ISSN: 2581-5989
PubMed - National Library of Medicine - ID: 101738774

International Journal of Dental Science and Innovative Research (IJDSIR)

IJDSIR : Dental Publication Service

Available Online at:www.ijdsir.com

Volume – 8, Issue – 6, November – 2025, Page No. : 231 - 236

Harmonizing Esthetics and Function through a Complete Digital Workflow: Full Mouth Rehabilitation with Guided Gingivectomy

[1]Aruna R Kamath, Post Graduate, Department of Prosthodontics and Crown and Bridge, Vokkaligara Sangha Dental College and Hospital, Rajiv Gandhi University of Health Sciences, (RGUHS), Bengaluru, India

[2]Anupama N M, Professor, Department of Prosthodontics and Crown and Bridge, Vokkaligara Sangha Dental College and Hospital, Bengaluru, India

[3]Vinayak Gowda, Professor, Department of Periodontics and Implantology, Vokkaligara Sangha Dental College and Hospital, Bengaluru, India

[4]Archana Shetty, Reader, Department of Prosthodontics and Crown and Bridge, Vokkaligara Sangha Dental College and Hospital, Bengaluru, India

Corresponding Author: Aruna R Kamath, Post Graduate, Department of Prosthodontics and Crown and Bridge, Vokkaligara Sangha Dental College and Hospital, Rajiv Gandhi University of Health Sciences, (RGUHS), Bengaluru, India

Citation of this Article: Aruna R Kamath, Anupama N M, Vinayak Gowda, Archana Shetty, “Harmonizing Esthetics and Function through a Complete Digital Workflow: Full Mouth Rehabilitation with Guided Gingivectomy”, IJDSIR- November – 2025, Volume – 8, Issue – 6, P. No. 231 – 236.

Copyright: © 2025, Aruna R Kamath, et al. This is an open access journal and article distributed under the terms of the creative common’s attribution non-commercial License. Which allows others to remix, tweak, and build upon the work non-commercially, as long as appropriate credit is given, and the new creations are licensed under the identical terms.

Type of Publication: Case Report

Conflicts of Interest: Nil

Abstract

A complete digital workflow for full mouth rehabilitation has been followed. Intra oral scanning and virtual articulation were used to obtain restorations based on Hobo Twin Stage concept. Customized gingivectomy surgical guide was fabricated using the data obtained from digital smile designing.

Keywords: full mouth rehabilitation, Hobo Twin Stage, Gingivectomy, Digital Smile Designing, Virtual Articulator, 3D printing, surgical guide

Introduction

Successful full mouth rehabilitation requires careful diagnosis, accurate facebow transfer, maxillomandibular relationship records, and diagnostic wax up to achieve optimal esthetics and function with stable static and dynamic occlusion. The conventional workflow for complete mouth rehabilitation involves the fabrication of restorations with the assistance of a mechanical articulator to simulate mandibular border movements to achieve appropriate occlusion. However intraoral scanners (IOSs) can record maxillomandibular relationship more accurately than physical recording materials.[2,3,4] The mechanical articulator (MA) have long been used as an essential tool during laboratory procedures to aid in both diagnosis and treatment planning. A mechanical articulator refers to a physical instrument that facilitates reproduction of the relationship between the jaw and the skull base, as well as mandibular articulation, in relation to each of the three spatial planes. With advancements in technology, the articulator is shifting from a mechanical device to its digital alternative - the virtual articulator. A virtual articulator is a virtual instrument involving software tools.[5,6,7] Dental computer-aided design (CAD) programs with a digital articulator module can be used to visualize eccentric occlusal interferences during virtual tooth placement and adjustment of cusp height.

To facilitate the fabrication of restorations and to achieve optimum occlusal conditions, Hobo and Takayama advocated the use of the twin-stage technique. Anterior restorations were set at a steep condylar inclination, while the posterior restorations were designed at a relatively flat condylar angle to facilitate the fabrication of restorations with mutually protected articulation occlusal schemes.[1]

Esthetics is an essential part of contemporary dental practice, and a pleasing smile depends on gingival tissue architecture and dental characteristics. The successful esthetic rehabilitation of patients with excessive gingival display and short clinical crowns often requires an interdisciplinary approach and close collaboration between a periodontist and prosthodontist. Esthetics-related crown lengthening surgery aims to provide adequate clinical crown length and diminish gingival display without violating the biologic width. Some authors suggest the use of diagnostic waxing to generate an acrylic resin or vacuum-formed surgical guide. However, these devices are often imprecise.

The use of computer-aided design and computer-aided manufacturing (CAD-CAM) techniques has helped surgeons perform more precise and predictable surgery and contributed to improved esthetics.[8]

This report presents a full mouth rehabilitation case utilizing the Hobo Twin-Stage technique in conjunction with a completely digital CAD-CAM workflow and 3D-printed surgical guides for precise gingivectomy.

Case Report

A 45 year old female patient presented with unesthetic gummy smile. The patient was dissatisfied with the appearance of the anterior fixed dental prosthesis which was fabricated 4 years ago.

Figure 1: Pre treatment pictures of patient

The patient had congenitally missing maxillary lateral incisors and eventually the space was occupied by maxillary canines. On examination patient presented with metal ceramic restoration with respect to 11, 21 and 31, 32, 33, 34, 41, 42, 43 and 44 with a deep overbite of 4mm.

©2025 IJDSIR, All Rights Reserved

Figure 2: Pretreatment intra oral pictures

Figure 3: OPG of the patient

Diagnostic casts of the patient were obtained. Facebow transfer was recorded and maxillary and mandibular casts were mounted using bite records made at maximum intercuspation. The occlusal plane was analyzed using Broadricks occlusal plane analyzer. Lower posterior teeth were waxed up according to HOBO condition 1 and anterior teeth were waxed up according to HOBO condition 2 for reference.

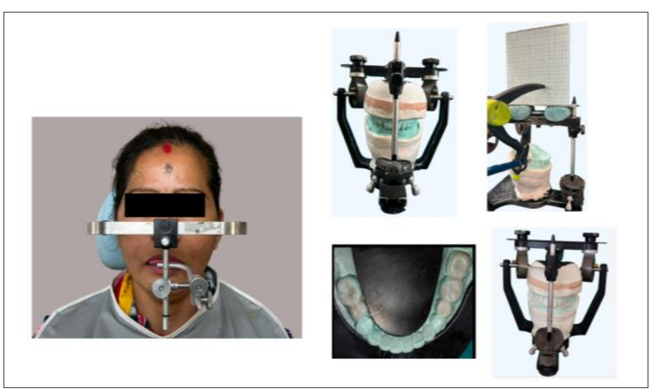

Figure 4:

35, 36 and 45, 46 teeth were prepared and an intraoral scan of prepared teeth and interocclusal record was obtained. The digital casts were mounted on virtual articulator (Artex) at HOBO condition 1. CAD CAM milled temporaries were fabricated and cemented. The patient was recalled after 6 weeks to ensure there was no discomfort. Once it was established that the patient was comfortable and acceptable of the restoration, the permanent restorations were milled and cemented.

Figure 5: Tooth preparation and intraoral scan

Figure 6: A Temporization; B Permanent Restoration

Patients smile was analysed using digital smile designing software and multiple smile designs were presented to the patient and the patient was given an option to select the design most appealing to her.

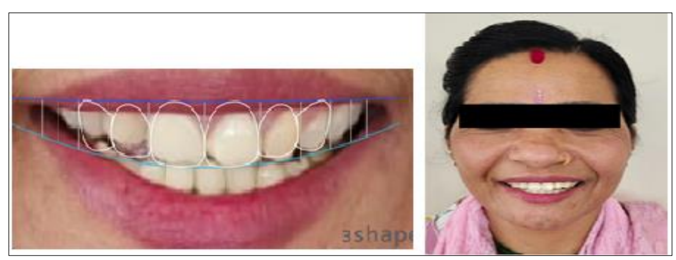

Figure 7: A smile analysis, b smile design the patient approved

Based on the chosen smile design, gingivectomy surgical guides were designed and 3D printed

©2025 IJDSIR, All Rights Reserved

Figure 8: Cad design of surgical guides; b 3d printed guides; c surgical guides placed intraorally

Figure 9: C gingivectomy performed; d surgical pack placed

Gingivectomy was performed using internal bevel incision under local anesthesia and surgical packs were placed for 2 days to assist healing. After 2 days the patient was recalled for anterior tooth preparation so that temporary restorations could be immediately placed to retain the gingival architecture. Intraoral scans were obtained to virtually mount it according to HOBO condition 2. Cad Cam temporaries were milled. Esthetics and phonetics was analyzed and a favourable functional anterior guidance was obtained. Patient wore the temporaries for 6 weeks and once the healing and esthetics was satisfactory, intraoral scan was obtained. All ceramic permanent restorations were fabricated and cemented.

Figure 10: Anterior teeth preparation

Figure 11: Temporization and verifying the anterior guidance

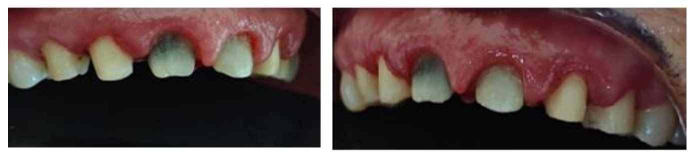

Figure 12: The new gingival architecture obtained after 8 weeks of healing

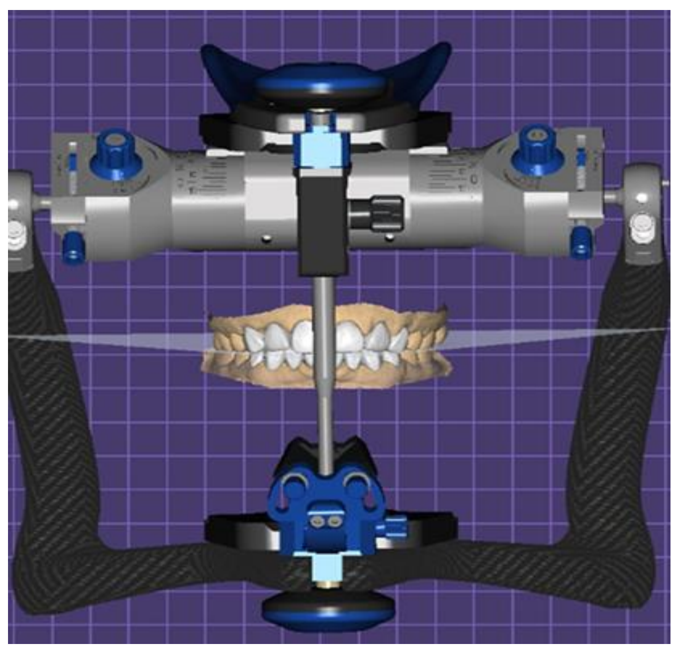

Figure 13: Virtual mounting

©2025 IJDSIR, All Rights Reserved

Figure 14: Permanent restoration

Figure 15: The final restoration

Discussion

As a development of the Twin Tables technique, the Twin-Stage procedure emphasises the cusp angle (e.g., 25° sagittal protrusive effective cusp angle) as the main occlusal determinant. It is more efficient and flexible for digital workflows because it only utilises one incisal guidance table that is modified for two scenarios (posterior wax-up without anterior guidance, followed by anterior guidance incorporation).

Because of its straightforward methodology and emphasis on cusp angle, which is readily programmed in CAD software, the Twin-Stage process is very viable for CAD/CAM and digital workflows. The Twin-Stage's standard settings (such as 40° condylar path and 15° lateral path) can be replicated by virtual articulators in software such as Exocad or 3Shape.

Incisal guidance can be adjusted for: Condition 1: Flat or minimal guidance for posterior restoration design with a standard cusp angle; Condition 2: Customised anterior guidance to achieve posterior disocclusion (e.g., 1.0 mm protrusive, 0.5–1.0 mm lateral).

The Twin-Stage's emphasis on mathematical accuracy is in line with digital workflows, which enable exact control of cusp shape and occlusal parameters. Digital design software can be used with the single-table, two-condition method since it eliminates the need for intricate articulator changes. CAD software can precisely reproduce the cusp angle, which is a stable parameter that guarantees repeatable disocclusion. By streamlining the manufacturing of restorations and cutting down on human wax-up time, digital scanning (Trios 4, iTero) and milling (Amann Girrbach Ceramill) are beneficial. By improving anterior guiding and posterior disocclusion precision, digital instruments reduce the need for chairside corrections. Intraoral try-in and cementation are performed after milling restorations (such as zirconia or lithium disilicate) utilising CAM equipment.

The main challenge is, to precisely create cusp angles and program virtual articulators, it is required to be proficient in CAD software. Certain CAD systems might not have preset Twin-Stage parameter settings, requiring manual corrections. Although Twin-Stage is more flexible than Twin Tables, there aren't many studies specifically confirming it in CAD/CAM workflows, even though its ideas are in line with digital occlusal design.

Because of its cusp-angle-based philosophy, streamlined methodology, which works well with virtual articulators and digital design tools, the Twin-Stage procedure is very viable for CAD/CAM and digital workflows. It is the recommended technique for contemporary whole mouth rehabilitation due to its efficient workflow and compatibility with digital instruments.[9]

©2025 IJDSIR, All Rights Reserved

Aspect	Twin Tables Technique	Twin-Stage Procedure
Digital Compatibility	Only partially valid; considerable adjustments are needed to replicate dual incisal tables in virtual articulators.	Very valid; cusp-angle, single-table focus works well with CAD/CAM processes.
Ease of Adaptation	Physical table-switching makes it complicated, and it's difficult to duplicate digitally without specialised programming.	streamlined process that is less complex because to two conditions that are simple to program in CAD software.
Software Support	limited; in order to replicate dual-table settings, manual changes are needed.	Strong; computerised occlusal design modules provide with standard cusp angle and articulator settings.
Clinical Efficiency	Because digital workflows involve numerous phases and physical interventions, they are less efficient.	more effective, as design and fabrication are streamlined by digital tools.
Research Support	There is little proof for digital use; analogue operations are the main source of validation.	There is little but increasing evidence that the ideas are in line with current trends in digital occlusal design.

Conclusion

The integration of the Hobo Twin-Stage technique with a completely digital workflow and digitally customized guided gingivectomy, allowed precise control over occlusion, esthetics, and soft-tissue contours. This case demonstrates that digitally assisted full mouth rehabilitation can enhance predictability, efficiency, and clinicians and patient satisfaction.

References

1. El Ashry MF, Hammad IA, Raheem IM. Cast-free modified digital twin-stage technique for complete mouth rehabilitation: A dental technique. The Journal of Prosthetic Dentistry. 2024 Sep 1;132(3):488-95.
2. Fraile C, Ferreiroa A, Romeo M, Alonso R, Pradíes G. Clinical study comparing the accuracy of interocclusal records, digitally obtained by three different devices. Clinical oral investigations. 2022 Feb;26(2):1957-62.
3. Gjelvold B, Chrcanovic BR, Korduner EK, Collin-Bagewitz I, Kisch J. Intraoral digital impression technique compared to conventional impression technique. A randomized clinical trial. Journal of Prosthodontics. 2016 Jun;25(4):282-7.
4. Ender A, Mehl A: In-vitro evaluation of the accuracy of conventional and digital methods of obtaining full-arch dental impressions. Quintessence Int 2014;46:9-17
5. Lepidi L, Galli M, Mastrangelo F, Venezia P, Joda T, Wang HL, Li J. Virtual articulators and virtual mounting procedures: where do we stand?. Journal of Prosthodontics. 2021 Jan;30(1):24-35.
6. Koralakunte PR, Aljanakh M: The role of virtual articulator in prosthetic and restorative dentistry. J Clin Diagn Res. 2014;8:Ze25-28
7. Bisler A, Bockholt U, Kordass B, Suchan M, Voss G. The virtual articulator. Int J Comput Dent. 2002;5:101-06
8. Liu X, Yu J, Zhou J, Tan J. A digitally guided dual technique for both gingival and bone resection during crown lengthening surgery. The Journal of prosthetic dentistry. 2018 Mar 1;119(3):345-9.
9. Rao BL. HOBO's Twin-Table & Twin-Stage Techniques in CAD/CAM Work Flow–A Review.

©2025 IJDSIR, All Rights Reserved