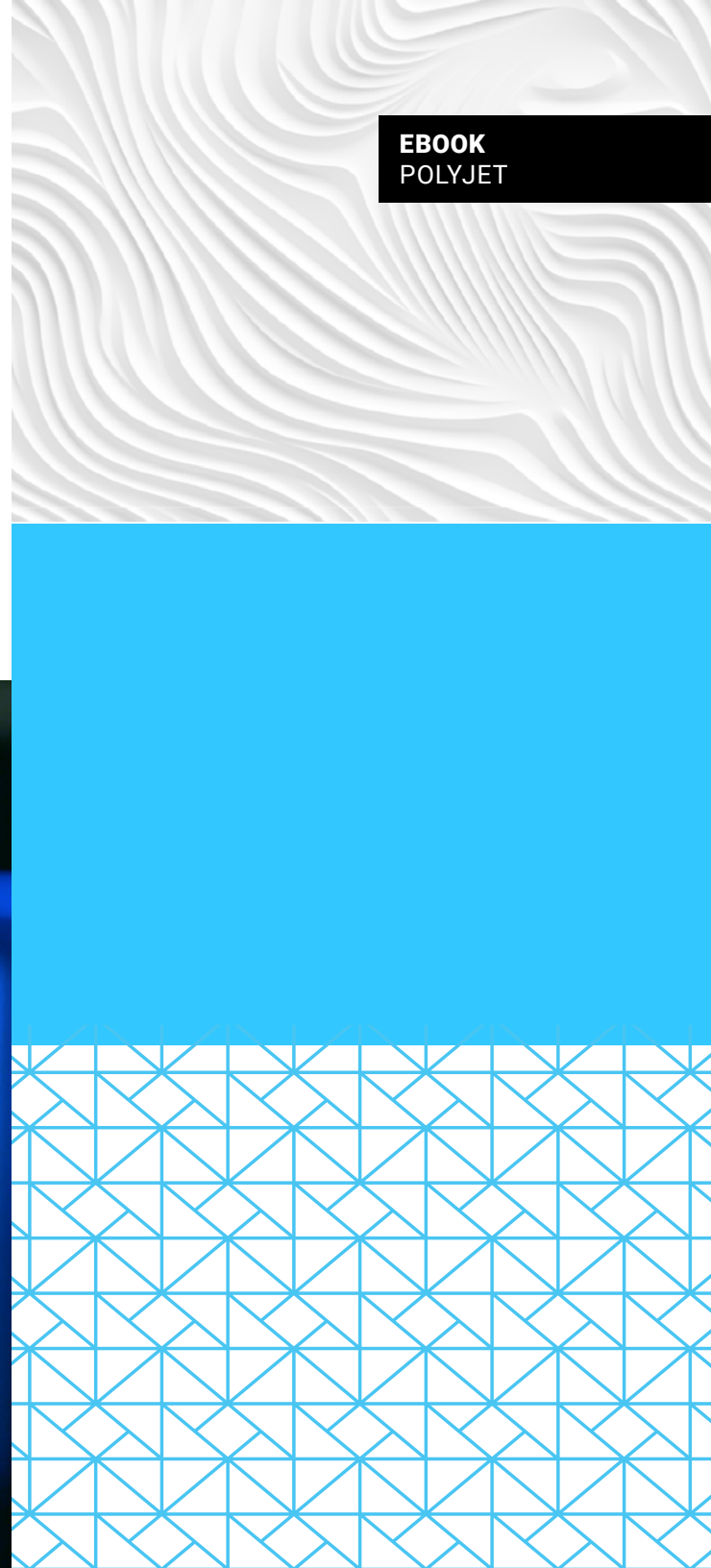




EBOOK
POLYJET

A Complete Guide to **TrueDent™** Dentures

3D Printed Monolithic, Full-Color Dental Appliances





The dental industry faces a significant global challenge: meeting the prosthetic needs of an expanding edentulous and partially edentulous patient population worldwide. Recent global health data reveals that edentulism affects 267.5 million people globally, with a prevalence rate of 4.8% among adults. This health concern is particularly pronounced in adults aged 50 and older, where prevalence exceeds 10% in many regions¹.

The impact of edentulism extends across continents. According to the American College of Prosthodontists, 90% of those who suffer from edentulism have dentures, and the number of partially edentulous patients is expected to increase to more than 200 million individuals in the next 15 years². Meanwhile, the European dentures market alone is expected, according to iData, to expand from USD 3.29 billion in 2023 to USD 4.06 billion by 2028³. This growth is mirrored in other international markets, with the worldwide full denture sector showing robust expansion potential.

To address this growing international demand, the dental industry must evolve to develop scalable digital workflows capable of delivering highly aesthetic denture solutions. These solutions must consistently provide optimal fit, form, and function to serve diverse patient populations across different geographic regions and healthcare systems.

¹ Tyrovolas S, Koyanagi A, Panagiotakos DB, Haro JM, Kassebaum NJ, Chrepa V, Kotsakis GA. Population prevalence of edentulism and its association with depression and self-rated health. Sci Rep. 2016 Nov 17.

² <https://www.gotoapro.org/facts-figures/>

³ iData Research Inc.





Converting to a Digital Workflow

Prosthodontists and dental laboratories have long sought a method to accurately replicate the shade, contour, and dentition when creating complete denture prosthetics all while ensuring cost-effectiveness, labor efficiency, and reproducibility.

Conventional dentures manufactured using PMMA have been known for their aesthetic appeal. However, the manual design and fabrication methods involved in creating these traditional dentures make them susceptible to inaccuracies. Another disadvantage is the loss of clinical data including impressions, master casts, and relationship records during the production process making replication impossible. Denture fabrication is labor intensive and, in many cases, can be considered an art form that requires highly skilled technicians. Unfortunately, the dental industry is suffering from a shortage of skilled labor, as the number of dental technicians has decreased by 50% over the last 15 years³.

Experienced technicians are leaving the profession at a faster rate than new ones can be hired and trained.

As CAD/CAM software and 3D printing advance, dental laboratories have gained the ability to digitally produce natural looking dentures with highly accurate fit and function. According to the Key Group Dental Lab 2022 survey, 29% of US labs offer digital dentures, in those labs 45% of cases are produced digitally. The survey also found that the adoption of digital dentures is increasing, matching the growing demand from patients. A key benefit to the digital workflow is that the original patient records and the prosthesis data can be stored and may be reproduced in the future.

“The most commonly used 3D printing technology for fabricating digital dentures is Digital Light Processing (DLP).

In this process, the denture base and teeth are printed separately and then bonded together. However, the bonding process introduces variables into the workflow, which can lead to improper tooth-base relationships and potential tooth debonding. Moreover, since the base and teeth are created from different materials in different shades, the resin for each print must be prepared and changed in the printer before each part is produced. As a result, dental laboratories need to maintain a range of denture base and tooth shade resins to accommodate different patients’ aesthetic preferences.



Mastering the Challenge of Digital Dentures

TrueDent™¹ and TrueDent-D™² are patented resins developed for 3D printing of full and partial dentures. PolyJet technology combined with TrueDent or TrueDent-D resin enables batch production of highly aesthetic, monolithic, full-color dental appliances and dentures, giving dental patients aesthetic, functional, and durable 3D printed prosthesis.

What is PolyJet?

PolyJet is a powerful 3D printing jetting technology that produces smooth, accurate parts, prototypes, and tooling with layer resolution of up to 18.75 microns. PolyJet printers work similarly to a household inkjet 2D paper printer, but instead of ink, tiny droplets of a UV reactive photopolymer are precisely placed, one layer at a time, and cured to build a 3D part. This unique process allows for a blending of base materials into digital materials.

¹ TrueDent resin is FDA-cleared (Class II)

² TrueDent-D resin is CE marked (Class I)



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Until now, printed dentures and appliances had to be designed and manufactured in multiple parts and bonded together, the TrueDent solution simplifies the process, lowers the costs, and allows for dentures to be produced much faster, achieving incredible aesthetics. We can now expand our prosthetic service printing multi-colored personalized appliance at scale.”

Frank Acosta

Owner of AA Dental Design.



Meet TrueDent

TrueDent enables batch production of highly aesthetic, monolithic, multicolor dental appliances on a single mixed part, high-capacity tray.

Monolithic Print

TrueDent dentures are fabricated in a single, continuous print that includes both the denture base and teeth. Eliminating the need to bond the teeth to the base and the risk of teeth debonding, which is a known cause of failure in dentures.

True Aesthetics Made Possible

TrueDent delivers natural-looking gums, mimics tooth structure and translucency, and eliminates conventional manual assembly and bonding for the teeth and base. The design software currently contains presets for 10 gingiva shades, 17 tooth shades with two-layer structure, and two tooth shades with three-layer structure (for incisal translucency). Aesthetics like layered shading, base veins or capillaries, and opacity are determined in software. Additional shade libraries will be added over time, expanding the available personalization options for the patients.



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This new resin signals a major disruption in dental technology: the beginning of the ‘full-color revolution’. The denture will forever change our industry for the better by pushing digital workflows forward and bending definitions.”

John Madden
CDT



Meet TrueDent

Accurate Print from Design to Fit

High fidelity matching and tight tolerances between design and print are achieved by incremental build-up and curing of thin (18.75 microns) material layers which results in reduced polymerization shrinkage compared to other denture printing techniques. In addition, each printed part is encapsulated by a unique gel-like support material (a hydrophilic plasticized photopolymer) which fully supports the entire denture surface. The support structure is automatically applied by the design software, eliminating human error, and optimizing material usage. The gel-like support material is easily removed from the printed denture using a water jet process, leaving behind a true high-fidelity fit with no support scarring and recontouring.

Having a high-fidelity match between collected clinical data, design data, and the PolyJet printed TrueDent prosthesis results in improved fit and form. A more accurate dental appliance can mean less clinical chair-time adjusting dentures, which is a win-win for patients, dentists, and laboratories.

Production Capacity

Simultaneous printing of multi-color parts simplifies the prosthetic production process while increasing efficiency and expanding the prosthetic service offering. With PolyJet printing, there is no need to change trays to achieve a different tooth or base shade. The need to stock liters of material in various denture base and tooth shades is eliminated as well. The large print tray allows for over 34 full color dentures to be printed simultaneously. Eliminating manual assembly and bonding of teeth to bases reduces the labor required to produce a denture. Denture designs can be saved and reproduced. This creates possibilities for economical back-ups or replacements for lost or broken dentures. A simpler production workflow, increased printer productivity, reduced inventory, advanced software features, and reduced labor requirements optimize removable production for dental labs.



Software Enabled Hardware

The J5 DentaJet PolyJet printer powered GrabCAD Print software platform and the TrueDent resin is a full turnkey solution for the fabrication of dental prostheses.

The J5 DentaJet offers multi-material printing capabilities and a large circular print tray, all in a small footprint. In addition to ensuring printing continuity, the material cabinet can be loaded with 2 cartridges of each TrueDent resin color.

GrabCAD is easy to use and integrates with leading Dental CAD platforms such as 3Shape and ExoCAD. It enables automated nesting, creating optimized support structure and offers additional features such as fleet management, performance monitoring, and remote printing capabilities.

Future software updates will offer improved production capabilities and additional shade and internal tooth structure options.



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This is just the beginning, we will continue to advance the aesthetics of end use parts by developing the software. In the future, dental technicians may even have the capability of customizing their own teeth and base shades, delivering the most lifelike dental prosthesis imaginable.

Daniel Bahar

Product Manager at Stratasys

TrueDent

True Aesthetics Made Possible.

Expand your services, increase efficiency,
and give your customers and their patients a
product that will make them smile.

For more information please visit:

[https://www.stratasys.com/en/industries-
and-applications/3d-printing-applications/
dentures/](https://www.stratasys.com/en/industries-and-applications/3d-printing-applications/dentures/)



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