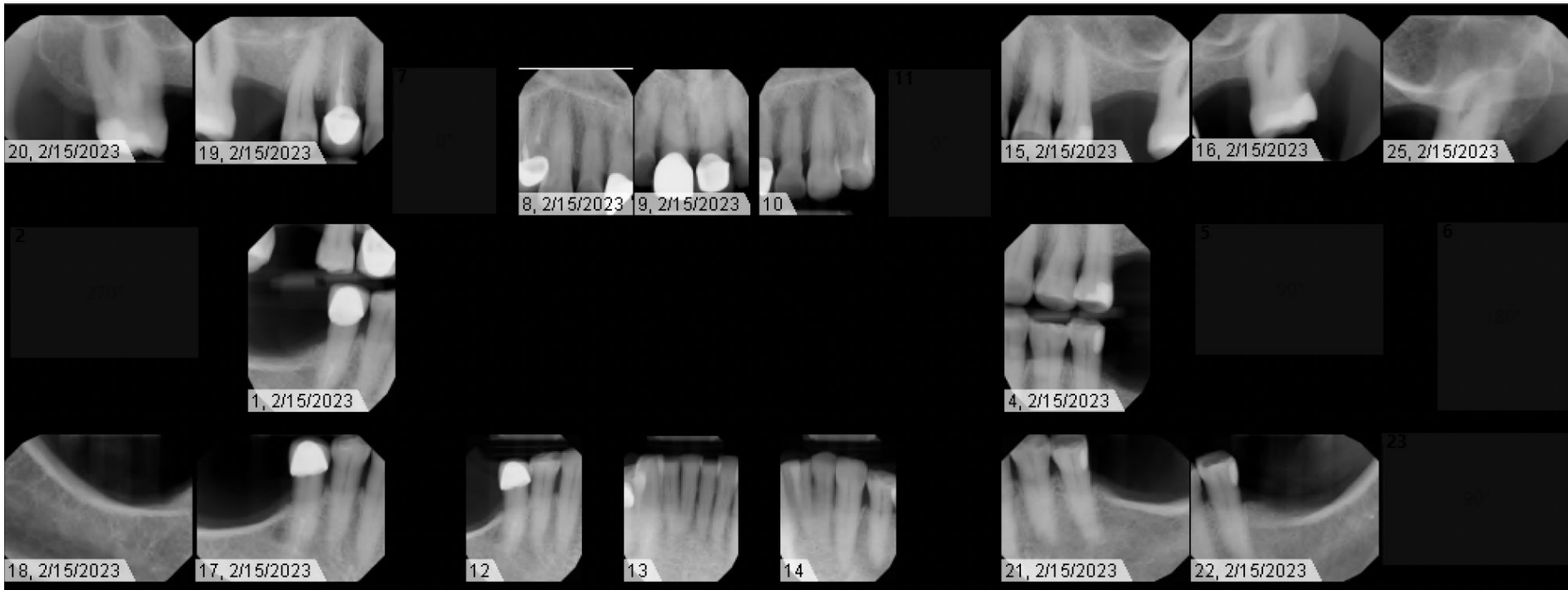
Extra-Oral Photographs



Intra-Oral Photographs



Radiographic Exam



Head and Neck Examination

- ❖ Extra-Oral Examination:
 - No significant findings
- ❖ Intra-Oral Examination:
 - Lower lip trauma from biting her lips constantly
- ❖ TMJ Assessment:
 - Asymptomatic - no pain, clicking, or popping

Hard Tissue Exam

- ❖ #1, 3, 14, 16, 17, 18, 19, 30, 31, 32 - missing
- ❖ #2 - DO composite, gingival recession
- ❖ #4 - B composite
- ❖ #5 - RCT, PFM crown with open mesial contact, overhanging margin (no clinical caries)
- ❖ #6 - heavy attrition, erosion on lingual
- ❖ #7 - ML composite (missing), heavy attrition, erosion on lingual
- ❖ #8 - zirconia crown
- ❖ #9 - PFM crown
- ❖ #10 - distal caries and chip, attrition, lingual erosion
- ❖ #11 - attrition, lingual erosion
- ❖ #12 - heavy attrition and erosion
- ❖ #13 - DO composite, heavy attrition and erosion
- ❖ #15 - DO composite, gingival recession
- ❖ #20 - D composite, occlusal caries lesion, heavy attrition and erosion, buccal abfraction
- ❖ #21 - heavy attrition, erosion, buccal abfraction
- ❖ #22 - heavy attrition
- ❖ #23-26 - attrition, loss of crown structure from previous dentist shaving them down, gingival recession
- ❖ #27 - attrition, erosion
- ❖ #28 - attrition, buccal abfraction
- ❖ #29 - RCT with incomplete obturation, PFM crown with open buccal margin and recurrent caries

Caries Risk Assessment

- ❖ ATP reading: 356 (low)
- ❖ Lives and works in a fluoridated community
- ❖ No restorations due to caries in past 3 years
- ❖ Uses fluoridated toothpaste 2x daily
- ❖ Frequent snacker
- ❖ Saliva test
 - WNL - looks watery
 - pH: 5.5 - 6.9
- ❖ Caries Risk: High Caries Risk - due to high acidity of saliva

Assessments and Diagnosis

- ❖ Periodontal Diagnosis
 - Generalized plaque induced gingivitis on a reduced periodontium
 - Stage III Grade B periodontitis (stabilized)
 - Prognosis: fair to good
- ❖ Endo Diagnosis:
 - #5 - previous RCT with normal apical tissues
 - #29 - previous RCT with symptomatic apical periodontitis

Assessments and Diagnosis

- ❖ Vertical Dimension of Occlusion
 - Patient has lost VDO due to missing molars and dental wear of anterior teeth and premolars
- ❖ Evidence of erosive tooth wear and attrition on all teeth
- ❖ Caries Diagnosis
 - Recurrent decay on tooth #29
 - Incipient decay on tooth #20
 - Distal incipient caries and chip on #10
- ❖ Existing Restoration Assessment
 - #5 crown clinically acceptable
 - #2, 4, 13, 15, 20 composites clinically acceptable
 - #29 crown defective restoration
 - #7 ML lost restoration

Social Determinants of Health

Economic Stability

Patient has financial security and access to resources such as housing, food, etc.

Social / Community

Close family relationships and strong support system

Systemic Health Literacy

High systemic health literacy due to occupation

Dental Health Literacy

Low dental health literacy → enhance through open communication with OHI and dietary counseling

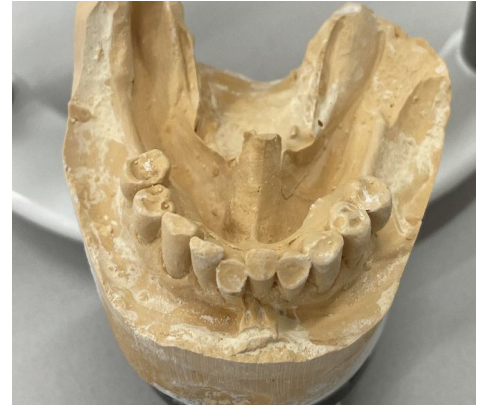
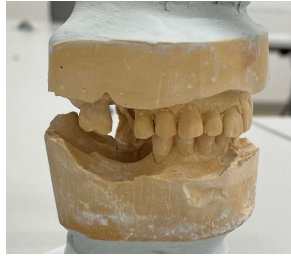
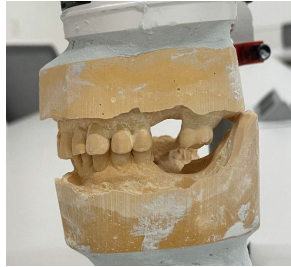
Healthcare

Patient has chronic medical condition (hypothyroidism) that impacts care

Dental Care Access

Patient lives an hour away and needs to take time off from work to attend appointments

Diagnostic Models



Consultations

- ❖ Prosthodontics consultation with Dr. Wakeel:
 - Orthodontics not indicated in supra-erupting the mandibular premolars and crowns or onlays are preferred
 - Patient VDO can be restored using resin-based restorations with consistent monitoring for TMJ complications or tooth-related complications for at least 2 months before proceeding to any restorative treatment
 - Temporary restorations on mandibular premolars to be transitioned to crowns when there is enough restorative space and improved VDO
 - Maxillary premolar restorations to involve #5 crown and onlays on other premolars
 - Anterior composite restorations can be maintained as final restorations to restore functionality and esthetics

Consultations

- ❖ Implant consultation with Dr. Wakeel:
 - Radiology referral CBCT of upper and lower jaws
 - Based on CBCT, type of implant, restorations, and surgical guide determined along with surgical process
 - Implants are viable option for restoring edentulous space for #3, 14, 19, and 30
- ❖ Medical consultation with patient's physician:
 - Patient cleared to receive implant surgery and no other medical conditions other than those recorded in patient medical history
 - No contraindications were reported by physician to invasive dental treatment
 - Patient cleared to undergo implant surgery using either 2% lidocaine with 1:100k epinephrine or 4% articaine with 1:100k epinephrine under local anesthesia

Ideal Treatment Plan

- Urgent Care:
 - No pain or esthetic emergencies
- Disease Control:
 - Prophylaxis
 - Endo consultation » retreat, post, and build-up #29
 - Endo consultation » retreat #5
 - # 10 lingual composite
 - #20 occlusal glass ionomer

Ideal Treatment Plan (Continued)

- Restorative:
 - Phase 1: increase VDO – monitor at least 2 months, recall every 2 weeks
 - #6, 7, 11 – IL composites
 - #22, 23, 24, 25, 26, 27 – FIMDL composites
 - #21, 28 – O glass ionomer
 - Phase 2: Implant placement
 - Maxillary and mandibular CBCT
 - Implant 3D printed surgical guide
 - Implant placement #3, 14, 19, 30 – 2 week post-op recall
 - Phase 3: restorations
 - #20, 21, 28, 29 – zirconia crowns
 - #5 – build-up and zirconia crown
 - Implant crowns #3, 14, 19, 30
 - Phase 4: esthetics
 - #6, 7, 10, 11 veneers, redo #8 and 9 crowns
- Maintenance
 - Night guard
 - 6 month perio recall, 1 year recall for #29 RCT
 - Final restorative recall – 1 week, 1 month, 3 months, 6 months, yearly

Alternative Treatment Plan

- Urgent Care:
 - No pain or esthetic emergencies
- Disease Control:
 - Prophylaxis
 - Endo consultation » retreat, post, and build-up #29
 - Endo consultation » retreat #5
 - # 10 lingual composite
 - #20 occlusal glass ionomer
- Restorative
 - Phase 1: increase VDO - monitor at least 2 months, recall every 2 weeks
 - #6, 7, 11 - IL composites
 - #22, 23, 24, 25, 26, 27 - FIMDL composites
 - #21, 28 - O glass ionomer
 - Phase 2: restorations
 - #20, 21, 28, 29 - zirconia crowns
 - #5 - build-up and zirconia crown
 - Phase 3: removable prosthetics
 - Upper and lower removable partial dentures
- Maintenance
 - Night guard, 6 month perio and removable recall, 1 year RCT recall #29, yearly recall

Accepted Treatment Plan

- Urgent Care:
 - No pain or esthetic emergencies
- Disease Control: same as ideal
- Restorative:
 - Stage 1: increase VDO - monitor at least 2 months, recall every 2 weeks
 - #6, 7, 11 - IL composites
 - #22, 23, 24, 25, 26, 27 - FIMDL composites
 - #21, 28 - O glass ionomer
 - Stage 2: Implant placement
 - Maxillary and mandibular CBCT
 - Implant 3D printed surgical guide
 - Implant placement #3, 14, 19, 30 - 2 week post-op recall
 - Stage 3: restorations
 - #20, 21, 28, 29 - zirconia crowns
 - #5 - build-up and zirconia crown
 - Implant crowns #3, 14, 19, 30
- Maintenance
 - Night guard
 - 6 month perio recall, 1 year recall for #29 RCT
 - Final restorative recall - 1 week, 1 month, 3 months, 6 months, yearly

Phase 1: Disease Control and Increasing VDO

Vertical Dimension of Occlusion

- Vertical dimension of occlusion (VDO) is the vertical relationship between the mandible and maxilla when teeth contact
 - It is an important factor in the treatment planning and fabrication of restorations
- VDO can be lost by a variety of factors, including attrition and erosion
- Loss of VDO can lead to TMJ problems, impaired chewing function, loss of proper occlusion, and esthetic problems
- Loss of posterior occlusion can cause significant attrition and loss of clinical crown height of anterior teeth
- Treatment for loss of VDO involves an interdisciplinary approach that may involve endodontics, prosthodontics, orthodontics, periodontics, oral surgery, and restorative dentistry

Vinnakota DN, Kanneganti KC, Pulagam M, Keerthi GK. Determination of vertical dimension of occlusion using lateral profile photographs: A pilot study. J Indian Prosthodont Soc. 2016 Oct-Dec;16(4):323-327. doi: 10.4103/0972-4052.176531. PMID: 27746594; PMCID: PMC5062146.

Song MY, Park JM, Park EJ. Full mouth rehabilitation of the patient with severely worn dentition: a case report. J Adv Prosthodont. 2010 Sep;2(3):106-10

Hasanzade M, Ghodsi S, Yaghoobi N. Rehabilitation of a deep bite patient with worn dentition using minimally invasive approach: A 3-year follow-up. Clin Case Rep. 2021 Nov 22;9(11):e05121

Increasing Vertical Dimension of Occlusion

- ❖ Increasing vertical dimension of occlusion (VDO) should be dictated by functional and esthetic needs
- ❖ According to Abduo and Lyons, VDO may be increased up to a maximum of 5 mm for restorations to improve function and esthetics
- ❖ By determining the patient's position of rest and comparing it to the VDO that she presented with to our clinic, it was found that she had lost 4-6 mm of her VDO
- ❖ It was determined that we could increase her VDO by approximately 4 mm
- ❖ By monitoring her TMJ symptoms and making adjustments as needed to the anterior composites, we could safely increase her VDO while preventing TMJ problems



Increasing Vertical Dimension of Occlusion

- ❖ Dahl concept for increasing VDO
 - New TMJ or myofascial pain dysfunction have 2-4% rate of occurrence using Dahl appliance
 - No reports of apical resorption associated with the Dahl concept
 - Composite can be used as a fixed Dahl concept restoration that is reversible and easily repairable in a two stage technique
- ❖ Increasing VDO using resin composites
 - Wax-up template approach is recommended to improve results and occlusion
 - Large direct composite restorations can be used to restore VDO in patients
 - High functional survival of restorations (100%) after 5.2 years
 - 94.9% functional survival of restorations after 10.7 years
 - Resin composites are easier to repair than indirect restorations over time if it is needed

Tauböck TT, Schmidlin PR, Attin T. Vertical Bite Rehabilitation of Severely Worn Dentitions with Direct Composite Restorations: Clinical Performance up to 11 Years. *Journal of Clinical Medicine*. 2021; 10(8):1732.

Poyser, N., Porter, R., Briggs, P. et al. The Dahl Concept: past, present and future. *Br Dent J* 198, 669–676 (2005). <https://doi.org/10.1038/sj.bdj.4812371>



Lempel E, Németh KG, Lovász BV, Szalma J. Adhesive Management of Anterior Tooth Wear in Combination with the Dahl Concept-A 27-Month Observational Case Series. *Oper Dent*. 2021 Nov 1;46(6):594-608. doi: 10.2341/20-190. PMID: 35507908.

Smile Design and Testing New Occlusion Using Integrity



Diagnostic Wax-Up



Anterior Composites and Posterior Stops Followed by 2 Months Monitoring



Phase 2: Endo Retreatment

#5 and #29 intended for new crowns and endo consult needed

Endo Retreatment Considerations

- ❖ Retreatment versus extraction of endodontically treated teeth
 - Structural issues of removing versus retaining an endodontically treated tooth involve remaining tooth structure
 - Ferrule = tooth structure between margin of the crown and margin of the build-up, ideally at least 2 mm
 - Lack of ferrule and tooth structure is a major cause of failure in endodontically treated teeth
 - Cement used place restoration, post, and core is important ➤ adhesive resins
 - Esthetic issues depend on the tooth to be restored and if removing it will impact esthetics
 - Value of keeping versus removing a tooth in terms of costs and benefits to the patient
 - Patients should be educated on the risks, benefits, and alternatives for restoring an endodontically treated tooth and have the autonomy to choose whether to keep or remove the tooth

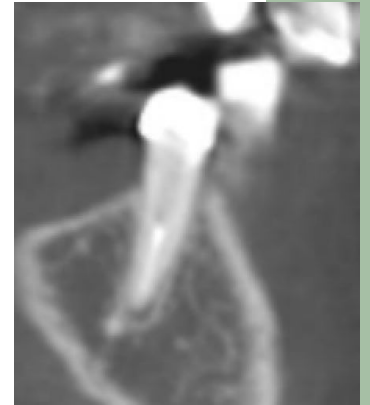
#5 and #29 Endo Testing

- ❖ Control teeth #2, 4, 12 - WNL to cold, percussion, and palpation
- ❖ #5 RCT
 - No sensitivity or pain on percussion
 - No sensitivity or pain on palpation
 - RCT slightly short of apex, ledge in obturation present on PA
- ❖ #29 RCT
 - Slight sensitivity and pain on percussion
 - No sensitivity or pain on palpation
 - RCT obturated to less than $\frac{1}{2}$ of root, post space visible on PA
 - Radiolucency present on PA distal to root



Endo and Restorability Consultations

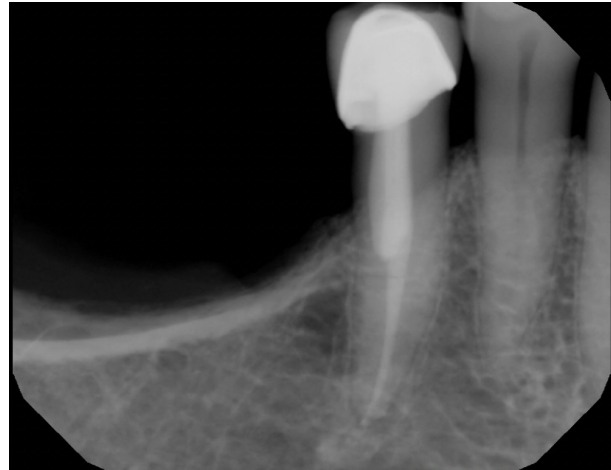
- ❖ Endo consultation and diagnosis with Dr. Lai and Dr. On
 - #5 - previous RCT with normal apical tissues
 - CBCT shows normal apical tissues and adequate RCT WNL
 - #29 - previous RCT with symptomatic apical periodontitis
 - Periapical radiolucency on CBCT
 - Pain on percussion
 - Endo retreatment needed
 - Referral made to Endo resident Dr. On for retreatment and post placement for #29
- ❖ Restorability consultation #29:
 - #29 needs a post and core after Endo retreatment
 - Tooth has sufficient crown:root ratio to be restored with a new crown



#29 Endo Retreatment Treatment Provided by Dr. On



Pre-Op



Post-Op

Phase 3: Re-eval and Implant Placement

Evaluating TMJ and VDO

Periodontal Re-evaluation

Guided Surgical Implant Placement by Dr. Wakeel

Periodontal Re-Evaluation Exam

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	6 7 6		5 6 4	3 4 3	3 5 3	3 2 3	2 1 2	2 1 3	3 2 3	3 2 2	2 4 2	3 3 3		7 7 5		FreeGM
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1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	
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				-1 -3 -1	-1 -3 -1	0 -4 0	-3 -5 -3	-3 -6 -3	-1 -4 -1	-1 -3 -1	-1 -3 -1	-1 -3 -1	0 -5 -3			FreeGM
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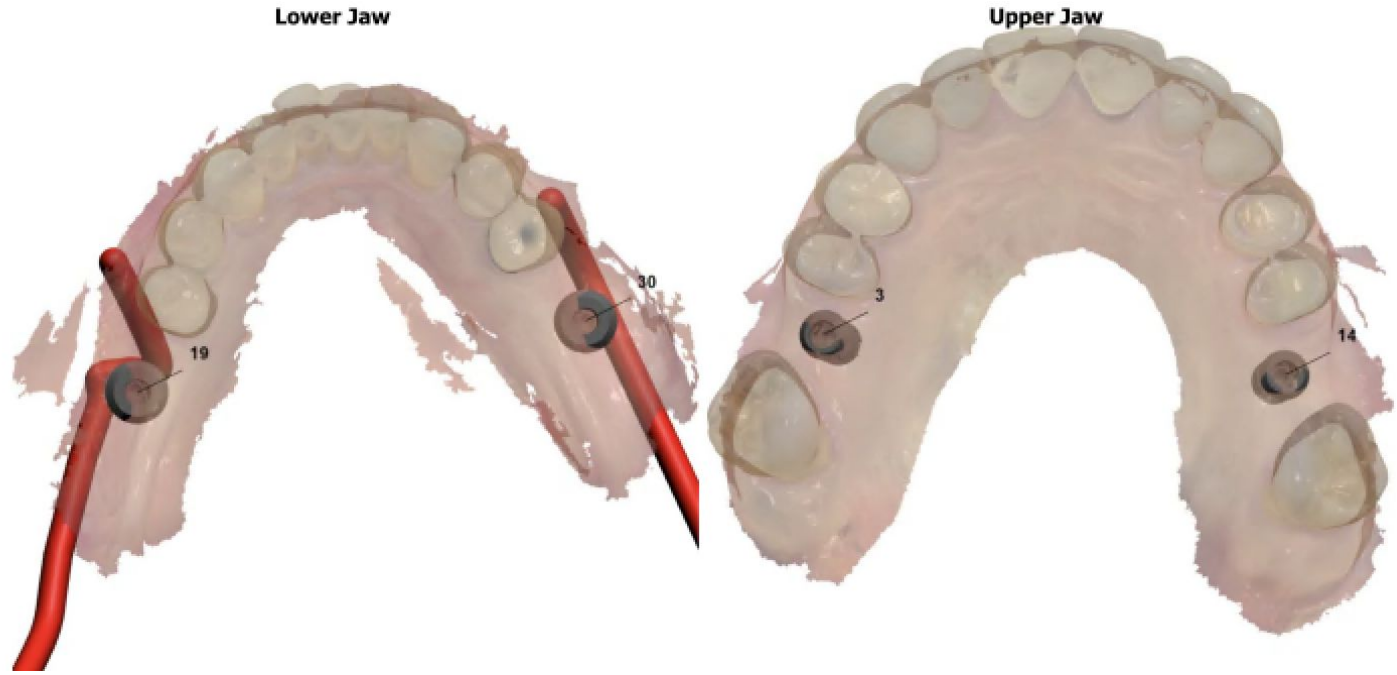
- ❖ Plaque index: 1.3 – fair
- ❖ Pocket depths 1-4

Implant Surgery

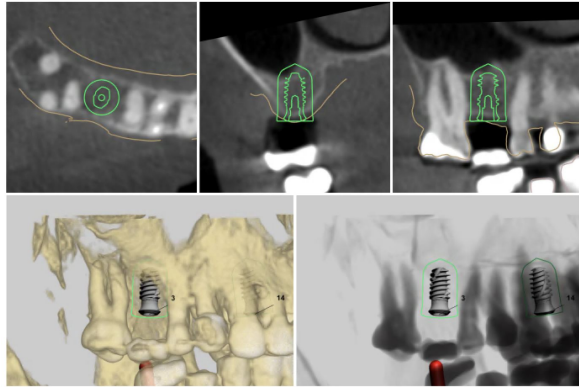
- ❖ Crown:implant ratio for single unit crowns
 - Implant-based success rate 98.1%
 - Crown:implant ratio under 3:1 is critical threshold for avoiding excessive bone loss or implant failure
- ❖ Guided versus Conventional Implant Placement
 - Guided surgery is superior to conventional in placing implants because there is a higher level of accuracy of placement
 - Surgical design can be determined prior to surgical placement and replicated using the surgical guide
 - Efficiency of surgical implant placement is higher than conventional implant placement



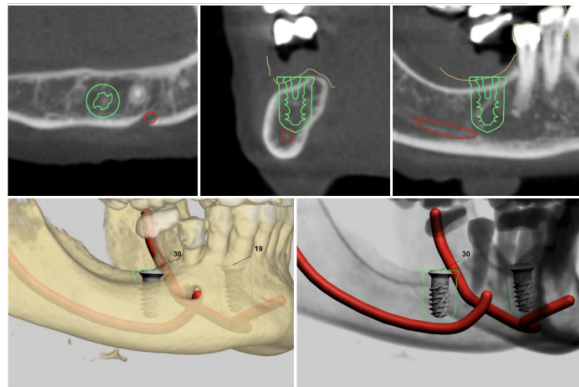
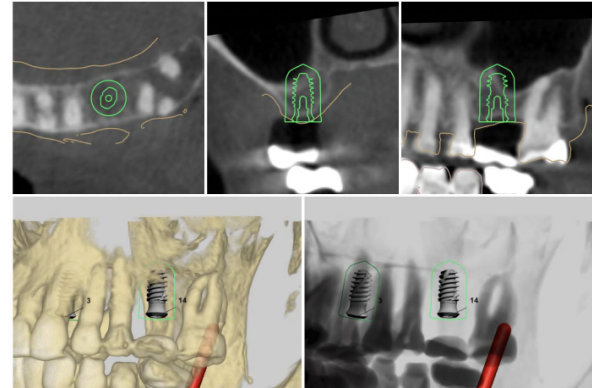
Implant Surgery Planning



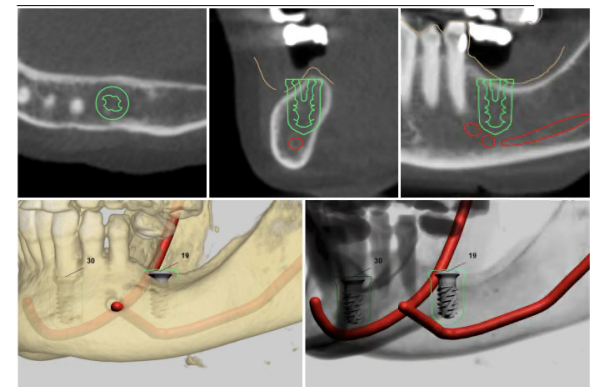
Implant Surgery Planning





#3, 14





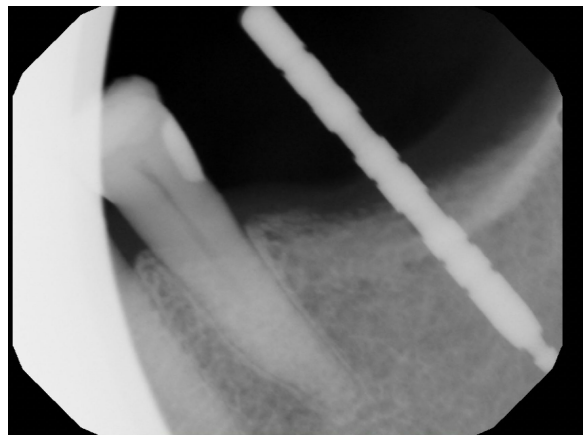
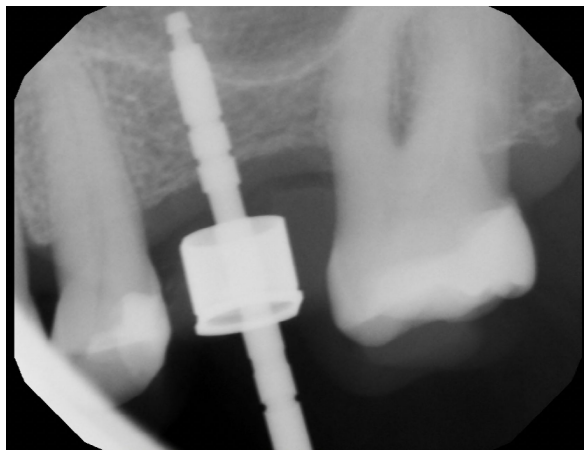
#30, 19



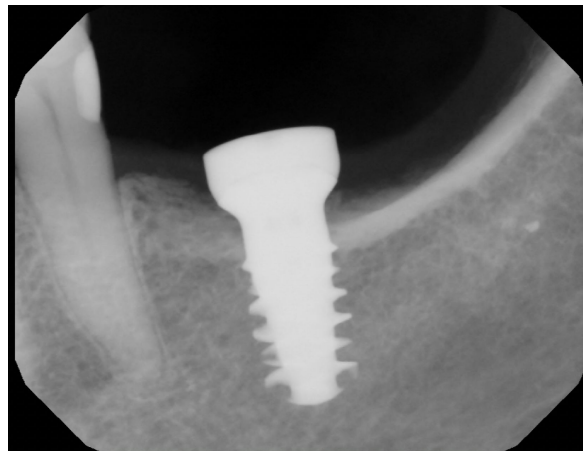
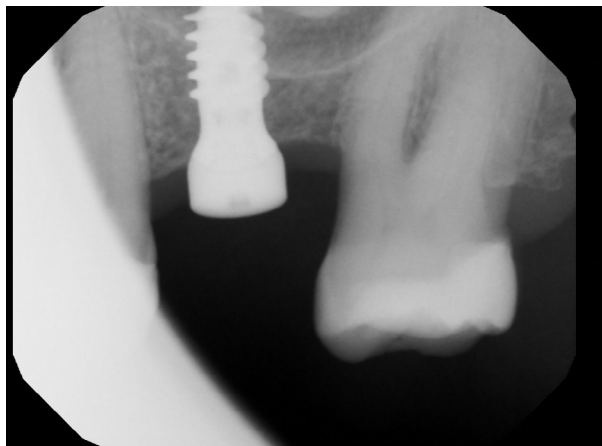
Implant Surgery Planning

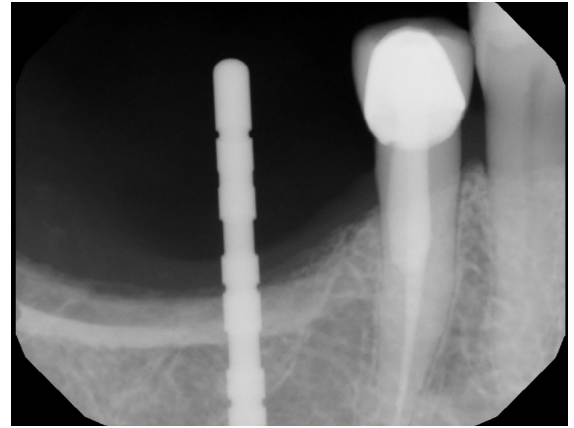
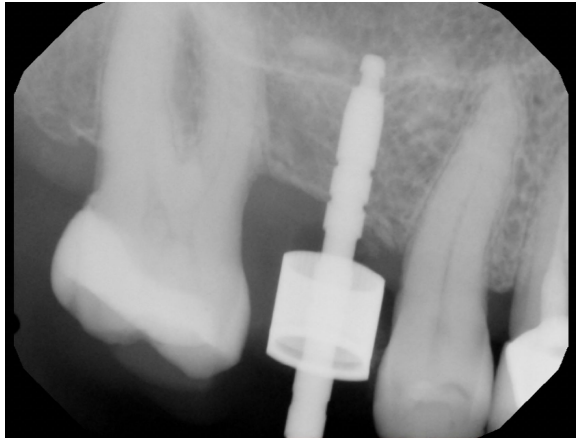
Implant information			
Implant position (UNN)	3		14
Manufacturer	Straumann		Straumann
Type	TLX SP ø4.5 RT, SLActive® 8mm, RXD		TLX SP ø4.5 RT, SLActive® 8mm, RXD
Order number	035.3508S		035.3508S
Length, mm	8		8
Diameter (Ø), mm	4.5		4.5
Color	Green		Green 

Implant information			
Implant position (UNN)	19		30
Manufacturer	Straumann		Straumann
Type	TLX SP ø5.5 WT, SLActive® 10mm, RXD		TLX SP ø5.5 WT, SLActive® 10mm, RXD
Order number	035.3710S		035.3710S
Length, mm	10		10
Diameter (Ø), mm	5.5		5.5
Color	Brown		Brown 

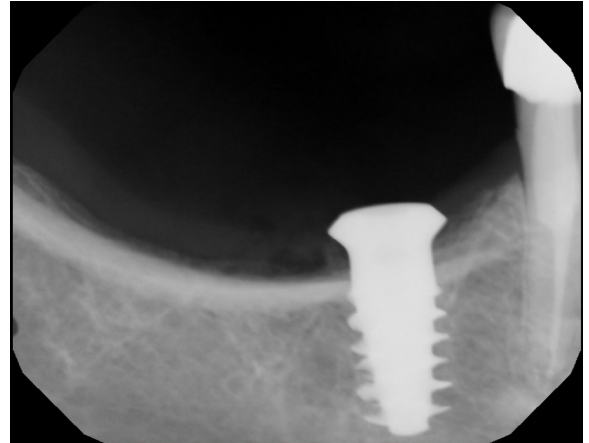


#14, #19





#3, #30



**Phase 6: Crown
Preparations, Anterior
Whitening, and
Osseointegration Check**

#5, 20, 21, 28, and 29 Crown Preparations

#3, 14, 19, and 30 Implant Sites



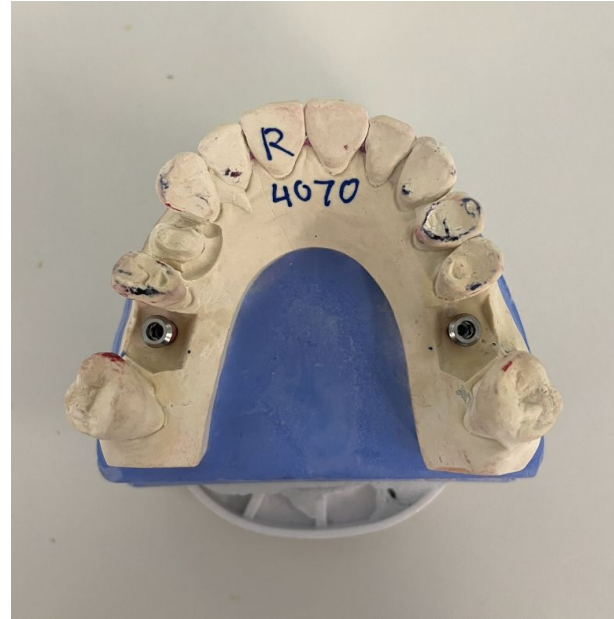
- ❖ #3 ISQ: B/L 76, M/D 80
- ❖ #14 ISQ: B/L 78, M/D 79



- ❖ #19 ISQ: B/L 83, M/D 74
- ❖ #30 ISQ: B/L 84, M/D 82

Phase 6: Restoration Design

Upper and Lower Mastercasts

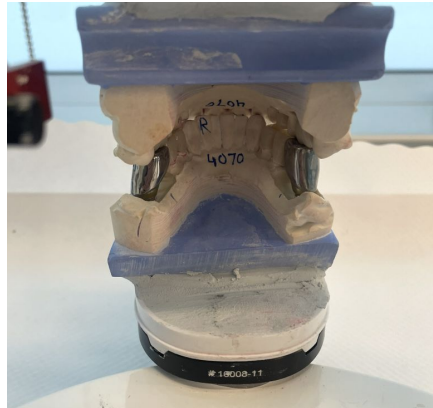
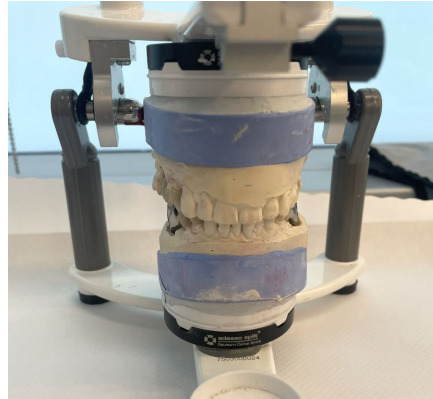
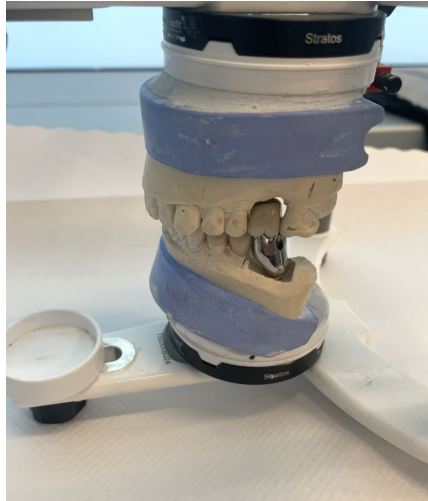


Restoration Design



- Shade 3R1.5
- Maxillary:
 - #3 Screwmentable CAD/CAM Abutment with Monolithic Zirconia Implant Crown
 - #14 Screwmentable CAD/CAM Abutment with Monolithic Zirconia Implant Crown
 - #5 Monolithic Zirconia Crown
- Mandibular:
 - #19 Screw-retained Titanium All-in-One Implant Crown
 - #20 Monolithic Zirconia Crown
 - #21 Monolithic Zirconia Crown
 - #28 Monolithic Zirconia Crown
 - #29 Monolithic Zirconia Crown
 - #30 Screw-retained Titanium All-in-One Implant Crown

Mounted Restorations



Screw-Retained Titanium Implant Design

- ❖ Due to the high crown:implant ratio of #19 and #30 implant crowns in combination with the slightly more buccal placement of the implants, it was determined that titanium screw-retained implant crowns would be more predictable than cement-retained ceramic restorations
- ❖ Screw-retained versus cement-retained implant crowns:
 - Screw-retained implant crowns have been found to have fewer biological and technical complications and higher ease of retrievability
 - Risk of element extrusion into sulcus found in cement-retained crowns but are not a cause for concern in screw-retained crowns
 - In a unibody abutment, there is no need for cement, leading to a stronger restoration
- ❖ Titanium all-in-one crowns would have a higher strength and fracture resistance than zirconia screwmentable crowns



Phase 6: Final Restoration Delivery

Sequence of Restoration

- ❖ The maxillary restorations were delivered first:
 - #3 Screwmentable CAD/CAM Abutment with Monolithic Zirconia Implant Crown
 - #14 Screwmentable CAD/CAM Abutment with Monolithic Zirconia Implant Crown
 - #5 Monolithic Zirconia Crown
- ❖ The mandibular restorations were delivered next:
 - #28 Monolithic Zirconia Crown
 - #29 Monolithic Zirconia Crown
 - #20 Monolithic Zirconia Crown
 - #21 Monolithic Zirconia Crown
 - #30 Screw-retained Titanium All-in-One Implant Crown
 - #19 Screw-retained Titanium All-in-One Implant Crown



Final Restoration Delivery



Final Restoration Delivery



Final Photographs



Next Steps

- ❖ Implant Post-Op Appointments
 - 3 month follow-up
 - 6 month follow-up
 - 1 year follow-up
 - Follow up at each recall appointment during periodontal charting and radiographic imaging
- ❖ Night Guard Fabrication
 - Scheduled for May 29th
- ❖ #29 Endo Retreatment 1 year follow-up

Reflection

- ❖ This case presented a unique set of challenges that I had to navigate, including communicating with numerous specialty clinics and my patient to provide the best treatment possible that addressed her oral health needs and desires. The most challenging aspect of providing treatment was in the planning of each step of the treatment plan, which required hours of preparation and consultation both in and out of the operatory. This experience allowed me to grow in my skills, my critical thinking ability, and my heart.
- ❖ It has been one of the greatest honors of my life to be able to help my patient regain confidence in her smile and restore function to her dentition. Seeing her smile at the final delivery of her restorations and sharing our collective experiences throughout our journey together was an irreplaceable moment that I will keep with me for the rest of my life. From start to finish, this case has allowed me to gain experience in interdisciplinary and truly comprehensive care, and has shaped who I am as a healthcare provider. Bonding with my patient and providing care that has changed her life has also changed mine for the better. This case truly demonstrated to me how life-changing dentistry can be, and the importance of treating our patients with the head, heart, and hands. I internalized the Dugoni spirit of humanism, and truly felt how widespread this spirit was in all my faculty, in my supportive faculty, my peers, and myself.



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