

Complete Digital Workflow for Complex Rehabilitation of Full Arch Immediate Implant Placement and Immediate Loading, Transforming Class II Deep-bite into Class I Profile. A dream or reality? A Case Report

Mario Hertanto DDS, Shengtao Yang MS, Berna Saglik DDS MS FACP, Fei Liu DDS MS PhD FACP, Junying Li DDS MS PhD
Department of Biologic and Materials Sciences & Prosthodontics, University of Michigan School of Dentistry



BACKGROUND

- Nowadays, immediate loading of full-arch implant-supported fixed prostheses has become a popular treatment option when treating edentulous patients as it increases patient comfort and acceptance with comparable outcomes to conventional and early loading protocols ¹.
- Traditional approach can be challenging to quantify how much bone is to be removed. Through a digitally made virtual patient, the operator can see “the end in mind” and confirm if the outcome will satisfy the patient.
- This report presents a complete digital workflow using a virtual patient approach to determine the relationship between a future prosthetic prototype and the patient’s smile line. This relationship forms the basis of the entire treatment, facilitating the seamless execution of full arch immediate placement and loading.
- Virtual patient is a unique approach to digital implant planning and prosthetic design². It is a numerous superimposition of patient 3D images to produce 3D volume rendering of the patient’s face, teeth, soft tissue, and bone. With the integration of CBCT, Intra Oral Scanner (IOS), and Face scans as modern diagnostic tools, the fabrication of virtual patients becomes more accessible².

CLINICAL REPORT

- A 63-year-old healthy male, non-smoker patient suffered partial edentulism with the chief complaint: “I cannot eat or smile. I want dental implants to replace my missing teeth.”
- Clinical examinations showed a few terminal maxillary teeth, a class II profile, and an anterior deep bite. After discussing the risks and benefits of various treatment options, the patient chose a full-arch implant-supported fixed prosthesis.



Fig 1. Pretreatment Condition



Fig 2. Increasing the VDO with leaf gauge

A. lateral view;

B. Frontal view

C. Patient wearing bite splint for 6 months

METHODS & RESULTS

Digital planning

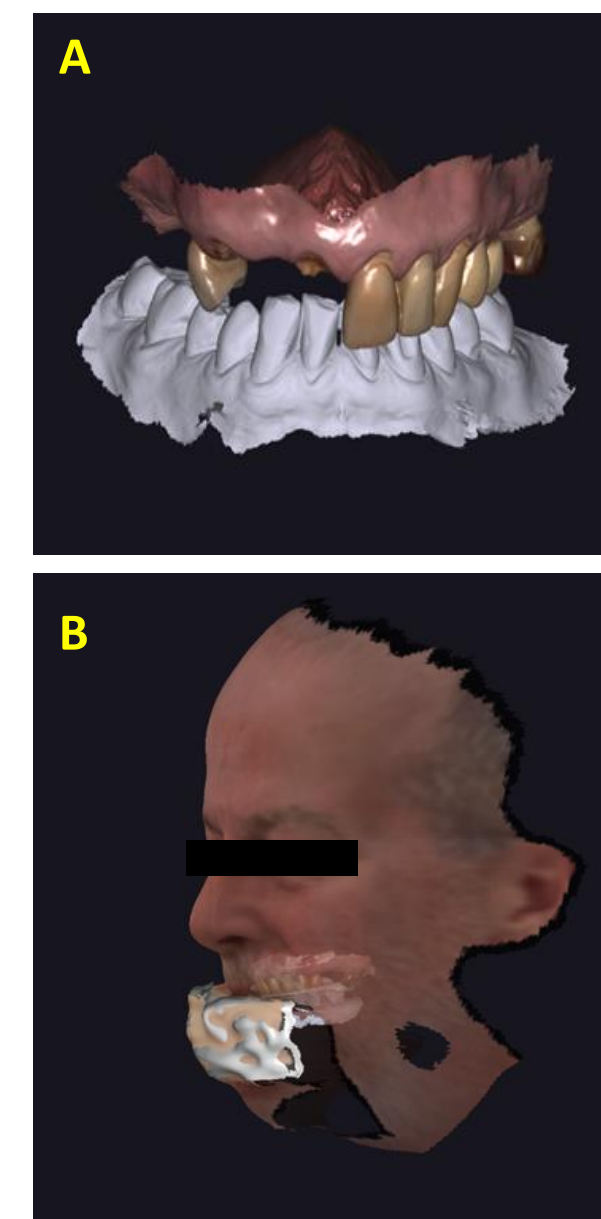


Fig 3. A. Intra Oral Scanner using TRIOS scanner; B. Virtual facebow is created from superimposition between facial scan and printed bite fork



Fig 4. Virtual patient to evaluate the needs and amount of bone reduction

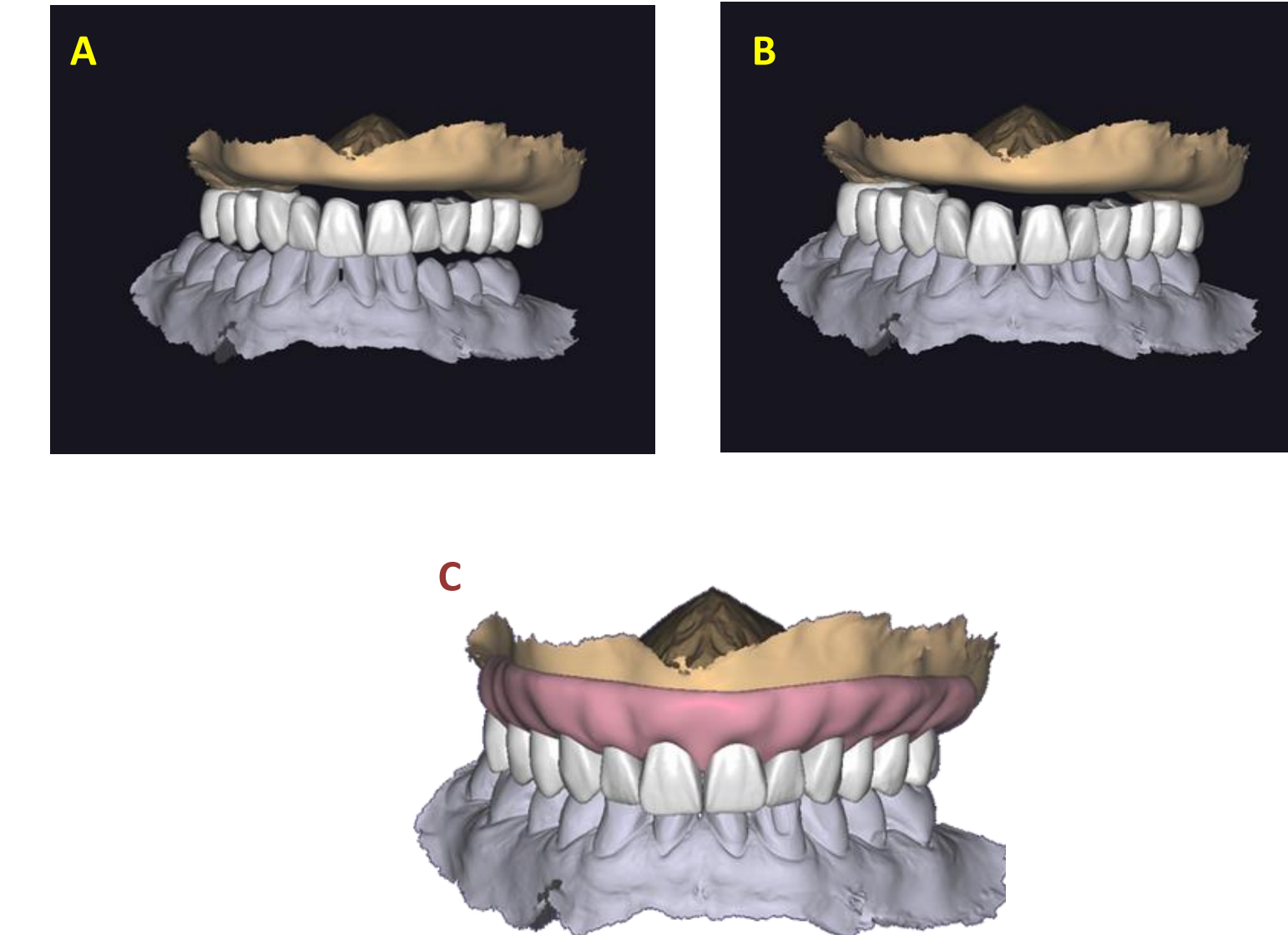


Fig 5. Using virtual articulator for virtual jaw movement simulation:
A. Right laterotrusion;
B. Maximum Intercuspation (MIP);
C. Fabricating the soft tissue for prototype

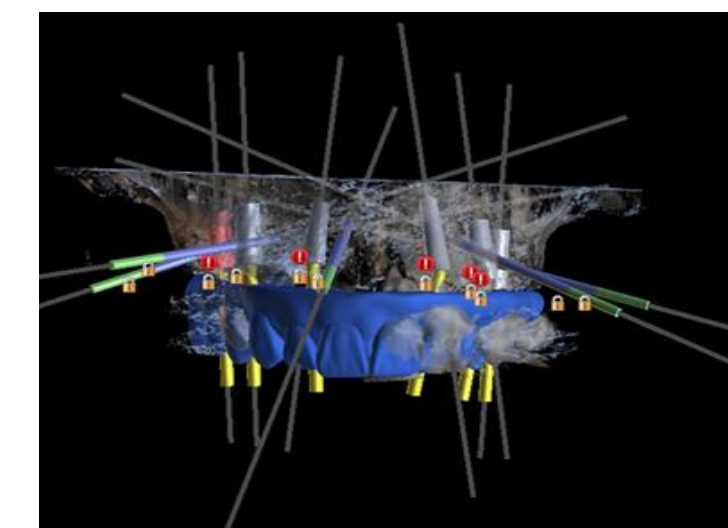


Fig 6. Prosthetically driven implant planning in relation to bone and prototype

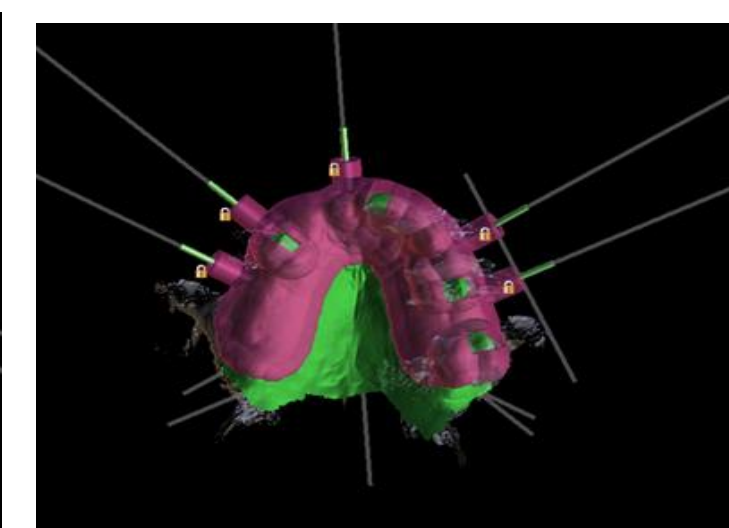


Fig 7. Fabricating tooth-support fix pin guide

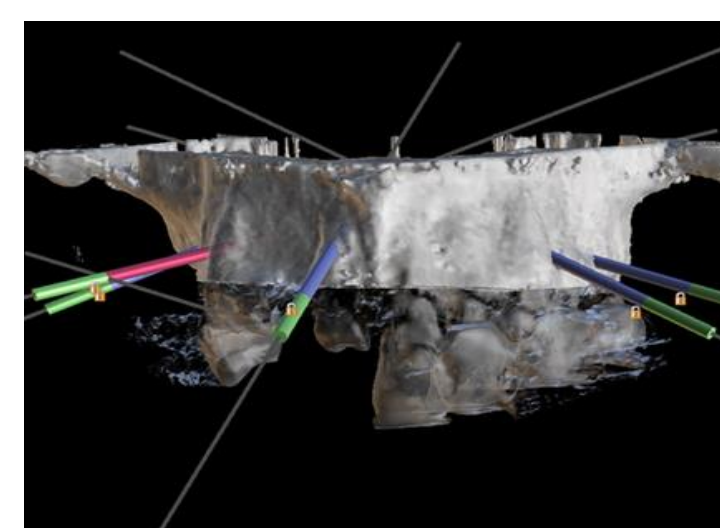


Fig 8. Designing bone reduction guide

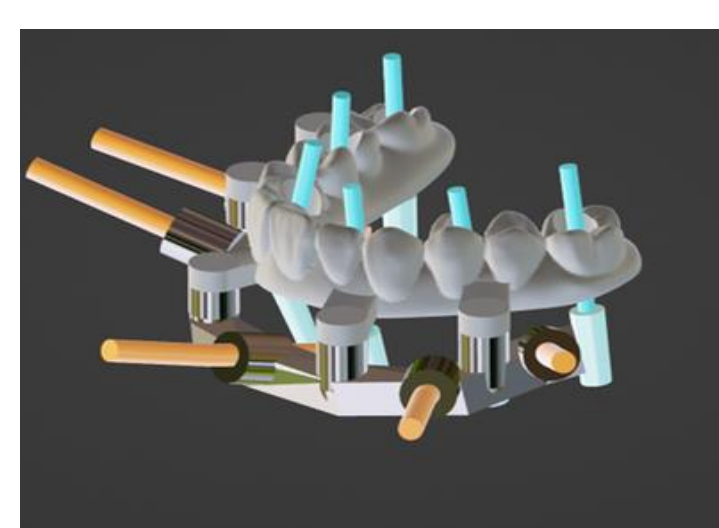


Fig 9. Designing implant guide which correlates with future prototype



Fig 10. Printed Fix pin guide



Fig 11. Implant guide that sit on bone reduction guide with magnet connector



Fig 12. Prototype try-in on the bone reduction guide

Translating digital planning into reality

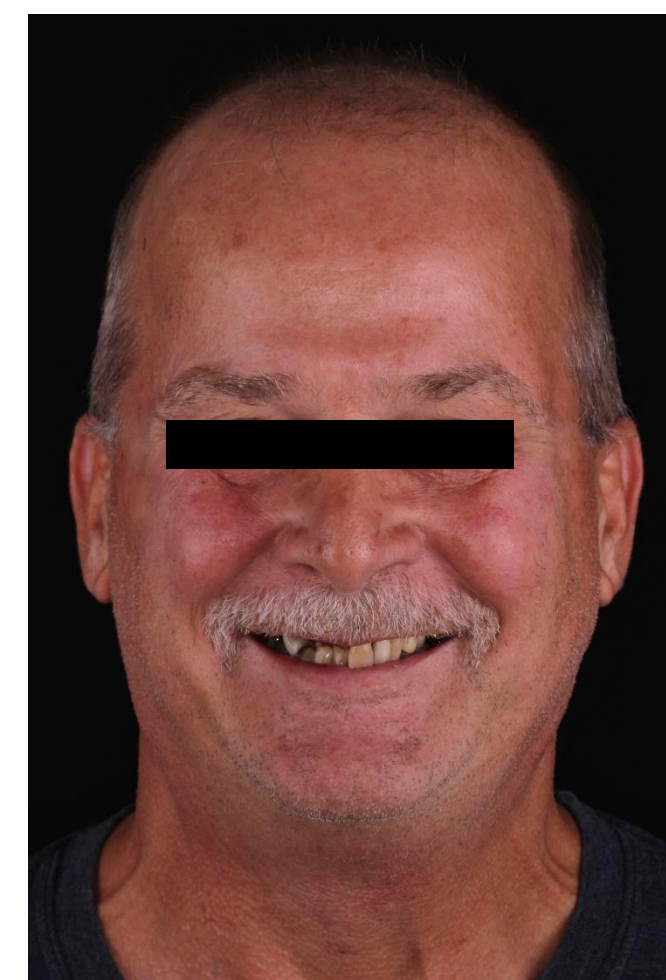


Fig 13. Extraoral Pre - treatment



Fig 14. Tooth supported fix pin guide placed

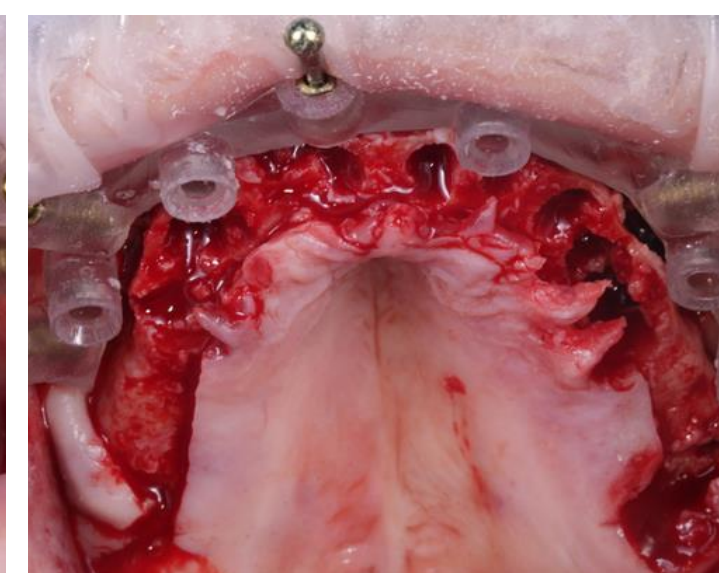


Fig 15. Remaining teeth extracted and bone reduction guide placed on the osteotomy sites made from fix pin guide.

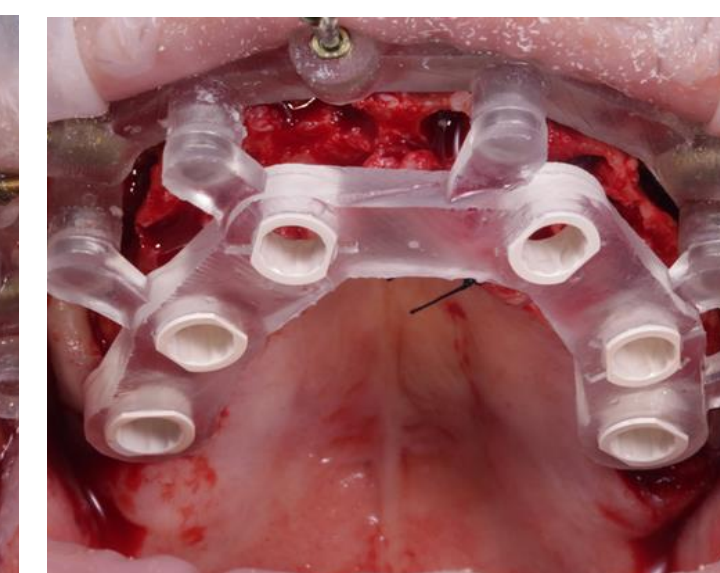


Fig 16. Implant guide sit on top of bone reduction guide and 6 implants placed fully guided

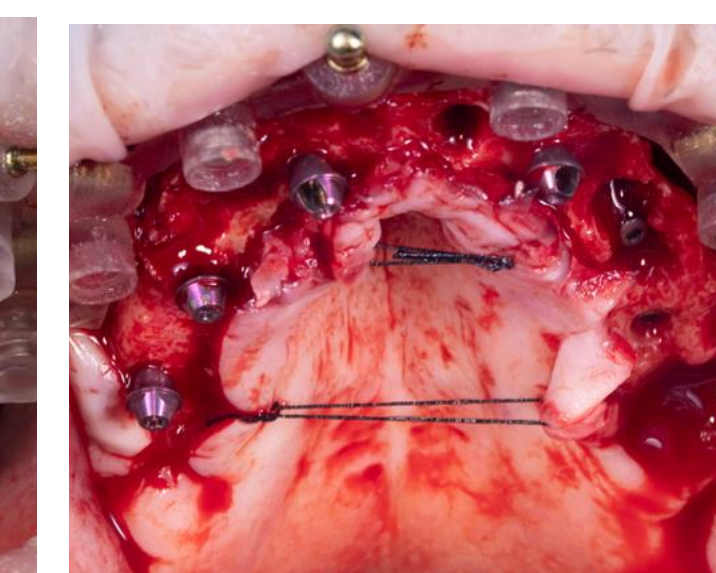


Fig 17. Multi Unit Abutment Placed on 4 implants that have primary stability, whereas cover screws placed on 2 implants that don't achieve primary stability



Fig 18. Prototype doesn't need to undergo any occlusal adjustment post surgery due to its precision with the planning. Canine guidance achieved exactly as shown on planning (Fig 5A)

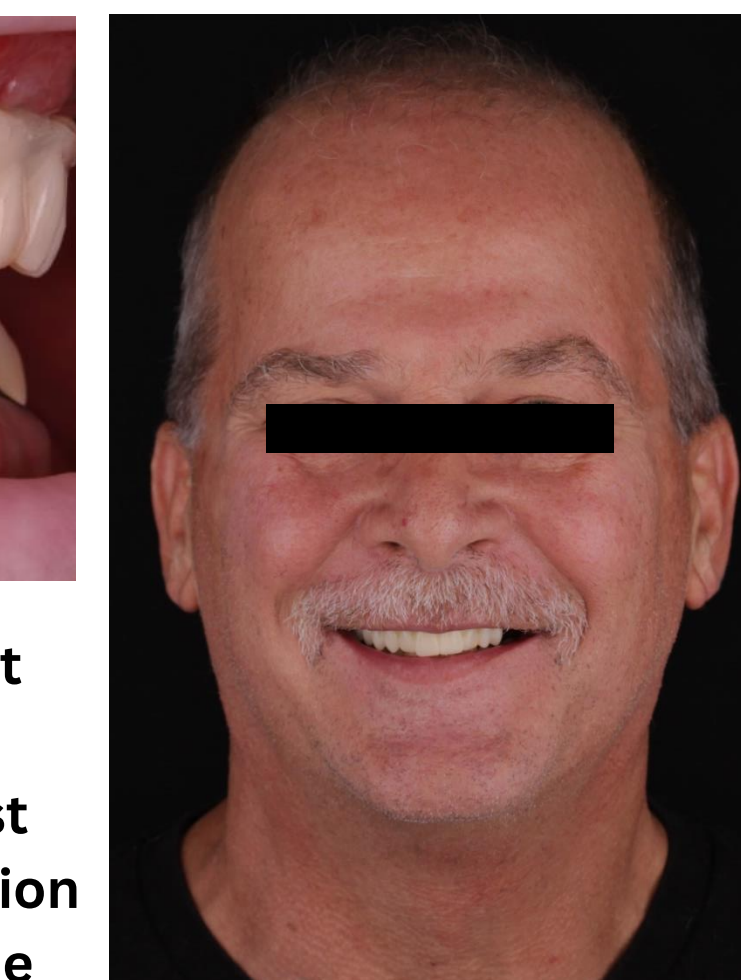


Fig 19. Extraoral Post - treatment

DISCUSSION

- 1.Virtual patient planning is beneficial for treating complex cases. The surgical planning and prosthetic design can be facilitated by having bone, intraoral soft tissue, and face at one framework².
- 2.In this case, we use a tooth-supported guiding stent as a reference to guide the fixation of the bone reduction guide as it is proven a good level of accuracy for immediate implant placement and loading ³.
- 3.The virtual patient provides the benefit of diagnosis and treatment planning even when the patient is absent, reduces visits, and maximizes treatment care ².

SUMMARY

1. This report describes a step-by-step procedure guide and highlights the accuracy of a fully digital workflow using virtual patient approach to meet complex rehabilitation needs, successfully transforming a class II deep bite into a class I.
2. The outcome demonstrating precision translation of the planning, accuracy in occlusion, superior smile, and patient-reported high satisfaction.



Fig 20. Intraoral photos showing obvious changes in occlusion
A. Patient shows class II division 2 deep bite
B. Patient shows class I angle

REFERENCES

- 1.Makarov N, Pompa G, Papi P: Computer-assisted implant placement and full-arch immediate loading with digitally prefabricated provisional prostheses without cast: a prospective pilot cohort study. International journal of implant dentistry 2021;7:1-9
- 2.Li J, Chen Z, Dong B, et al: Registering maxillomandibular relation to create a virtual patient integrated with a virtual articulator for complex implant rehabilitation: a clinical report. Journal of Prosthodontics 2020;29:553-557
- 3.Baruffaldi A, Baruffaldi A, Baruffaldi M, et al: A suggested protocol to increase the accuracy of prosthetic phases in case of full-arch model-free fully guided computer-aided implant placement and immediate loading. Oral and Maxillofacial Surgery 2020;24:343-351