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CASE REPORT

DIGITAL INNOVATION IN IMMEDIATE DENTURE DESIGN: A NEW ERA OF PATIENT-CENTERED CARE: A CLINICAL CASE REPORT

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Abstract

Background: Immediate complete dentures are frequently associated with reduced retention and stability because the prosthesis is fabricated before the post-extraction anatomy has stabilized. The resulting changes in the residual ridge and soft tissues may require early adjustment or replacement. These difficulties become particularly important when rapid prosthetic rehabilitation is required because of an impending systemic medical treatment.

Case Presentation: A 70-year-old woman presented with an ill-fitting maxillary immediate complete denture, inadequate retention, localized discomfort, and a symptomatic buccal exostosis. Following localized alveoloplasty, expedited prosthetic rehabilitation was required because the patient was scheduled to undergo breast cancer surgery followed by systemic chemotherapy. The conventional sequence of multiple clinical and laboratory appointments was therefore considered impractical.

Clinical Technique: The existing immediate denture was modified and used as a functional impression carrier. Underextended borders were corrected with sectional polyvinylsiloxane putty border molding, followed by a closed-mouth definitive impression with light-body polyvinylsiloxane. The resulting impression was digitized using a 3Shape E4 laboratory scanner. The mandibular dentition and interocclusal relationship were recorded with a 3Shape TRIOS 4 intraoral scanner. The prosthesis was digitally designed using the 3Shape Dental System and fabricated with a SprintRay Pro2 three-dimensional printer using dedicated denture-base and tooth resins.

Outcome: The resulting prosthesis demonstrated clinically satisfactory retention, stability, and tissue adaptation. The workflow reduced intermediate laboratory procedures and allowed rapid prosthetic rehabilitation within the patient's limited treatment window. At follow-up after two cycles of chemotherapy, the oral tissues appeared healthy, without clinical evidence of xerostomia or oral mucositis, and the patient reported satisfactory prosthesis use.

Conclusion: Using an existing immediate denture as a modified functional impression carrier can provide a practical connection between conventional prosthodontic principles and digital denture fabrication. This hybrid approach may be useful for selected patients in whom rapid prosthetic treatment is required and conventional laboratory timelines are difficult to accommodate.

Keywords: Immediate Complete Denture; Digital Denture; Hybrid Analog-Digital; Three-Dimensional Printing; Computer-Aided Design and Computer-Aided Manufacturing; Prosthodontics

INTRODUCTION

The fabrication of complete removable dentures traditionally involves a sequence of clinical and laboratory procedures, including preliminary impressions, custom tray fabrication, border molding, definitive impressions, jaw-relation records, tooth arrangement, and laboratory processing. These procedures remain clinically valuable because they allow the clinician to evaluate tissue support, border extension, occlusion, and prosthesis adaptation at several stages of treatment. At the same time, the conventional workflow requires multiple appointments and laboratory procedures, and the cumulative nature of these steps may increase treatment time and the potential for procedural errors. The quality of the final prosthesis therefore depends not only on the materials used but also on the accuracy and consistency of each clinical and laboratory stage [1,2].

Impression making remains one of the most important stages of complete denture treatment. Adequate retention and stability depend on accurate recording of the denture-bearing tissues and appropriate functional extension of the peripheral borders. Polyvinylsiloxane impression materials have been widely used because of their dimensional stability, elastic recovery, detail reproduction, and resistance to permanent deformation [2]. Different border-molding approaches have been described, including sectional and single-stage techniques. Clinical studies have shown that silicone-based border molding can provide satisfactory recording of the functional vestibular anatomy when the material is appropriately manipulated and functional movements are incorporated into the procedure [3,4].

The introduction of computer-aided design and computer-aided manufacturing has changed the way complete dentures can be planned and fabricated. Digital workflows permit clinical information to be converted into digital datasets that can be stored, modified, transferred electronically, and reused for future prosthetic treatment. Earlier clinical studies demonstrated that computer-aided design and computer-aided manufacturing dentures can provide favorable denture-base adaptation and retention compared with conventional fabrication methods [5-7]. A systematic review and meta-analysis involving 73 studies further demonstrated that computer-aided design and computer-aided manufacturing complete dentures can reduce chairside time and overall treatment costs while providing clinically acceptable outcomes [8].

The development of additive manufacturing has expanded these possibilities further. Three-dimensional printing permits denture bases and prosthetic teeth to be produced directly from digital designs and offers advantages in manufacturing flexibility and digital reproducibility. Recent clinical evidence has demonstrated favorable intaglio surface trueness of three-dimensional printed denture bases, with printed bases showing greater surface trueness than conventional analog denture bases in one clinical investigation[9]. Nevertheless, three-dimensional printing should not be considered universally superior to conventional or milled fabrication. Differences in resin composition, printing parameters, post-processing, mechanical properties, color stability, and long-term clinical behavior remain important considerations [10]. Systematic reviews published in recent years have provided a more balanced assessment of digital complete dentures. Thu et al. identified substantial variation among digital clinical and laboratory protocols, emphasizing that the clinical steps used to acquire the initial records remain important determinants of the final result [11]. Similarly, Avelino et al. reported that digitally fabricated complete dentures generally demonstrated clinical performance comparable with or better than conventional dentures, although conventional printed dentures showed greater retention than conventional dentures in some analyses and patient-reported outcomes were not consistently different between manufacturing methods [12].

Fouda et al. likewise found that digital workflows generally offered advantages in fabrication time and cost-effectiveness, but patient satisfaction and clinician-assessed denture quality were not consistently superior to conventional approaches [13].

Immediate complete dentures present a particular challenge because they are fabricated before extraction of the remaining natural teeth. The denture-bearing anatomy is therefore estimated rather than recorded after extraction and healing. Subsequent changes in the residual ridge and soft tissues may alter the relationship between the denture base and supporting tissues, leading to reduced retention, stability, and comfort. Digital techniques have recently been applied to immediate complete denture treatment, demonstrating that digital workflows can reduce some of the conventional laboratory stages and provide an efficient means of prosthesis fabrication [14].

The clinical problem becomes more complex when an existing immediate denture becomes significantly inaccurate during healing and the patient cannot reasonably undergo a conventional sequence of new impressions, cast fabrication, custom tray construction, and laboratory processing. In such situations, repeating the entire conventional procedure may require more time than the patient's medical circumstances allow. The existing prosthesis, however, may still contain useful information regarding tooth position, vertical dimension, occlusal relationships, and facial support.

The present case describes a hybrid approach in which the patient's existing immediate denture was not discarded. Instead, its deficient borders were corrected using polyvinylsiloxane putty, allowing the prosthesis to function as a patient-specific impression carrier. A definitive light-body polyvinylsiloxane impression was then obtained and digitized using a laboratory scanner. The opposing dentition and interocclusal relationship were recorded with an intraoral scanner, and the resulting datasets were incorporated into a computer-aided design workflow for three-dimensional printing.

The relevance of this approach is particularly apparent in patients who require rapid dental rehabilitation because of impending systemic medical treatment. In the present case, the need for a functional prosthesis coincided with an imminent oncological treatment schedule. The hybrid technique permitted functional tissue recording using a conventional elastomeric material while avoiding several intermediate laboratory stages. At the same time, digital fabrication allowed the recorded anatomy to be transferred directly into the definitive prosthesis. Although previous reports have described fully digital immediate denture workflows [14], the use of an existing, poorly fitting immediate denture as a modified functional impression carrier followed by laboratory digitization and additive manufacturing has received considerably less clinical attention. The present report therefore describes a practical hybrid protocol designed to preserve useful information from an existing prosthesis while adapting it to the patient's current anatomy.

CASE REPORT

A 70-year-old woman presented to the College of Dental Medicine at the Medical University of South Carolina with severe discomfort, localized pain, and poor retention of her maxillary immediate complete denture. The prosthesis had been inserted immediately after extraction of the remaining maxillary teeth in the oral surgery department of the same institution. During the subsequent healing period, however, the denture no longer adapted adequately to the changing maxillary anatomy.

Clinical examination demonstrated satisfactory healing of the extraction sites, except for a prominent buccal exostosis in the right maxillary posterior region corresponding to the areas of teeth #4, #5, and #6. The region showed localized erythema and tenderness (Figure 1).

The patient also had shallow buccal vestibules and a moderately flat palatal vault. The maxillary immediate denture exhibited inadequate adaptation and deficient peripheral extension. The mandibular arch was dentate and had been restored with full-coverage fixed crowns fabricated from different restorative materials (Figure 1).

Figure 1. Initial Intraoral clinical presentation. Intraoral views demonstrating the poorly adapted maxillary immediate complete denture, localized buccal exostosis with associated erythema and tenderness in the right maxillary posterior region, shallow buccal vestibules, and the opposing mandibular dentition restored with full-coverage fixed crowns.

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No additional intraoral lesions or clinically significant soft-tissue trauma were identified.

An oral and maxillofacial surgery consultation was obtained during the same visit. Because the buccal exostosis was symptomatic and interfered with the prosthesis, localized alveoloplasty was performed to remove the bony prominence.

Under ordinary circumstances, definitive prosthetic treatment would be postponed until appropriate healing of the surgical site had occurred. In this patient, however, the treatment plan was influenced by an urgent medical schedule. She had recently been diagnosed with breast cancer and was scheduled to undergo lumpectomy followed by systemic chemotherapy the following week. Providing a functional and comfortable prosthesis within the available treatment period was therefore considered an important component of her dental care.

Because of the ongoing medical treatment, the patient was unable to attend the routine 24-hour postoperative dental appointment. She subsequently returned after completing two cycles of chemotherapy. At that visit, she reported a favorable oncological response. Clinical examination demonstrated satisfactory healing of the alveolar and soft tissues. No clinical evidence of xerostomia, oral mucositis, or other chemotherapy-associated oral complications was observed.

Because the original immediate denture was poorly adapted and conventional prosthetic treatment could not be completed within the available timeframe, a hybrid analog-digital workflow was selected.

The existing denture was retained and modified rather than discarded. Its deficient peripheral borders were extended with high-viscosity polyvinylsiloxane putty, allowing the denture to function as a patient-specific impression carrier. A definitive light-body polyvinylsiloxane wash impression was subsequently obtained within the modified prosthesis. The resulting impression was digitized and used as the basis for computer-aided denture design and additive manufacturing.

MATERIALS AND METHODS

The digital workflow combined conventional elastomeric impression procedures, laboratory scanning, intraoral scanning, computer-aided design, and additive manufacturing.

The modified maxillary impression was digitized with a 3Shape E4 desktop laboratory scanner (3Shape A/S, Copenhagen, Denmark). The opposing mandibular dentition and interocclusal relationship were recorded using a 3Shape TRIOS 4 intraoral scanner. The resulting digital datasets were processed using the 3Shape Dental System software.

The definitive prosthesis was fabricated using a SprintRay Pro2 three-dimensional printer (SprintRay Inc., Los Angeles, CA, USA). Apex Base resin in Original Pink was used for the denture base, and Apex Teeth resin in Shade A2 was used for the prosthetic teeth. The uncured flowable form of the Apex Base resin was also used as the bonding medium between the printed teeth and denture base before final polymerization.

The laboratory fabrication process required approximately 40 minutes for digital denture design, performed in collaboration with a dental student. Printing of the denture base required approximately 1 hour and 17 minutes, while printing of the tooth segments required approximately 25 minutes. Post-processing, assembly, bonding, and final polymerization required approximately 1 hour.

Clinical Border Correction and Definitive Impression

The peripheral borders of the existing immediate denture were first evaluated intraorally. Because the flanges were underextended, high-viscosity polyvinylsiloxane putty was added incrementally to the deficient areas (Figure 2). Border correction was performed in sections to permit controlled adaptation of the material to the patient's vestibular anatomy.

During border molding, the clinician manually manipulated the facial tissues while the patient performed functional movements to activate the surrounding musculature. Particular attention was given to the buccal vestibule and posterior palatal region to obtain adequate extension without overextension. Once the desired border contours had been established, excess polyvinylsiloxane that had extended onto the intaglio surface was removed with a laboratory blade. Approximately 2 mm of material was maintained as a continuous peripheral rim along the denture borders.

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The modified denture was then prepared for the definitive impression. Polyvinylsiloxane tray adhesive was applied to the modified denture, followed by placement of low-viscosity light-body polyvinylsiloxane over the intaglio surface (Figure 2).

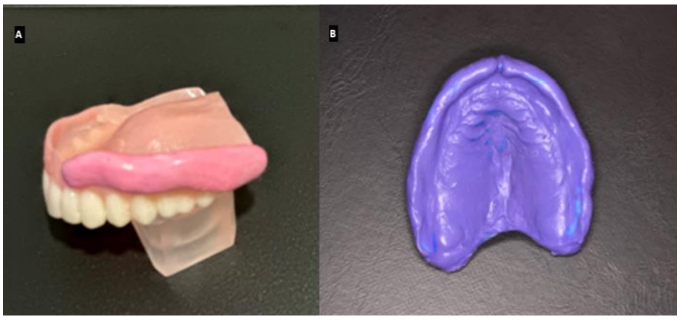

Figure 2. Clinical modification of the existing immediate denture and definitive impression procedure.

Sequential clinical views demonstrating sectional addition of high-viscosity polyvinylsiloxane putty to the deficient denture borders, functional border molding, trimming of excess material, and subsequent application of light-body polyvinylsiloxane for the definitive closed-mouth impression.

The resulting impression was digitized and used as the basis for computer-aided denture design and additive manufacturing. The definitive prosthesis was designed using the 3Shape Dental System and fabricated with a SprintRay Pro2 3D printer.

The denture was seated intraorally, and the patient was guided into the previously established vertical dimension of occlusion. Functional movements were repeated during polymerization of the impression material to refine the peripheral extension and record the dynamic relationship between the denture borders and surrounding soft tissues.

Digital Scanning, Denture Design, and Additive Manufacturing

After removal from the oral cavity, the definitive maxillary PVS impression was scanned using the 3Shape E4 laboratory scanner.

The digital acquisition process included scanning of the definitive maxillary impression, acquisition of the opposing mandibular dentition, and registration of the interocclusal relationship (Figure 3).

This generated the digital datasets required for computer-aided denture design.

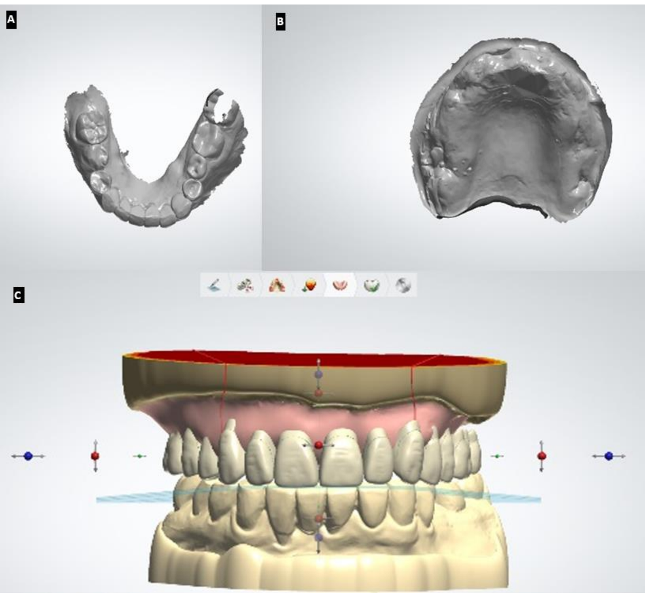

Figure 3. Digital acquisition and computer-aided denture design.

Digital workflow showing laboratory scanning of the definitive maxillary polyvinylsiloxane impression, intraoral scanning of the opposing mandibular dentition and interocclusal relationship, digital alignment of the maxillary and mandibular arches, and virtual design of the definitive complete denture.

The resulting datasets were imported into the 3Shape Dental System. The maxillary and mandibular digital models were aligned, and the maxillomandibular relationship was evaluated. The virtual denture was then designed with attention to the required denture-base thickness, peripheral contours, tooth position, and overall facial and occlusal form.

A lingualized occlusal scheme was selected, with a 15-degree cusp inclination. This arrangement was chosen to provide a stable occlusal relationship while limiting potentially destabilizing lateral forces. The prosthetic teeth were arranged digitally and incorporated into the final denture design before export to the printing software.

The denture base was printed horizontally using Apex Base resin, while the prosthetic teeth were printed separately using Apex Teeth resin.

Following printing, the denture base and tooth segments were cleaned, assembled, and bonded before final polymerization (Figure 4).

Figure 4. Additive manufacturing, assembly, and final prosthesis.
Three-dimensional printing of the denture base and prosthetic tooth segments, followed by positioning of the printed tooth segments within the denture base, application of uncured denture-base resin at the interfaces, final polymerization, and the completed definitive maxillary complete denture.

Before final polymerization, uncured flowable Apex Base resin was applied at the interfaces between the tooth segments and denture base. The assembled prosthesis was then subjected to the prescribed final thermal and ultraviolet-light polymerization procedure.

After completion of post-processing and inspection of the finished prosthesis, the denture was clinically evaluated and delivered to the patient (Figure 5).

Figure 5. Intraoral clinical appearance of the definitive prosthesis following completion of post-processing, final polymerization, and clinical delivery.

DISCUSSION

The present case demonstrates a practical method for combining conventional prosthodontic procedures with digital manufacturing when the usual treatment sequence cannot be completed within the available clinical timeframe. The important feature of this approach was not the replacement of conventional prosthodontic principles with digital technology. Rather, the existing immediate

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denture was used as a starting point for recording the patient's current anatomy, after which the corrected impression was transferred into a digital workflow.

This distinction is clinically important. Digital fabrication does not eliminate the need for accurate tissue recording, functional border extension, appropriate maxillomandibular relationships, or careful clinical evaluation. These factors continue to determine the biological and mechanical performance of a complete denture [1,2,7].

Immediate dentures are inherently more difficult to manage than dentures fabricated after tissue healing because their intaglio surfaces are based on an anticipated post-extraction anatomy. Following extraction, the residual ridge and surrounding soft tissues undergo changes that may alter the relationship between the denture and supporting tissues. The resulting loss of retention and stability may require adjustment, relining, or replacement.

In the present patient, these anatomical changes were accompanied by a symptomatic buccal exostosis, shallow vestibular anatomy, and the need for surgical correction. The situation was further complicated by the patient's imminent breast cancer treatment. A conventional sequence of new impressions, cast fabrication, custom tray construction, definitive impression, and laboratory processing would have required additional time and appointments that were difficult to accommodate.

The modification of the existing prosthesis with polyvinylsiloxane provided a practical alternative. Polyvinylsiloxane has favorable dimensional stability, elastic recovery, detail reproduction, and resistance to distortion, making it suitable for recording complex intraoral anatomy [2]. In this case, the material was used not simply as a conventional impression material but as a means of converting the existing denture into an individualized impression carrier.

The sectional approach was particularly useful because the original denture required correction in both the vertical and horizontal dimensions of the peripheral borders. Sectional border molding permitted the deficient regions to be addressed individually and allowed the clinician to assess the relationship between the material and the functional vestibular anatomy. Previous studies have demonstrated that silicone-based border molding can provide clinically acceptable functional extension [3,4]. The use of a closed-mouth light-body polyvinylsiloxane impression further incorporated functional movements during impression making.

This was relevant in the present case because the final objective was not simply to reproduce the static tissue surface but to establish a clinically useful peripheral seal while maintaining the patient's established jaw relationship.

One of the main advantages of the described workflow was the ability to transfer the definitive anatomical record directly into a digital environment without fabrication of a conventional stone cast. The modified polyvinylsiloxane impression was scanned with a laboratory scanner, while the opposing dentition and interocclusal relationship were obtained with an intraoral scanner. This combination represents a useful hybrid approach because it assigns each technology to the part of the workflow for which it is most appropriate.

Direct intraoral scanning of completely edentulous tissues can be technically demanding because mobile mucosa, limited anatomical landmarks, saliva, and the absence of stable reference points may affect scanning accuracy. In the present case, the clinically established soft-tissue relationship was recorded conventionally and digitized afterward. This avoided the need to obtain the entire functional impression directly through intraoral scanning.

The digital workflow is supported by a growing body of evidence. Early studies demonstrated that computer-aided design and computer-aided manufacturing dentures can provide favorable adaptation and retention [5-7]. A larger systematic review and meta-analysis subsequently reported that computer-aided design and computer-aided manufacturing dentures can reduce chairside time and overall costs while providing acceptable clinical outcomes [8].

More recent evidence provides a more nuanced interpretation. Faur et al. reported favorable intaglio surface trueness for three-dimensional printed denture bases, with a median deviation of 176.9 µm for the printed group compared with 342 µm for the analog group [9]. These findings support the potential of additive manufacturing to reproduce clinically relevant denture-base surfaces with considerable accuracy. However, such results should not be interpreted as evidence that every digital workflow will automatically produce a superior clinical prosthesis. The final accuracy depends on the quality of the initial impression or scan, data processing, design parameters, printing conditions, and post-processing.

Systematic reviews have also emphasized the heterogeneity of digital denture workflows. Thu et al. found considerable variation in the clinical and laboratory procedures used to fabricate digital complete dentures [11]. This is particularly relevant to the present case because the workflow did not represent a completely digital

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protocol. Instead, conventional functional impression making was intentionally retained and combined with digital scanning and additive manufacturing.

This hybrid approach may be more clinically realistic than attempting to convert every stage of complete denture fabrication into a digital procedure. The clinician remains responsible for establishing the correct tissue relationship and functional borders, while digital technology is used to improve efficiency in subsequent design and manufacturing stages.

The clinical evidence comparing digital and conventional dentures is also mixed. Avelino et al. found that digitally fabricated complete dentures demonstrated similar or better clinical performance overall, but conventional printed dentures showed greater retention than conventional dentures in one comparison, while patient satisfaction did not differ significantly according to the manufacturing method [12].

Fouda et al. similarly reported that digital workflows were generally associated with shorter fabrication times and better cost-effectiveness, but patient satisfaction and denture quality were not consistently superior [13].

These findings are important when interpreting the present case. The clinical benefit was not that the digitally manufactured denture was necessarily superior to a conventional denture in every respect. Rather, digital manufacturing provided an efficient means of producing a prosthesis when the patient's medical circumstances made a conventional treatment sequence impractical.

A recent systematic review of patient satisfaction and oral health-related quality of life further supports this interpretation. Poker et al. compared digital and conventional complete dentures from both patient and clinician perspectives and found that digital dentures can provide favorable patient-centered outcomes, although the evidence does not establish universal superiority of digital treatment [16]. Thus, the principal advantage of digital technology in cases such as the present one may be its ability to make appropriate prosthetic treatment more accessible within a restricted timeframe.

The use of three-dimensional printing also requires careful consideration of material properties. Printed denture bases are produced layer by layer from photopolymerizable resins, and their final properties are influenced by printing orientation, layer thickness, resin composition, washing, and post-curing. Manufacturer-specific processing protocols should -

therefore be followed carefully [15].

Although printed dentures have demonstrated clinically acceptable outcomes, limitations remain. These include concerns regarding long-term mechanical behavior, surface characteristics, color stability, wear, and fracture resistance. Goodacre emphasized that three-dimensional printing has substantially expanded the possibilities of digital complete denture fabrication, but continued material development is required before all limitations of printed denture materials can be considered resolved [10].

Recent evidence has reinforced the importance of these limitations. Sivaswamy et al. reported in a 2026 systematic review and meta-analysis that three-dimensional printed complete dentures generally demonstrated clinical outcomes comparable with conventional and milled dentures, although conventional dentures showed greater retention in some comparisons [17]. This supports the concept that three-dimensional printing is a clinically viable option, but not necessarily a universally superior manufacturing method.

Similarly, a 2026 systematic review by Smets et al. evaluated complications and post-insertion visits associated with three-dimensional printed dentures. The authors found that manufacturing technique could influence the type and frequency of complications and emphasized that digital fabrication does not eliminate the need for clinical follow-up [18]. This point is particularly relevant to immediate dentures, where anatomical changes after extraction can continue even after the definitive prosthesis has been delivered.

The present case also illustrates the value of digital archiving. Once the final prosthesis has been designed, the digital dataset can be retained for future modification or reproduction. This may be particularly valuable for patients who have difficulty attending multiple appointments or who may require replacement of a prosthesis because of fracture, loss, or changes in oral anatomy. Digital records can also facilitate communication between clinicians and dental laboratories.

The treatment time recorded in this case further illustrates the practical advantage of the workflow. Approximately 40 minutes were required for digital design, 1 hour and 17 minutes for denture-base printing, 25 minutes for tooth printing, and approximately 1 hour for post-processing and assembly. Although these times are specific to the equipment and materials used in this case and should not be generalized to all digital systems, they demonstrate that additive manufacturing can compress several laboratory stages into a relatively short period.

The clinical context was an important part of the treatment decision. The patient had a narrow window between dental treatment and initiation of systemic cancer therapy. The objective was therefore not to circumvent appropriate healing or clinical evaluation but to provide a functional prosthesis within a medically determined timeframe. The subsequent follow-up after two cycles of chemotherapy demonstrated satisfactory healing and no clinically evident xerostomia or oral mucositis. Nevertheless, this individual observation cannot be interpreted as evidence that the described workflow reduces or prevents oral complications associated with cancer therapy.

Close communication between dental and medical teams remains essential when prosthetic treatment is provided to patients receiving systemic anticancer therapy. The timing of dental procedures, healing status, oral hygiene, mucosal condition, and potential treatment-related complications should all be considered before definitive prosthetic intervention.

Several limitations should be acknowledged. First, this is a single clinical case, and the outcome cannot establish superiority of the hybrid workflow over conventional or milled complete denture fabrication. Second, objective measurements of denture retention, three-dimensional intaglio trueness, occlusal accuracy, and dimensional stability were not performed. Third, the follow-up period described in this report was limited, and long-term evaluation of the printed materials was not possible. Fourth, the technique may not be appropriate when the existing denture has major deficiencies in tooth arrangement, vertical dimension, facial support, or occlusion.

The method is most likely to be useful when the existing immediate denture retains clinically useful information but has become inaccurate because of changes in the denture-bearing tissues. In such circumstances, the existing prosthesis can serve as a starting point rather than being discarded. However, when the original prosthesis is fundamentally inadequate, a new conventional or digital treatment plan may be more appropriate.

Future developments in digital complete denture therapy are likely to involve greater integration of clinical scanning, three-dimensional facial imaging, computer-aided design, additive manufacturing, and digital archiving. Automated design tools may eventually assist with tooth arrangement, occlusal analysis, denture-base design, and identification of anatomical landmarks. These technologies should remain under appropriate clinical supervision because automated systems cannot independently account for all biological and functional variables encountered in complete denture treatment.

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The most useful future direction may therefore be the development of flexible hybrid workflows rather than complete replacement of conventional prosthodontic procedures. Conventional impression techniques remain valuable for recording mobile soft tissues and functional borders, whereas digital systems provide clear advantages in data storage, design modification, communication, and rapid manufacturing.

The present case illustrates this principle. The functional anatomy was established clinically using polyvinylsiloxane, transferred into the digital environment by laboratory scanning, combined with intraoral records of the opposing dentition, and subsequently used for computer-aided design and additive manufacturing. The resulting workflow preserved the clinical information required for successful prosthetic treatment while reducing unnecessary laboratory stages.

Future clinical research should evaluate this approach in larger patient populations and compare hybrid workflows directly with conventional and fully digital techniques. Such studies should include objective measurements of retention, stability, intaglio adaptation, occlusal accuracy, fabrication time, cost, number of appointments, patient satisfaction, oral health-related quality of life, and long-term material performance.

CONCLUSION

This clinical report presents a hybrid analog-digital approach for the management of an ill-fitting maxillary immediate complete denture in a patient with an urgent medical treatment schedule. The patient's existing prosthesis was modified with sectional polyvinylsiloxane border molding and used as a functional impression carrier. A definitive light-body polyvinylsiloxane impression was then digitized and transferred into a computer-aided design and additive manufacturing workflow.

The main clinical value of the technique was the preservation of useful information contained within the existing prosthesis while allowing the denture-bearing surface and peripheral borders to be adapted to the patient's changing post-extraction anatomy. This approach avoided several conventional laboratory stages and allowed the definitive prosthesis to be produced within a restricted treatment period.

The case also demonstrates that digital technology should complement rather than replace fundamental prosthodontic principles. Accurate impression making, functional border extension, adequate tissue support, appropriate maxillomandibular relationships, and careful clinical assessment remain essential regardless of the manufacturing method.

The favorable clinical outcome supports the feasibility of the described workflow, but it should not be interpreted as evidence of superiority over conventional or milled denture fabrication. The report represents a single clinical experience, and quantitative long-term measurements were not available. Further prospective clinical studies are required to establish the reproducibility, accuracy, cost-effectiveness, patient acceptability, and long-term clinical performance of this approach.

Overall, the hybrid analog-digital workflow may be a useful option for carefully selected patients who require rapid prosthetic rehabilitation. Its principal advantage is not the use of three-dimensional printing alone, but the integration of established clinical prosthodontic principles with digital technology to provide individualized treatment within a clinically realistic timeframe.

DECLARATIONS

Conflict of Interest

The author declare no conflict of interest.

Funding

No external funding was received for this study.

Ethical Approval

The study was conducted in accordance with the principles of the Declaration of Helsinki for research involving human subjects.

Informed Consent

Written informed consent was obtained from the patient for the clinical treatment and publication of this case report and the accompanying intraoral photographs.

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