

# ORTHODONTICS AND 3D PRINTING

## ACHIEVE OPTIMAL PERFORMANCE THROUGH DIGITIZATION

By Daniel Alter MSc, MDT, CDT

Forward-thinking orthodontic laboratories are finding ways to optimize their businesses and dental offerings to their clientele through digital orthodontic dentistry and 3D printing. Orthodontic laboratories can decrease labor-intensive and time-costly practices by adopting 3D printing, as well as increase profitability and efficiency. This paper will highlight and demonstrate the benefits of dental digitalization and 3D printing in the orthodontic setting, as well as provide a case study of how a progressive orthodontic laboratory is reaping the rewards.

## OVERVIEW

Orthodontic dental technology requires a unique set of skills and understanding to aid the patients' treatment and properly align teeth. This requires ample communication with the orthodontic clinician and a series of potential oral appliances to achieve optimal results. Traditionally, much of the work relied heavily upon less accurate alginate impressions, which were turned into stone (gypsum) models of the hard oral environment. These models were used to manufacture orthodontic appliances, such as acrylic retainers, mouth guards, spacers and arch expanders. Orthodontic appliance manufacturing is an incredibly laborious process that requires a heightened level of expertise to properly complete and provide the patient with optimal results.



*Assurance Retainer System: With the use of 3D printed models, orthodontic appliances like acrylic retainers and/or clear aligners can be easily and efficiently fabricated.*

Digital technology decreases costs, workloads and human errors by automating the dental model fabricating process with 3D printing. This new technology also increases accuracy and efficiency. 3D printing also helps eliminate potential shortfalls and increase appointment options through digital dentistry. This allows for more patient appointments and a potential increase of revenue to the bottom line.

## MIDLyne ORTHODONTIC LABORATORY

MidLyne Orthodontic Laboratory in Lenexa, Kansas, is a progressive orthodontic laboratory that recognizes the significant advantages of going digital, and what it could provide the laboratory and its clientele. Since adopting 3D printing in 2013, MidLyne has seen a dramatic increase in business, specifically in the digital dentistry portion.

Cory Meschke, owner of MidLyne, says the company owns the Objet30 OrthoDesk™ and Objet Eden260VS™ 3D Printers, and considers the new technology an “amazing addition” to the



laboratory. Within less than a year of acquiring the 3D printers, the original concern that the laboratory wouldn't have enough work for a single full shift (seven hours for 12 to 15 models per printer) of printing disappeared; now the laboratory enjoys three full shifts of 3D printing a day and is looking forward to further growth.

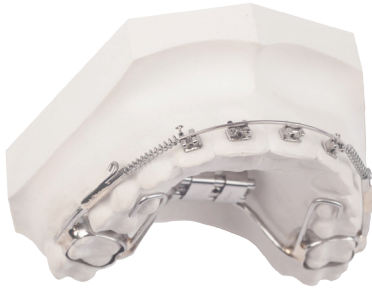
“Twenty percent of our business is digital and growing weekly,” Meschke continues. “Through digital dentistry, we can eliminate entire appointments for the dentists. The technology allows us, by means of an intraoral scan and software, to virtually remove braces and fabricate the retainer. This way the patient can have the braces removed and their retainer fit on the same appointment, thereby eliminating one appointment.” Beyond reduced appointments, patients also save time, receive a superior product and have their overall dental experience enhanced by eliminating the need to endure a dental impression.



*Herbst Appliance: This appliance is used to correct the anterior to posterior relationship of the maxillary and mandibular jaw, a relationship that can be established correctly and easily with digitization and 3D printing.*

## DIGITAL PROCESS AND 3D PRINTING

The digital orthodontic treatment begins with an intraoral scan of the patient's oral environment. The scan is sent electronically to the orthodontic laboratory, where it is inspected for complete data and converted to a 3D rendering of the mouth. Many times, third-party software may be required to fill in any missing or inappropriate data, and renders it in a printable format. The object is then placed



*Oscar Angled Appliance: 3D printed models provide the ease and ability to fabricate an arch expander with buccal wire in order to maintain anterior position.*

virtually into the nesting software within the 3D printer and routed to be printed.

The printer jets layers of curable liquid photopolymer in 16-micron layers with accuracy as high as 0.1 mm, which appreciably enhances the dental models' and medical devices' quality. Along with the photopolymer plastic, the printer deposits support material in areas deemed non critical, but are needed to successfully print the 3D rendering. This support material is removed during post-processing and leaves only the intended dental model and its corresponding critical components.

Post-processing is simple with either the Objet30 OrthoDesk 3D Printer or the Objet Eden260VS 3D Printer. Once the printed model is finished and extracted from the 3D printer, a post-processing time of less than a minute per model is required. The Objet30 OrthoDesk 3D Printer comes with a high-pressure WaterJet system to pressure wash out any of the support material, while the Objet Eden260VS 3D Printer uses a dissolvable support material that is easily and quickly removed.

Accurate and complete 3D printed models are used to fabricate an extensive array of orthodontic appliances, such as splint therapy, mouth guards, retainers, expanders, indirect bonding and clear aligners. Along with the previously mentioned retainer benefits, orthodontic band appliances share similar benefits. Metal appliances require bands – simply by scanning the teeth with separators or wedges, the model can be 3D printed in the laboratory and the metal band appliance can be created prior to the patient's appointed time and delivered at appointment. This frees up time for both the patient and the orthodontist, who is then able to schedule more appointments.

## DIGITAL STORAGE SOLUTIONS

Another benefit of digitization and 3D printing – specifically for the orthodontists and general practitioners performing orthodontic treatments – is the storage of orthodontic patients' models. Most states require orthodontists to maintain dental records for upwards of 10 years, including gypsum models. This law creates a large need for storage space in orthodontists' offices in order for them to be compliant.

Digitization and 3D printing have remedied that. Digital intraoral scans qualify as maintaining patient records and can be housed on the practice's server or with a partnered orthodontic lab. Should the need arise for hard models, any open-source (.stl) digitized intraoral impression can quickly be 3D printed to attain a dental model. This creates much needed space and eliminates the clutter of multiple models for every patient in the orthodontic practice.



*RPE Appliance: Digital dentistry and 3D printing allows for shortened appointment frequency when fabricating an arch expander.*

## ULTIMATE BENEFITS

Orthodontic digitization and 3D printing have raised the level of standards of care by providing patients with an optimal orthodontic appliance, with elevated levels of accuracy. The digital process reduces costly remakes for the laboratory and orthodontist. It also streamlines those labs' office operations – eliminating redundant appointments and delivery fees, and improves of the orthodontic process and patient experience. The orthodontic patient's overall dental experience is enhanced by adopting these new technologies. The negative connotations of the alginate impressions are dispelled now that they are enhanced

with the cutting-edge look and feel of the digital acquisition/digital impression unit and the sleek look of the 3D printed models.

Orthodontists who adopt digital technologies reap rapid benefits in patient growth, which translates to a quick return on investment. Orthodontic laboratories too, experience a large positive shift with digitization. Their labor costs are significantly reduced by eliminating steps in creating stone models, while their accuracy and efficiency is significantly enhanced. Furthermore, these translate to a reduction in costly remakes. Streamlining the clientele booking process plus a cleaner working environment lead to an enhanced quality of work life. Orthodontic laboratories who are early adopters of digital orthodontic dentistry are experiencing and will continue to experience the benefits of enriched robust new clientele, greater revenues and business vitality.

As Cory Meschke, owner of MidLyne enthusiastically says, "We are extremely excited and looking forward to harnessing all the benefits that digital orthodontics has to offer. The technology ultimately benefits the orthodontist, orthodontic laboratory and most importantly, the patient."

**Stratasys** | [www.stratasys.com](http://www.stratasys.com) | [info@stratasys.com](mailto:info@stratasys.com)

7665 Commerce Way  
Eden Prairie, MN 55344  
+1 888 480 3548 (US Toll Free)  
+1 952 937 3000 (Intl)  
+1 952 937 0070 (Fax)

2 Holtzman St.  
Science Park, PO Box 2496  
Rehovot 76124, Israel  
+972 74 745-4000  
+972 74 745-5000 (Fax)

#### ISO 9001:2008 Certified

©2015 Stratasys Ltd. All rights reserved. Stratasys, Stratasys logo, Digital Materials, PolyJet, Vero, Tango, Objet, Connex3, Objet Studio, Eden, Eden260VS, Objet30 OrthoDesk, Digital ABS, TangoBlack, VeroCyan, VeroMagenta, VeroYellow, VeroBlackPlus, VeroWhitePlus, VeroClear, TangoBlackPlus and TangoPlus are trademarks or registered trademarks of Stratasys Ltd. and/or its subsidiaries or affiliates and may be registered in certain jurisdictions. FDM, FDM Technology are trademarks of Stratasys Inc. Product specifications subject to change without notice. Printed in 2014 and in the USA.  
WP-PJ-OrthodonticsAnd3DPrinting-EN-05-15

For more information about Stratasys systems, materials and applications, call **888.480.3548** or visit [www.stratasys.com](http://www.stratasys.com)

