

# Digital Applications of Locator Cases

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## Introduction

Clinicians are often faced with tough decisions regarding patients who present completely edentulous or those with a failing dentition who request treatment. Rehabilitation of the dentition with removable or fixed restorations with dental implants remains an exciting, yet challenging, dental procedure. While removable restorations such as tissue-supported or implant-supported overdentures are popular because they are simple to work with for both patient and clinician, many patients request a non-removable restoration option.

Fixed restorations utilizing dental implants typically require a combination of precise surgical and prosthetic techniques. This ultimately permits seamless delivery of a prosthesis that accomplishes a complex interplay of esthetic, functional, and maintenance goals.<sup>1</sup> Historically fixed restorations are often quite technically demanding with regards to implant position, angulation, tooth position, emergence form, and the interplay between teeth and tissues.<sup>1</sup> Further, patient-mediated outcomes, occlusion, and number and position of implants within the arch further complicate planning rehabilitation with fixed prostheses.<sup>2</sup>

While utilizing digital dentistry techniques with single units and short span FPDs with dental implants, full-arch implantology techniques with digital tends to be quite a bit more involved. Reports and studies have determined that while digital techniques are extremely promising, many clinicians opt for traditional analog techniques for the most challenging cases to ensure reliability and predictability of clinical procedures.<sup>3</sup> Digital technology is rapidly becoming an integral part of everyday clinical practice and permits the clinician to expedite treatment. This article aims to describe a two-visit clinical approach to using intraoral scanning and 3D printing technology to enhance clinical and laboratory procedures for full-arch rehabilitation with dental implants with Locator.

## Clinical case presentation

A patient presents to the author's clinical practice with the chief concern "Doctor,



**Fig. 1.** Patient presents with existing implant overdentures requesting fixed restorations, she is happy with the esthetics and incisal edge position of the existing prostheses.



**Fig. 3.** The patient has 6 implants (Helix, Neodent) and Locator (Zest Dental Solutions) abutments.



**Fig. 2.** The patient presents with 7 implants (Helix, Neodent) and Locator (Zest Dental Solutions) abutments.



**Fig. 4.** The patient has anatomical features that permit conversion into a fixed restorations including well-integrated implants and healthy soft tissues.

"I want my teeth to be permanent." The patient was previously treated 2 years prior with an implant overdenture and Locator abutments (Figure 1) on the maxillary and mandibular arch. Her maxillary arch has 7 implants (Helix, Neodent) on the maxillary arch (Figure 2) and 6 implants (Helix, Neodent) on the mandibular arch (Figure 3). Her periodontal tissues and gingival architecture appear healthy and she reports being comfortable with her prostheses in her mouth, but unable to chew hard or crunchy foods (Figure 4). She is interested in converting her existing teeth into a fixed prosthesis.

Traditionally, transitioning from Locator overdentures into a traditional screw-retained prosthesis is a viable option for patients who wish to transition away from a removable prosthesis. Multiple challenges exist with this approach including needing to remove the Locator abutment, modify the patient's existing prosthesis, and then fabricating the screw-retained restoration. This process requires multiple clinical and technical steps and typically associated with a high costs.

Recently, the Locator Fixed system was introduced and it represents a hybrid

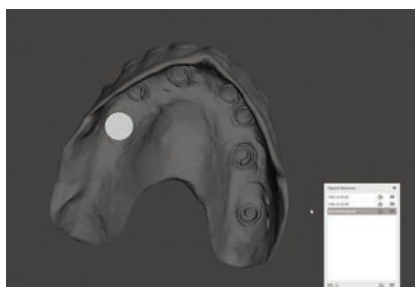
solution that combines the benefits of fixed and removable prosthodontics. It is particularly well-suited for patients who desire the stability of a fixed restoration with the retrievability and hygiene accessibility of a removable option. Additionally, it utilizes the same Locator abutment for both removable and fixed restorations, permitting the clinician to seamlessly switch between the two simply by changing inserts. This clinical case review presents the diagnosis, treatment planning, surgical and prosthetic procedures, and outcomes associated with the use of the Locator Fixed system in the management of a fully edentulous arch. The case highlights the decision-making process, clinical challenges, and the functional and esthetic results achieved.

## Digital scanning technique

The patient's overdenture prostheses were removed and each scanned 360 degrees using an intraoral scanner (TRIOS, 3Shape). Emphasis was placed on capturing the prosthesis occlusal surfaces, the intaglio, and the facial/lingual aspects in a singular scan of each arch. The prostheses were placed back onto the edentulous ridges



**Fig. 5.** Using an intraoral scanner (TRIOS, 3Shape), the patient's maxillary and mandibular prostheses were scanned 360-degrees outside of the mouth and occlusion captured intraorally.



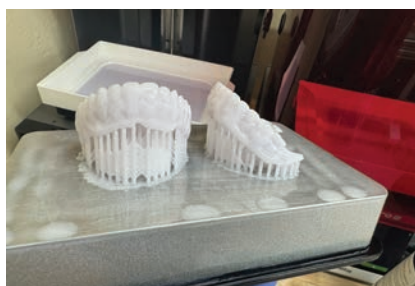
**Fig. 6.** The laboratory used Locator scan body geometries to align to existing housings within each prosthesis and using a Boolean procedure to cut away the shape of the scan body inside the intaglio of the prosthesis.



**Fig. 7.** Completed digital design of the intaglio of the prostheses.



**Fig. 8.** The design file was imported into 3D printing software in preparation for printing (Rayware, SprintRay)



**Fig. 9.** The prostheses were 3D printed using a nano-ceramic hybrid resin (OnX Tough 2, SprintRay)



**Fig. 10.** The printed prostheses were cleaned in isopropyl alcohol, adjusted and polished.



**Fig. 11.** The patient returned and block-out spacers and gold Locator housings were placed onto maxillary abutments. The prosthesis was placed confirming a passive fit.



**Fig. 12.** Blockout spacers and gold Locator housings were placed onto mandibular abutments, the prosthesis was placed confirming a passive fit. Occlusion was verified.



**Fig. 13.** Composite resin (Chairside Attachment Processing Material, Zest Dental Solutions) was placed into the prepared recesses and each prosthesis was seated onto the edentulous arch ensuring the mandibular arch was in occlusion with the maxillary arch.

and the bite on the left and right sides were scanned, permitting the scans to be in occlusion (Fig 5). The scan files were sent to the dental laboratory for processing to utilize them for building her fixed prosthesis.

In the laboratory the scans were imported into digital design software for analysis. Because the patient was satisfied with the midline, tooth shape, incisal edge, occlusal surfaces, and speech of her current prostheses, the laboratory felt comfortable in utilizing her existing prostheses with a copy denture workflow.

### Digital design & 3d printing

The maxillary and mandibular arches were separated, and the intaglio surfaces were visualized to show where existing Locator housings and inserts are within the prostheses. A Locator scan body was

aligned to the housing in the intaglio surface onto each respective area. (Fig 6) A Boolean subtraction procedure was completed on each housing using a commercially available open-architecture software (Meshmixer, Autodesk), creating a recessed area within the denture surface (Fig 7).

The completed design files were imported into a 3D printer software (Rayware, SprintRay) for preparation to print (Fig 8). The prostheses were 3D printed utilizing a nano-ceramic hybrid resin (OnX Tough 2, SprintRay) and removed from the build platform (Fig 9). The prints were lightly washed with a 91% isopropyl alcohol spray and any excess uncured resin is wiped away with a paper towel. The prostheses were cured in a commercially available ultraviolet light curing box from the manufacturer

utilizing post-cure settings and duration that is recommended by the manufacturer (ProCure2, SprintRay). Using acrylic resin burs and flush end cutter instruments, the sprues and support pins were removed and the prostheses were polished using a rag wheel and pumice. (Fig 10)

### Picking up housings

The patient returned for placement of the prostheses. Block out spacers and gold Locator housings with processing spacers were placed onto each abutment on the maxillary arch. The maxillary prosthesis was placed onto the edentulous arch, confirming passive fit of the prosthesis over the housings. (Fig 11) Block-out spacers and gold Locator housings were placed onto abutments on the mandibular arch and the prosthesis was placed on the edentulous ridge to confirm adaptation of the





**Fig. 14.** The prostheses were removed ensuring all housings were properly attached to the prosthesis.

mandibular prosthesis. (Fig 12) The patient was instructed to close into occlusion and any adjustments were made to confirm even contacts of all teeth and that she felt comfortable prior to moving forward with housing attachment procedures.

The recessed areas of the prostheses were air abraded utilizing 27µm aluminum oxide media and a chairside air abrasion unit (Microetcher CD, Zest Dental Solutions), rinsed, and air dried. Beginning with the maxillary arch, composite resin material (Chairside Attachment Processing Material, Zest Dental Solutions) was applied to the recessed areas of the prosthesis, filling 2/3 of each recess. (Fig 13) A small amount of resin was applied intraorally onto each Locator housing and the maxillary prosthesis was placed onto the edentulous arch. Prior to polymerization of the maxillary arch, the same procedure was repeated on the mandibular arch. After seating the mandibular arch, the patient was instructed to close into occlusion, ensuring that the prostheses were aligned with the maxillary midline and relevant anatomical features. After complete polymerization of the composite resin, the prostheses were removed and inspected to ensure that all the housings were successfully attached to the prosthesis. (Fig 14)

#### Prosthesis adjustments

Up to this point, the prostheses have the contours and shape of a removable



**Fig. 15.** Adjustments were made to the prostheses, removing any resin flanges and converting into a convex prosthesis shape.

prosthesis, however, the prosthesis is intended to be a fixed restoration using Locator abutments. As a result, the prosthesis requires adjustments to convert the contours and shape of the prosthesis into a convex and cleansable design. The prostheses with attached housings were placed into a dust collector cabinet (Microcab, Zest Dental Solutions) where acrylic burs (Chairside Prep & Polish Kit, Zest Dental Solutions) were utilized to cut away the concave denture flanges. (Fig 15)

The prosthetic contours were outlined using a marker, aiming for minimal cantilever of the prosthesis. In this example, a cantilever of a 1:1 ratio was planned and outlined using the marker. Using a thin acrylic bur (Vent Bur, Zest Dental Solutions), the distal portions of the prosthesis were cut away. Additionally, the acrylic resin flange was removed using a



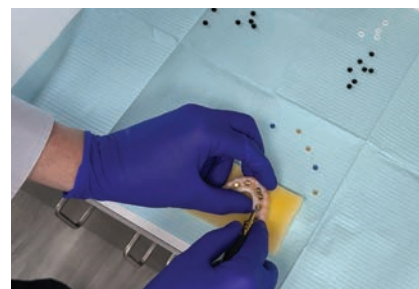
**Fig. 17.** The prostheses were tried onto the edentulous arch, ensuring all abutments engaged with the prosthesis, occlusion was verified, and the patient was pleased with the esthetics.



**Fig. 16.** Pink colored composite resin (EasyGum, Harvest) was applied to the facial aspect of the prostheses.

thicker acrylic bur (Trim Bur, Zest Dental Solutions), excess composite resin utilized during attachment of housings were removed using a round bur (Grind Bur, Zest Dental Solutions), and the prosthesis was polished using a polishing bur (Polish Bur, Zest Dental Solutions).

The prosthesis tissue flanges of the maxillary and mandibular prostheses were air abraded utilizing 27µm aluminum oxide media and a chairside air abrasion unit (Microetcher CD, Zest Dental Solutions), rinsed, and air dried. Using a brush, composite resin bonding resin (EasyGum Bond, Harvest) was applied to the air abraded surfaces and air dried to thin out the resin. The resin was light cured, and a pink composite resin material was applied in sheets and incrementally using tissue colored pink composite resin (EasyGum, Harvest). Emphasis was placed on ensuring

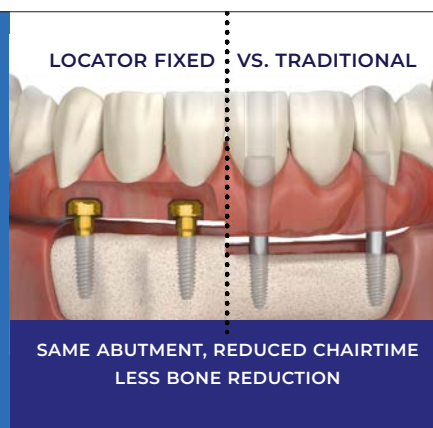


**Fig. 18.** Processing inserts were removed and fixed inserts were placed.

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the pink tissue covered all flange areas without covering any of the facial aspects of the teeth. The pink composite resin material was light cured until fully polymerized. The prosthesis was fully polished using a rag wheel and pumice, and processing inserts were replaced prior to placing the prostheses intorally to ensure accurate verification of the prosthesis attachment procedures. (Fig 16)

### Prosthesis delivery

The maxillary and mandibular prostheses were placed onto each edentulous arch, ensuring the prostheses were fully engaged on Locator abutments. After verification of adaptation on each abutment, the occlusion was verified utilizing articulating paper, and any areas of adjustment were made prior to placing the final fixed inserts. The occlusal paper marks were removed, and the patient was given a mirror to verify esthetics of the restoration. (Fig 17) The patient was very pleased with the final appearance of the restorations.

The prostheses were removed from the edentulous arches and the processing inserts were removed from the prostheses. (Fig 18) The final fixed inserts were placed according to manufacturer's recommendation. (Fig 19). The Locator abutments were air dried, and each prosthesis was placed using finger pressure. The complete adaptation of the prostheses was confirmed with the assistance of a seating tool provided by the manufacturer (Seating and Removal Tool, Zest Dental Solutions). A panoramic radiograph was made confirming the complete seat of the prostheses.

The patient was given wear and care, hygiene instructions, and recall instructions of returning to the office for regular check-ups once a year. The patient was very satisfied with the esthetics of her new prostheses.



**Fig. 19.** The contour of the restoration should be convex, permitting cleanability of the fixed prosthesis.



**Fig. 20.** The prostheses were placed onto edentulous arches, engaging the Locator abutments. Hygiene and recall strategies were discussed with the patient.

### Summary

A clinical case was described utilizing an expedited clinical and technical procedure utilizing intraoral scanning, 3D printing, and a novel new fixed attachment system. While many associate Locator abutments with removable restorations; however, this clinical case reviewed describes utilizing existing Locator abutments together with gold housings and fixed inserts to permit the clinician to deliver a fixed prosthesis for the patient. If for some reason the same patient were to return to the clinical practice and requests a removable restoration, simply changing inserts from the fixed inserts to the removable nylon inserts will convert the prosthesis into a fixed restoration. The patient has been seen for multiple follow-up visits and is very pleased with the restoration and the final outcome and wishes to remain with the fixed prosthesis.

### Disclosure:

*Dr. Michael Scherer is the Chief Clinical Officer; Zest Dental Solutions.*

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