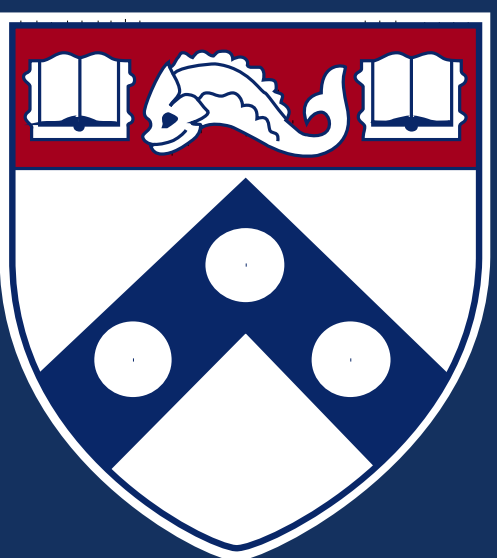




Maxillary Rehabilitation for a patient with cleft palate: Achieving Aesthetic and Functional Equilibrium in Complex Malocclusion

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Introduction

This study undertakes an in-depth examination of the intricate challenges faced by a patient afflicted with severe skeletal malocclusion, who underwent maxillary reconstruction but encountered difficulties in adapting to the resultant occlusion. The primary objective of this investigation is to elucidate the potential of prosthodontic intervention in achieving a harmonious alignment between the patient's aesthetic aspirations and functional requisites. The patient's medical history reveals a congenital condition involving cleft palate and lip, necessitating early maxillofacial reconstruction. Despite diligent orthodontic and advanced dental care, persistent malocclusion of Class III nature and congenitally and acquired missing teeth, coupled with both aesthetic and functional impediments, persisted. Consequently, the patient sought comprehensive dental reconstruction with the aim of attaining a Class I occlusion. In 2021, the patient underwent extensive reconstruction surgery, which included the placement of eight implants, four of which were zygoma implants and two of which were pterygoid implants. However, due to the complexity of the maxillary skeletal malformation and the extensive prior surgeries, the maxillary fixed implant-supported prosthesis had to be divided into two sections and then delivered to the patient. Initially, the patient expressed great satisfaction with the improved aesthetic appearance and enhanced masticatory function. However, he encountered difficulties in adjusting to the new occlusion. This manifested in symptoms of Temporomandibular Disorder, including jaw pain and tension headaches in the morning, hygiene problem because he couldn't get to pontic area properly with his floss to clean, which lead to inflammation and recessions around some implants. Additionally, the micromotion of the two-piece prosthesis, though minimal, caused discomfort for the patient. He reported the need for constant awareness of the position and movement of his lower teeth. In light of these challenges, the clinical team made the decision to design and fabricate a new prosthesis, this time opting for a removable implant-supported prosthesis.

Pre-operative

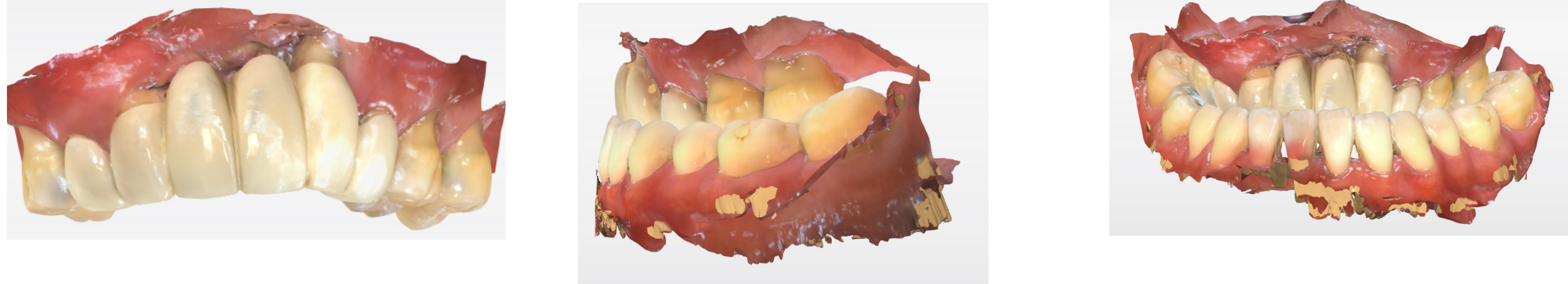


Figure 1, 2, 3 – Pre- operative intraoral scan, which was utilized in the virtual surgical planning.

Surgical Planning

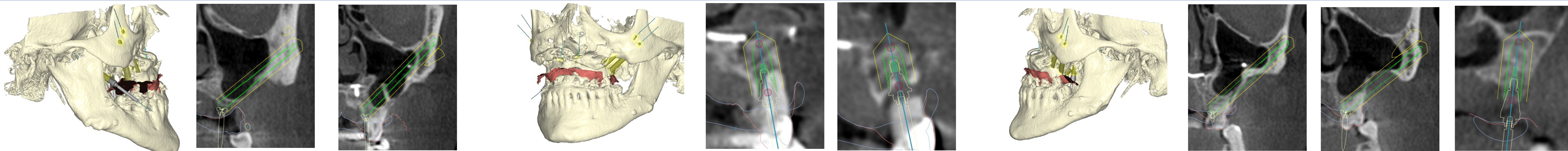


Figure 4, 5, 6 – Right side Quad zygoma implants surgical planning

Figure 7, 8, 9 –endosteal implants in the maxillary defect area. Only #9 implant was placed in due to lack of bone in #8

Figure 10, 11, 12 – Left side Quad zygoma and pterygoid implants surgical planning

Fixed Prosthesis



Figure 13, 14 – Occlusal view of fixed prosthesis abutments and prosthesis. Note the split between #7 and #8 to compensate for the #9 angled implant.

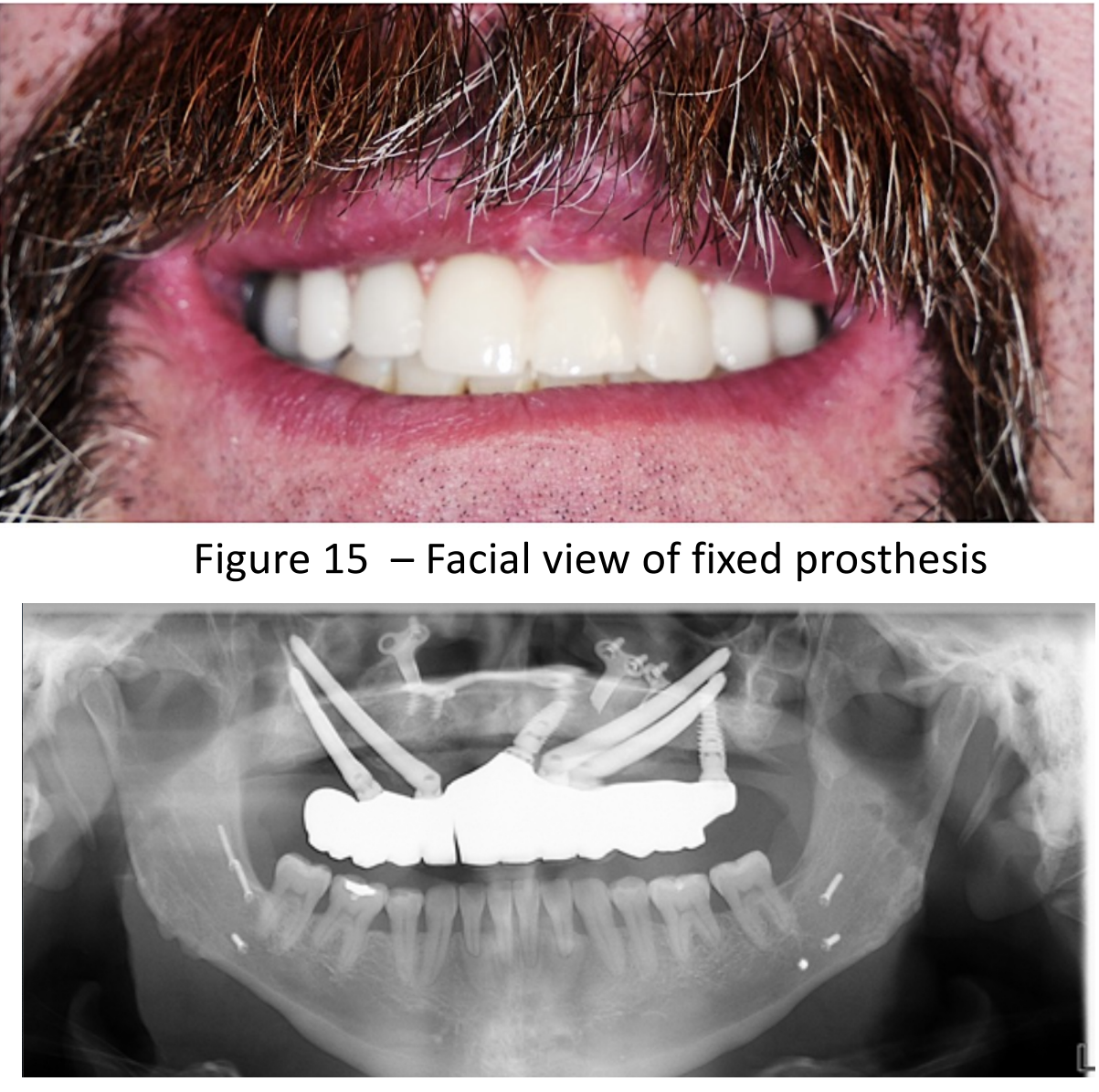


Figure 15 – Facial view of fixed prosthesis

Figure 16 – panoramic radiograph of fixed prosthesis

Removable Prosthesis

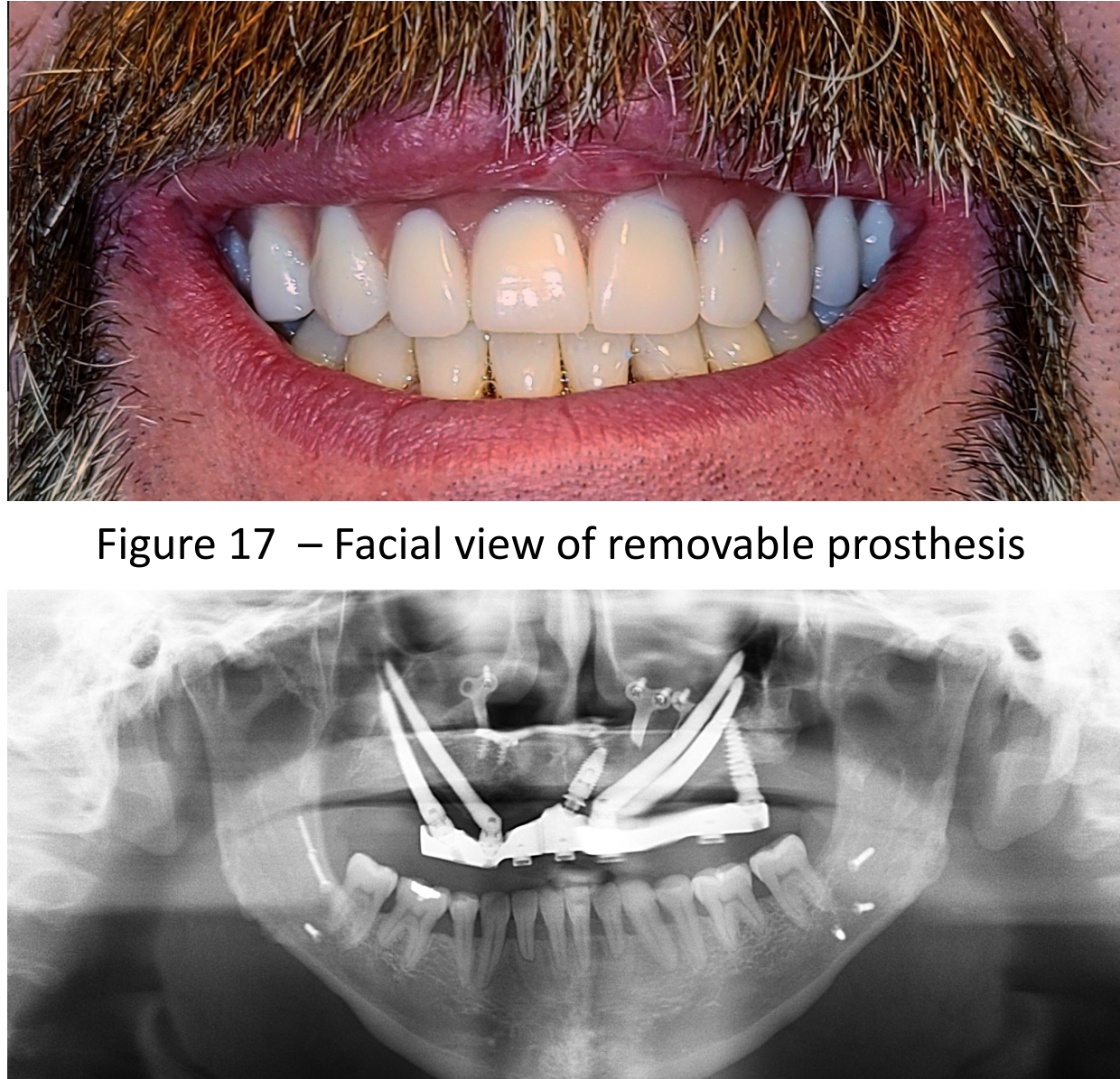


Figure 17 – Facial view of removable prosthesis

Figure 18 – panoramic radiograph of the milled bars



Figure 19 – Occlusal view of removable prosthesis

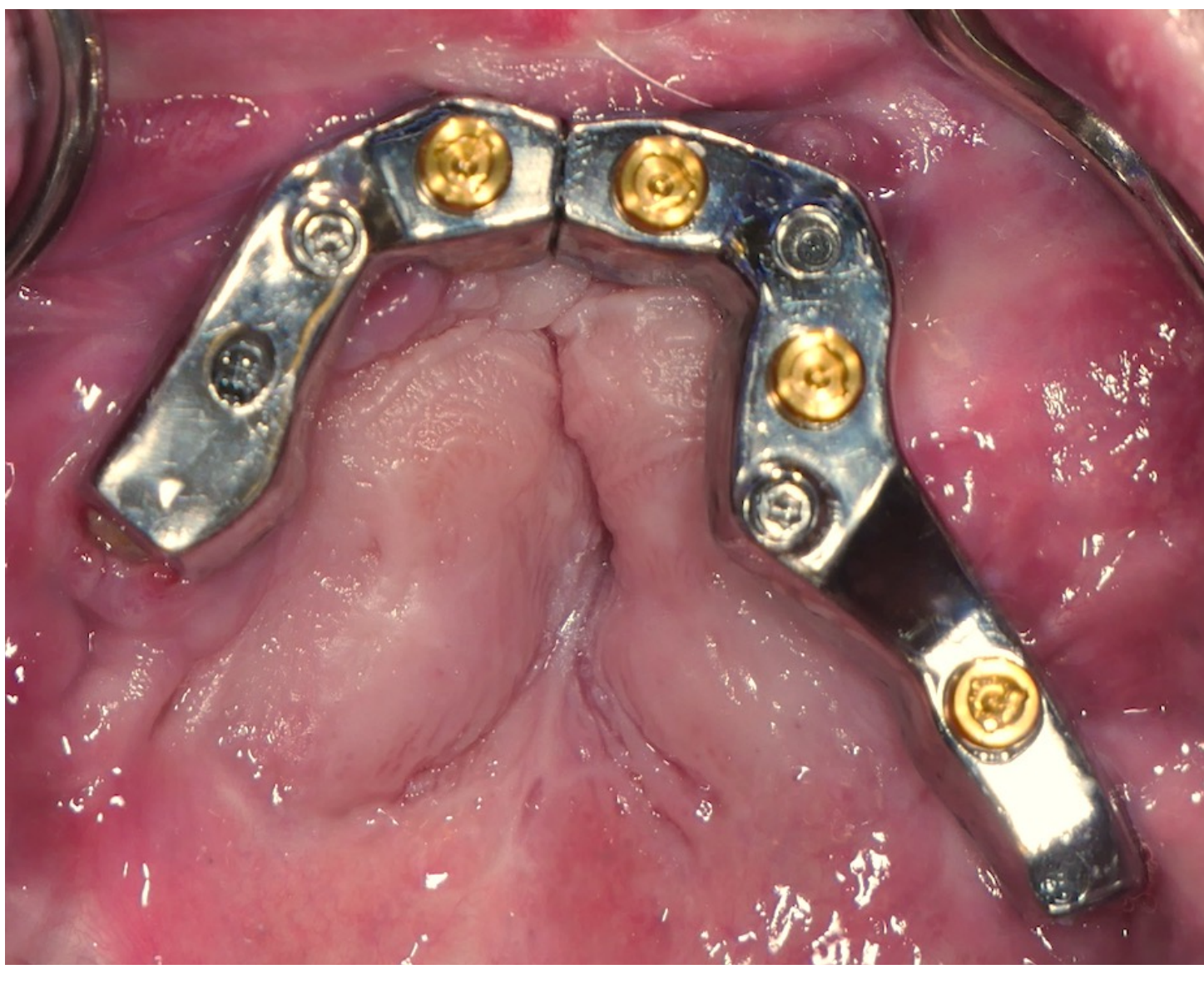


Figure 20 – Occlusal view of the milled bars

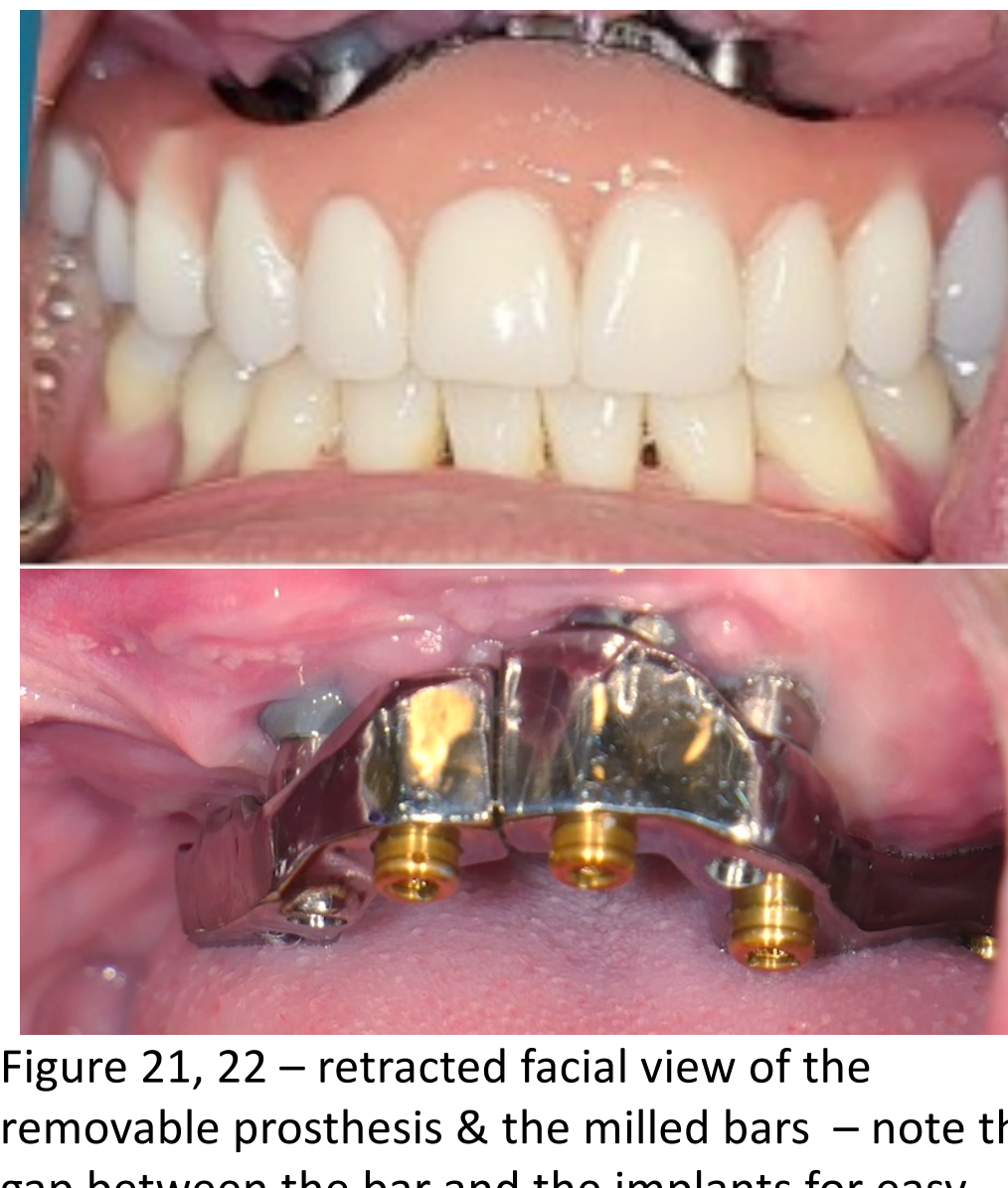


Figure 21, 22 – retracted facial view of the removable prosthesis & the milled bars – note the gap between the bar and the implants for easy cleaning

Fixed Prosthesis vs. Removable Prosthesis

Table I. Checklist for implant treatment: Extraoral examination (based on an acceptable existing prosthesis or an ideal wax-trial denture)^a

Superstructure	Fixed implant prostheses	Removable overdenture
Extraoral factors		
Facial support:	☐ Unnecessary	☒ Needed (evaluated with and without prosthesis)
Esthetic plane:	☐ Convex profile	☒ Concave profile
Maxillomandibular relationship (Angle class):	☐ Class I/II	☒ Class III (to be compensated)
Lip support	☒ Entire lip thickness displayed	☒ Trapped, thin upper lip
Smile line (determined during repose/speech/expanded smile)	☒ Low	☐ Average
Vestibular space:	☒ Little	☐ High (alveolar ridge visible during speech)
Horizontal tooth display:	☒ 6-10 teeth (no/1 cantilever possible)	☐ Increased during smiling
Length of the upper lip (subnasal to philtrum)	☐ Long (26-30 mm) ☒ Short (16-20 mm) = 0.9 mm of upper central teeth visible Average (21-25 mm) = 2.2 mm of upper central teeth visible	☐ 0-14 teeth (posterior soft tissue support possible) ☒ Short (16-20 mm) = 3.4 mm of upper central teeth visible

Table IV. Checklist for implant treatment: Intraoral examination (based on an acceptable existing prosthesis or an ideal wax-trial denture). Determine **free-way-space** and **incisal edge position** (touching the vermilion border of the lower lip during "F" sound)

Superstructure	Fixed complete denture	Removable overdenture
Intraoral factors		
Mucosal quality:	☐ Keratinized ☐ Nonmovable	☒ Nonkeratinized ☒ Movable
Mucosal quantity:	☐ Thick (molding possible)	☒ Soft tissue graft feasible: ☐ Yes ☒ No
Ridge palpation buccal and crestal:	☐ Buccal (convex), crestal (rounded, wide)	☒ Buccal (concave), crestal (thin, sharp)
Incisal papilla position:	☐ Palatal	☒ Bone graft feasible: ☐ Yes ☒ No
Crown-bone relationship/interarch space	☐ Optimal (minimal vertical resorption)	☒ Crestal ☐ buccal
Length of the clinical crown: (mean length of central incisors 10.5 mm)	☐ No	☒ Too long (to large vertical space) ☒ Sink porcelain accepted: ☐ Yes ☒ No
Tooth size to arch size discrepancy:	☐ No	☒ Yes (needs adaptation of S-ridge)
Speech disruption (phonetic zone):	☐ Type I (solely compact)	☒ Type III (dense trabeculated/thin corticalis)
Bone quality:	☐ Type II (dense trabeculated/thick corticalis)	☒ Type IV (porous spongiosa)
(approximately assessed from computed tomographic scan)		

The final prosthesis, presented to the patient, elicited a high degree of satisfaction. The patient expressed approval for both the aesthetics and functionality, echoing the contentment experienced with the prior prosthesis. Noteworthy is the removable prosthesis enabled better hygiene routine for the patient yet designed in a fashion that it serves as hybrid prosthesis. The strategic division of the titanium milled bar into two pieces, while maintaining the implant-supported overdenture as a single unit, effectively mitigated any perceptible movement during mastication or lip mobility. Also the angled maxillary anterior implant was not utilized in this prosthesis to provided more stability. The incisal length was reduced, and overjet was increased by 2 mm, which allowed the patient's mandibular anterior teeth to move and glide without constantly worrying about hitting the prosthesis. After two-weeks follow-up, the patient testified the alleviation of TMJ pain in the morning and improved chewing ability. As a result, the patient's overall oral sensation and functionality markedly improved, aligning closely with his expectations. The patient's resounding affirmation of the prosthesis and its associated alterations underscores the profound impact of this treatment on his quality of life.

This case underscores the presence of inherent biological limitations in effecting occlusal changes through fixed prosthetic interventions, including the full-arch implant-supported fixed prosthesis, particularly in cases of complex skeletal malformations. It emphasizes the critical role of prosthodontists in diligently pursuing solutions that not only align with the patient's anatomical constraints but also cater to their subjective comfort and contentment. Balancing functional efficacy with patient satisfaction necessitates a nuanced approach, ultimately culminating in a tailored, tolerable, and gratifying prosthesis.

Discussion

*This study was supported by the Maxillofacial
Prosthetics and Oral Oncology Fund of
Mr. and Mrs. Whitesell.*



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