

THE DENTAL ADVISOR

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Integrating the 3M ESPE Lava Chairside Oral Scanner C.O.S. into Daily Clinical Practice

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Introduction

The *3M ESPE Lava™ Chairside Oral Scanner C.O.S.* is used to capture high- accuracy digital images of teeth. Data from the scan are used to create an articulated stereolithography (SLA) model that a dental laboratory can use to fabricate restorations such as crowns, inlays, onlays, and bridges. The data may also be used for design and fabrication of a *Lava* zirconia coping.

The *Lava C.O.S.* intraoral scanning wand contains a single primary lens that captures images at video rate on three sensors. It delivers 20, three-dimensional data sets per second using patented wave-front sampling technology. The wand cable is connected to a cart that houses the CPU, which models the data in real time and displays it on a touch screen monitor. The touch screen is also used to manipulate the virtual model and interact with the system software to enter patient information and information relevant to the preparation (THE DENTAL ADVISOR Clinical Case Report, No. 10, April 2009).

Clinical Training and Integration

A two-day clinical training was provided in the office by two representatives of 3M ESPE. The first day of training consisted of an introduction of the *Lava C.O.S.* to the dentists and dental assistants at Enspire Dental, the private practice of four of the editors of THE DENTAL ADVISOR. The introduction included:

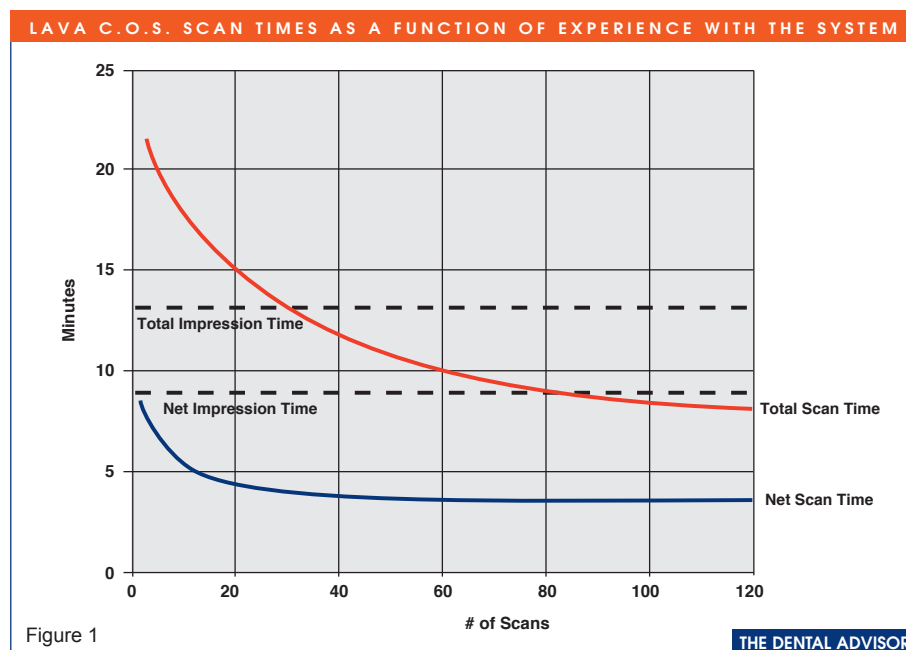
- *Lava C.O.S.* use and operation
- Isolation and powdering of the teeth
- Demonstration of scanning posterior and anterior teeth
- Patient data entry
- Practice scanning on typodonts and staff

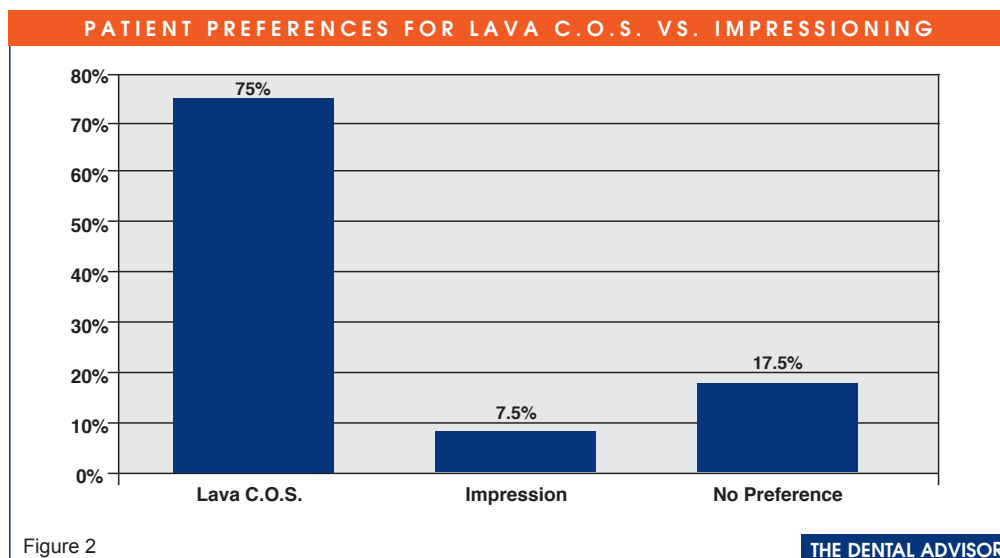
The second day of training involved the application of what was learned on day one. Patients who were treatment planned for crown, bridge and onlay procedures were scheduled in advance and consented that trainers would be present during their appointments. Each dentist was able to scan prepared teeth on one to three patients under supervision and get help when needed from two 3M ESPE trainers.

Three scans were taken. The first scan included the prepared tooth along with the remainder of the operative quadrant. The second scan captured images of the opposing quadrant, and the third scan included both arches in centric occlusion. These scans were sufficient to obtain an SLA model for use by the dental laboratory to design the restoration. During the procedure, scan times were noted as *Total Scan Time* and *Net Scan Time*. The *Total Scan Time* was based on a running clock, beginning with the powdering of the tooth through completion of all of the scans. *Total Scan Time* included time between individual scans, repositioning the patient, inspection of the on-screen images, and any other delays until the final scan was completed and accepted. The *Net Scan Time* was a sum of the actual time in which acceptable images were captured. This was taken directly off the **Lava C.O.S.** monitor. *Total Scan Time* and *Net Scan Time* are important to determine the efficiency of scanning when compared to impressing.

It was estimated that *Total Impression Time*, which included assistant set-up, tray selection, impressions of both arches plus a bite registration, would be approximately 13 minutes. *Net Impression Time*, which is the time it takes to mix the impression material, load it into the tray, time in the mouth, plus taking an opposing arch and a bite impression, adds up to about 9 minutes. This time does not include re-taking an impression when necessary. So in order for the **Lava C.O.S.** to be time efficient, the *Total Scan Time* and the *Net Scan Time* needed to be under 13 and 9 minutes, respectively.

In the first few days, during the learning process, both of these **Lava C.O.S.** times were long (Figure 1). After an initial learning period of taking 15-20 scans, both the *Total Scan Time* and the *Net Scan Time* of **Lava C.O.S.** decreased. For the experienced user, the *Net Scan Time* of the **Lava C.O.S.** takes about 4-5 minutes. This time represents a 50% reduction in the time required to take an impression. In addition to the time savings, patients preferred the scan. Of 122 patients who had both a digital scan and an impression, 75% preferred the scan (Figure 2).





Patients' Comments

- “The scan is so much easier than the impression. I would rather have the scan in place of the impression any day.”
- “I don’t like the feeling of an impression tray when I bite down. It is uncomfortable.”
- “Can we do this every time - I don’t like the impression.”
- “Loved it! Incredible! Nothing to it. This is exciting technology!”
- “This crown feels better - the bite is better and it is not as tight.”
- “As a person who gags easily, the scanning is much easier than the impression.”
- “The new procedure shortens and improves time considerations. The measurement and preparation of the prosthesis and installation takes less time.”
- “The procedure is more comfortable than the traditional impression procedure. It’s more pleasant.”
- “There is an increased confidence in the practice using the newest and the best procedures and materials for patients.”

Laboratory Comments

- “Margin marking takes less time than scanning stone models, increasing the productivity of our CAD/CAM department.”
- “From a milling center perspective, without a doubt, C.O.S. cases can be processed and forwarded to partner laboratories quicker than traditional impression/model cases.”
- “Love the multiple viewing options when marking margins. 3D view is particularly helpful.”

Preview of Scan

After completing the scan, a preview of the digital image must be done to ascertain that the margins are visible and can be easily defined. This image is viewable as black and white “snapshots” or in color-enhanced three-dimensional images. The dentist or the dental assistant can also mark the margin to assist the laboratory in locating it. The ability to preview the scan definitely helped in improving the accuracy of the margins and fit of the restoration.

Accuracy of Restorations

In a study conducted by THE DENTAL ADVISOR, 63 teeth were prepared for crowns, scanned with the *Lava C.O.S.*, and had traditional impressions taken (THE DENTAL ADVISOR Research Report, No. 22, June 2009). Two crowns were fabricated - one based on the *Lava C.O.S.* scan and an SLA model and one on a stone model from the impression. Each restoration was evaluated for fit in the mouth, and the results were reported for each group. The crowns made based on the *Lava C.O.S.* scan exhibited more perfect interproximal contacts, better fit and stability, better margins, and more perfect occlusion (Table 1). Perfect interproximal contacts, better margins and little need for occlusal adjustments on the *Lava C.O.S.* crowns resulted in about 33% savings in time at the crown seating appointment.

Conclusions

- The *3M ESPE Lava Chairside Oral Scanner C.O.S.* was easily incorporated into the daily tasks within the operator.
- The integration was smooth, fast and painless.
- The scanning (digital impressioning) resulted in 50% time savings as compared to impressioning.
- Seventy-five percent of patients preferred the scan to the impression.
- The crown from the scan fit better, required less interproximal and occlusal adjustment and resulted in a 33% time savings at the crown seating appointment.
- The staff embraced the *Lava C.O.S.* and were very pleased with its ease of operation.
- The *Lava C.O.S.* allows the operator to scan for all types of restorations, including those fabricated from ceramic, PFM, gold, and indirect composite.

Table 1. Results of clinical parameters tested.		
Rating	COS	Impression
Contacts – Mesial		
Perfect	62%	43%
Tight	38%	57%
Contacts – Distal		
Perfect	81%	71%
Tight	19%	29%
Rocking		
Perfect	97%	87%
Slight	3%	13%
Fit		
Perfect	92%	70%
Loose	8%	30%
Marginal Adaptation – Mesial		
Perfect	62%	59%
Close	32%	36%
Unacceptable	6%	5%
Marginal Adaptation - Distal		
Perfect	89%	87%
Close	11%	13%
Unacceptable	0%	0%
Marginal Adaptation – Lingual		
Perfect	56%	40%
Close	44%	57%
Unacceptable	0%	3%
Marginal Adaptation – Buccal		
Perfect	76%	59%
Close	19%	38%
Unacceptable	5%	3%
Occlusion		
Perfect	74%	46%
High	18%	48%
Light	8%	6%
Clinically Acceptable		
Yes	95%	89%
No	5%	11%
Restoration Seated		
COS	71%	
Impression	29%	
Cement Used		
RelyX Unicem	81%	
seT	11%	
G-CEM Automix	3%	
Clearfil Esthetic Cement/ Clearfil DC BOND	3%	
Durelon	2%	