align education

iTero Lumina™ scanner – a new technology in intraoral scanners transforming practices and people's smiles.

Dr. David R. Boschken has been providing Invisalign® aligner treatment to patients in the San Francisco Bay Area since 2000, and he has successfully treated over 6,000 patients. He founded several clear aligner treatment planning companies and consulting services. Dr. Boschken is also the longest-tenured faculty member and Invisalign lecturer, preparing clinicians worldwide for over 24 years. He graduated from the University of California, Berkeley, with a double major in Biochemistry and Anthropology. He received his dental degree and training in orthodontics from the University of Pennsylvania's School of Dental Medicine. After graduation, Dr. Boschken completed a hospital residency at Guy's and St. Thomas Hospital in England. In addition to owning two private practices in Los Altos and San Jose, California, Dr. Boschken enjoys boating and skiing in Tahoe with his family during his free time.

Background

As an orthodontist and practice owner, the iTero Lumina™ scanner transformed how prospective and existing patients, my team, and I experience orthodontic visits. Having practiced for over 24 years and using most of the previous intraoral scanners created by Cadent and iTero™, I had the privilege of using Align Technology's new scanner for over a year before its recent market release.

Each new scanner, from the original HDU to the iTero Element™ and iTero Element™ 2 scanners, and more recently, the iTero Element™

5D Plus imaging system, has built on the advancements in hardware and software of the previous versions to deliver unparalleled digital scanning quality, patient comfort, superior appliance fit and precision movements, all leading to a customized patient and doctor experience. While there still may be a general perception that a scanner is a tool only to obtain a digital record to manufacture clear aligners in the orthodontic practice, the reality is that iTero scanners have been an instrument to help me diagnose, communicate, and educate

prospective patients chairside so that they can understand their oral health needs. It has helped me build a trusting relationship with the few minutes my treatment coordinator and I have during the consults.

Align Technology has pushed the limits again with the total redesign of the iTero scanner. This comprehensive overhaul has seen a change in the form and updated features that addressed limitations in the scanning experience and its implications in the practice of orthodontics.

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Limitations experienced by orthodontic teams and patients.

Digital orthodontic practices faced several limitations in the past during new patient consults and follow-up visits. Some of the common obstacles my team and I encountered were the size and weight of the wand, the need for a developed technique to capture clear scans in a reasonable amount of time, the learning curve for new staff to become proficient in scanning, and the challenges of obtaining scans from hard-to-reach areas like the distal surfaces of terminal teeth, deep palates, interproximal surfaces, and undercuts, among others.

From the patient's perspective, we noticed some patients experienced discomfort during the scanning process caused by the wand's size and the scan's duration. These situations were especially evident for patients with temporomandibular disorders, small mouths, special needs such as those with craniofacial malformations as well as persons who have dental phobia. However, it is important to note that these discomforts are not as prevalent or severe as they were with traditional impressions, which we last used over a decade ago.

To improve the scanning experience for clinicians and patients, and to enhance the performance from speed to quality of visualizations and clinical outcomes, Align Technology looked for solutions in innovative design and technology.

iTero Lumina™ scanners.

Align Technology listened to orthodontic teams and patients and developed an innovative technology to overcome those limitations. They realized that building upon the confocal technology to improve those obstacles was not feasible.

Previous iTero™ scanners and most scanners on the market have a single camera in the base of the wand that indirectly captures one to two teeth at a given time. This concept is defined as the field of capture, and operators would prefer a scanner with a larger field of capture to include more teeth and tissues at any given time without compromising image quality. However, companies would have to design larger wands to achieve a larger field of capture with the known technology, which is inconvenient for clinicians and patients alike. The ideal scenario is having a small and lightweight wand with a larger field of capture that can scan at the operator's preferred speed rather than the scanner dictating the speed while maintaining high-quality images.

The most apparent improvement in the new scanner is the wand size and its weight[1]. This unit is considerably

Comparison between today's wands size and technology and the iTero Lumina™ scanners with the iTero Multi-Direct Capture™ technology.
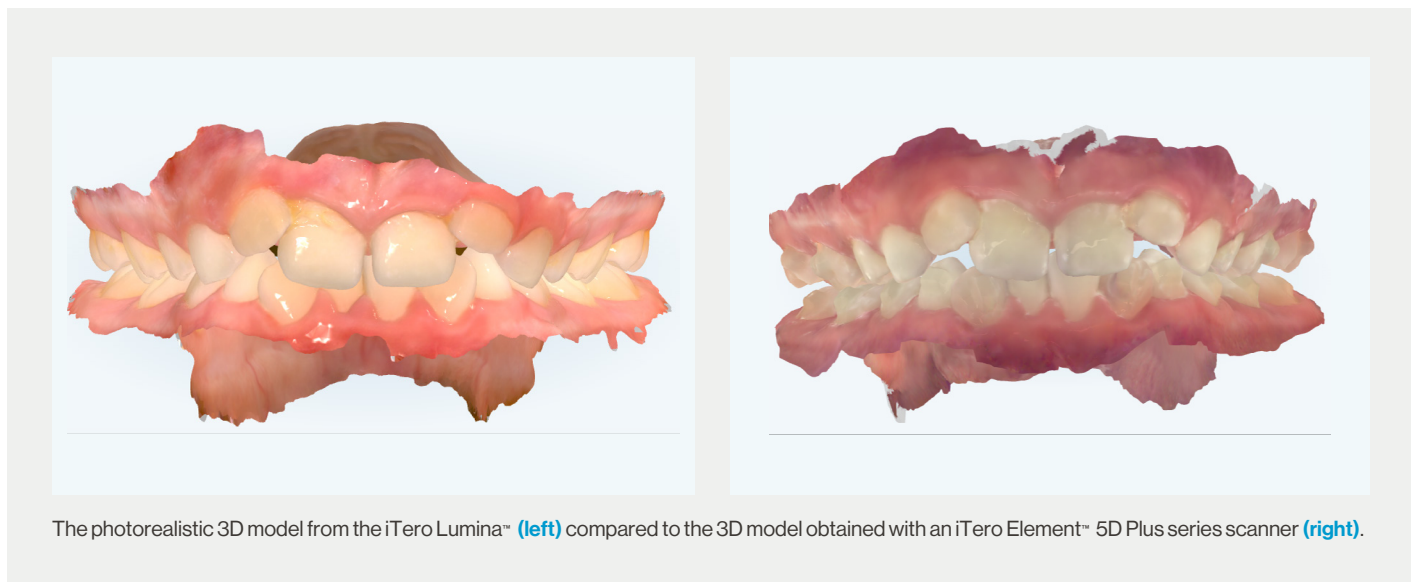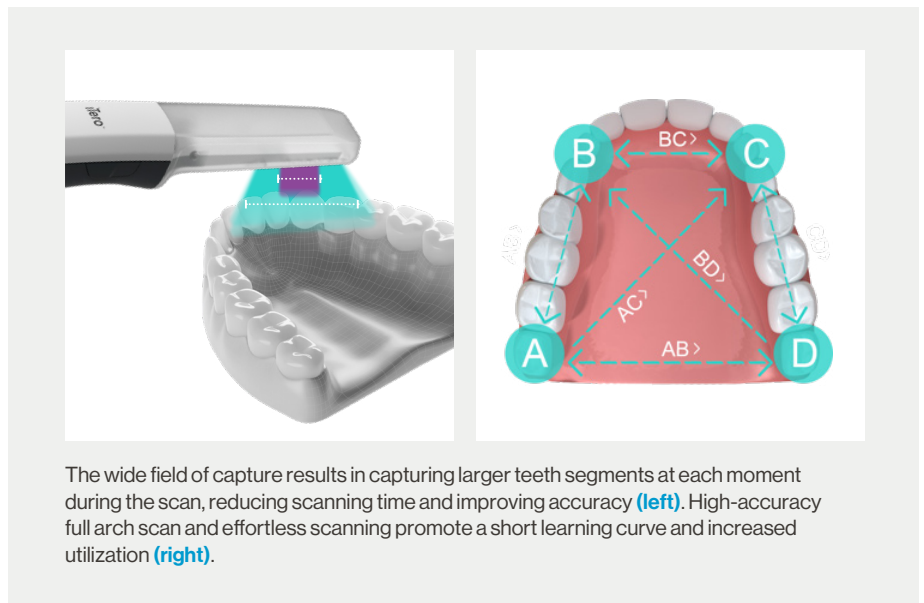
smaller, about half the size of the original HDU unit, lighter, and faster than previous models. Inside the wand, developers introduced the iTero Multi-Direct Capture™ technology (MDC)[2] that allows for simultaneous multi-angle capture that reduces maneuvering and allows for a smaller wand. But this scanner also has six cameras – five additional than previous models— and faster processors that result in unparalleled graphics.

Using a smaller and lighter wand for orthodontic scanning impacts practice workflows. Today, some practices have chosen to scan patients only after accepting orthodontic treatment as they have yet to discover the value of adding a few extra minutes to the initial consult. However, this approach can be risky as it may prevent prospects from fully understanding their oral health needs, and they may walk away without accepting treatment. Unfortunately, such practices are missing out on other valuable features of iTero scanners, such as the iTero Occlusogram and the Invisalign® Outcome Simulator Pro with in-face visualization. These tools aid in education and communication, especially during new patient visits. New clinicians rely on these tools to enhance communication during new patient visits to help increase treatment acceptance. Failure to scan every individual in your office could result in fewer starts and suboptimal production.

However, with the iTero Lumina™ scanner, you can scan the full arch in seconds[3], and inexperienced practices will not have to be concerned about added time to complete a scan on potential patients. The onboarding with this scanner was easy[4]. The new effortless scanning software has vastly improved the way we scan patients. The previous technique of scanning on one quadrant and then "rolling" around without lifting the wand is no longer necessary. With iTero Lumina™, the assistant can scan, pick up, and move to a different location inside the mouth without interrupting the results. With the improved depth of scans and field of view, you will see a considerable improvement in scanning times, quality of data captured, and hence the quality of aligner fit.

The wide field of capture results in capturing larger teeth segments at each moment during the scan, reducing scanning time and improving accuracy **(left)**. High-accuracy full arch scan and effortless scanning promote a short learning curve and increased utilization **(right)**.

The photorealistic 3D model from the iTero Lumina™ **(left)** compared to the 3D model obtained with an iTero Element™ 5D Plus series scanner **(right)**.

In addition to being easy to use, fast, and comfortable for both the operator and the patient, the iTero Lumina™ scanner impressed me with the quality of the 3D models and intraoral photos it generated. This device does not need to touch the teeth or soft tissues like previous models. The iTero Lumina™ scanner can capture depths of 25mm, which is crucial when scanning patients with deep, narrow palates, or acute gag reflexes[5]. The wider field of view facilitates an easier scan of the palate with no added time or effort, almost as a by-product of the dentition scan.

Moreover, the addition of multiple angled cameras creates accurate and natural 3D color models and dimensional images. The high resolution and detail captured by these cameras are equivalent to the renderings produced by digital single-lens reflex (DSLR) cameras[6], the standard in orthodontics and dentistry. These enhancements have significantly contributed to building trust and improving communication during consultations with new patients. Prospective patients can now see what I see inside their mouths on the scanner screen during an intraoral exam. They can easily follow my explanations, which

have become shorter since the visual representation is right before them.

As a result of the high-quality scans and intraoral images, I eliminated images from digital cameras for Invisalign® cases[7]. My practices solely rely on the scan to produce intraoral photos that are saved in the cloud and easily accessible on the myiTero.com portal and my practice management software. This new workflow has helped us save valuable clinical and administrative time while collecting and storing high-quality records efficiently and effectively.
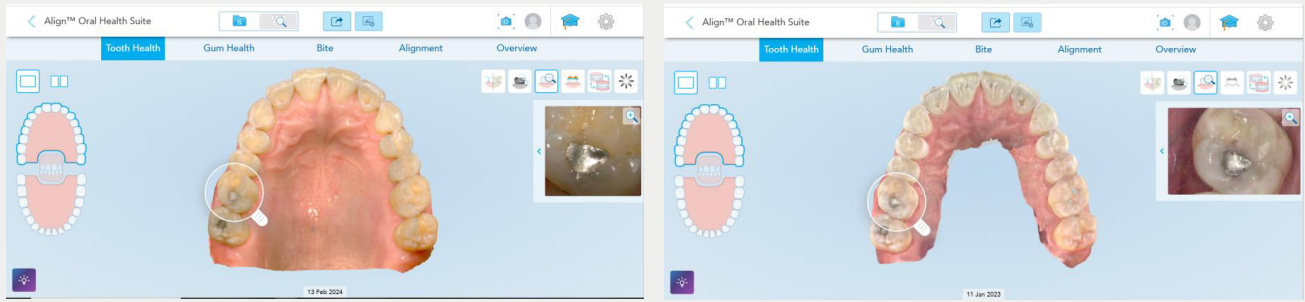
The photorealistic 3D model and the intraoral photos from the iTero Lumina™ **(left)** compared to the 3D model obtained with an iTero Element™ 5D Plus series scanner **(right)**. The effortless scanning and the increased field of capture allow operators to obtain more data in fewer seconds.

In the past 12 months of assessing this scanner, we have seen a measurable increase in case acceptance. Our practice data has shown scanning quality and times. During the consultation, the iTero Lumina™ scanner has given us the edge over our competition. Combining the Invisalign® Practice App for photo taking and deploying the Invisalign® Outcome Simulator Pro simulation to generate real-time before and after images of their smile gives the prospective patient all the necessary visuals to make that final decision to start treatment. Just showing potential patients the six cameras and viewing the lifelike scanning images on the screen often is enough to close same-day starts.

1. The iTero Lumina™ intraoral scanner wand is 50% smaller and 45% lighter than the iTero Element™ 5D imaging system wand.*
   *Compared to iTero Element™ 5D imaging system wand, excluding the wand cable. Data on file at Align Technology, as of November 15, 2023

2. The iTero Lumina™ intraoral scanner is powered by the new, proprietary iTero Multi-Direct Capture™ technology developed to capture more data[1] quickly[2] and accurately[3] while maintaining exceptional scan quality.
   1.) The iTero Lumina™ intraoral scanner offers 3x larger field of view designed for more surface area capture enabling faster scanning.
      *Compared to the field of view of the iTero Element™ 5D imaging system, when the iTero Lumina™ intraoral scanner's scanning distance is 12 mm.
   2.) The iTero Lumina™ intraoral scanner is designed to enable 2x faster* scanning compared with previous iTero™ intraoral scanners.
      *Compared to iTero Element™ 5D imaging system with tolerance AVE=±0.1 operating at a working distance from 0-20 mm.
   3.) The iTero Lumina™ intraoral scanner has scientifically proven greater accuracy* for your clinical orthodontic needs.
      *Greater global accuracy in comparison with the global accuracy of the iTero Element™ 5D imaging system.

3. The iTero Lumina™ intraoral scanner is designed to enable 2x faster* scanning compared with previous iTero™ intraoral scanners.
   *Compared to the iTero Element™ 5D imaging system with tolerance AVE=±0.1 operating at a working distance from 0-20 mm. Data on file at Align Technology, as of November 15, 2023

4. Majority of surveyed doctors and their staff prefer the iTero Lumina™ intraoral scanner for its easy scanning experience.*
   *Data on file at Align Technology, as of November 15, 2023

5. Majority of surveyed users agreed that the iTero Lumina™ intraoral scanner enables faster and easier scans of children and teenagers.*
   *Data on file at Align Technology, as of November 15, 2023

6. The iTero Lumina™ intraoral scanner features integrated high resolution intraoral cameras for capturing details as small as 30 um.
   *Data on file at Align Technology, as of November 15,

7. iTero Lumina photorealistic scans are clinically comparable to intra-oral photography. **Based on clinical data collected in January 2024 of n=15 subjects who participated in a clinical study with iTero Lumina™ intraoral scanner. Data reviewed by Invisalign trained practitioners (Orthodontists and GPs) in conjunction with Align clinical team.
   *Data on file at Align Lumina, as of January 31, 2024.

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