Optical Impressions:

I-History

II-Systems

III-Comparison

IV-Literature & Conclusion

Facts:

- Optical or Digital scanners are integral parts in the Image acquisition and the first step in CAD CAM.

- The Science of Optics had applications in different industries like Jewelry, Car Industries, Medicine, microscopy, Photo Industries.

- And of course Dentistry.

1950’s → CAD/CAM
1960’s → software for auto and aircraft industries.
1973 → Francois Duret “Empreinte Optique”.
1980 → Werner Mormann CEREC
2000 → CEREC3
2003 → 3D software
2007 → Itero
2008 → E4D, Lava COS.
2009 → LED blue cam
2012 → Omnicam, 3M true definition, IOS FastDesign™

Goals for Making Dental Impressions:

- The acquisition of an accurate negative copy of a prepared tooth or teeth and of the adjacent and opposing teeth.

- The establishment of a correct interocclusal Relationship.

- The conversion of this information into precise replicas of the dentition on which indirect restorations can be made.

Advantages of Optical Impressions:

- It can reduce the chair time (when mastered).

- Minimize the bench time at the laboratory.

- Patient is more comfortable, especially for gagging patients.

- A demonstration tool that is more appealing to the patient.

- Electronic record that can be easily retrieved, discussed with the Lab.
Type of Restorations that can be made using Optical scanner

- Inlays
- Onlays
- Complete crowns
- Implant supported crowns
- Veneers
- FPD
- Partial Dentures and complete dentures

II-Optical Systems

Intraoral scanning systems with milling unit

- CEREC AC
- Sirona Dental Company
- E4D
- D4D Technologies
- IOS fastscan System

Intraoral scanning systems without milling unit

- iTero and 3M true definition

Optical scanning in lab:
- Complete denture
- Partial Denture

- Avadent
- Sensable Technologies
- Dentca

Avadent.com, Dentca.com & Dentable.com
The ten existing intra-oral scanning devices for restorative dentistry are:

1. CEREC® – by Sirona Dental System.
2. iTero – by CADENT LTD.
3. E4D – by D4D TECHNOLOGIES, LLC.
4. Lava™C.O.S. – by 3M ESPE.
5. IOS FastScan – by IOS TECHNOLOGIES, INC.
6. DENSYS 3D – by DENSYS LTD.
7. DPI-3D – by DIMENSIONAL PHOTONICS.
8. 3D Progress – by MHT S.p.A. and MHT Optic Research
9. directScan – by HINT - ELS GMBH.
10. trios – by 3SHAPE A/S.


Strategies adopted by manufactures

- Smaller wand
- Ease of use clinically
- Powder application
- Reducing one extra step
- Type of light source
  - Laser
  - Infrared
  - Blue LED

1-CEREC

Take 3 images:

1st image is the preparation itself and will give you the path of insertion.

2nd and 3rd images are the adjacent teeth.

Keep the same angulation for all images, images are to overlap each other 8mm.

To create a virtual model.

2-E4D

- Founded in 2003, D4D Tech.
- First launched in Feb 2008.
- Comes with a milling unit
- No need to powder.
- “optical coherence tomography”
- E4D compare

3-iTero

- 3D Intra oral Scanner with voice prompts and no powder.
- In Restorative and Orthodontics Especially invisalign.
The product was officially launched in February 2008; as Lava C.O.S. system. CPU & a touch screen cart.

The new True definition → 2012

Wand is the lightest and smallest in optical scanners

It all begins with a strong protocol...

1. Scan Prepared Tooth
2. Video Review of the Prep
3. Scan Remainder of Operative Arch
4. Scan Opposing Arch
5. Register Bite Scan

Scanning the Preparation

- Begin and end on the occlusal surface
- Don't forget your "end zones"
- Rotate a full 90° to best capture contact walls
- Attempt to scan all critical information in one patch
- Look out for unwanted moving objects

Visual Cues While Scanning

Depth indicator
Surface-white
Surface - red

Margin Annotation Feature
Occlusal Registration
What happens to data?

- In 3m, unnecessary information are removed and a STL file is generated.
- STL file by 3M has open architecture which means it can interface with several CAD/CAM brand to fabricate prostheses.

Digital Workflow

Your office
- You take and accept your imagines
- Digital prescription
- Delivery

Your lab
- Digitally cut the die and mark finish line
- Lab receives virtual model
- Lab receives SLA model: Fabrication of final restoration

3M
- File is virtually ditched, data is seamlessly articulated with the operative, opposing and bite scans
- SLA model production
- SLA resin model replaces traditional stone model production in the digital workflow.

Stereolithography (SLA)

SLA resin model replaces traditional stone model production in the digital workflow.

III-Comparison

Cerec: Triangulation
- Itero: Confocal
- Lava: active wavefront sampling

IV-Literature

ruri arc scans: conventional versus digital impressions--an in-vitro study.
Ender A, Mehl A

They compared in vitro the accuracy of data obtained by CEREC Bluecam, Lava C.O.S., and the conventional method. The authors obtained similar results for the 3 methods, concluding that the digital impression is as accurate as the conventional one.
Accuracy

The Lava COS scanning resulted in the smallest and most consistent errors of all three scanners tested considering mean distance errors and average angulation errors in full arch impressions for both measured distances.

Dental impressions using 3D digital scanners: virtual becomes reality.

Birnbaum NS, Aaronson HB.

- The learning curve for any of the systems presented in this study requires the development of new abilities that request time and patience. Nevertheless, past this phase, the ability of using this new technology provides restoration with great adaptation, and is fast and very comfortable to the patient.

Conclusion:

- There will always be new Technologies and Systems.
- Every person has his own degree of comfort with any of the systems.
- Optical impressions are the future but you still have to know how to take a traditional impression for now.

Optical impression systems for CAD-CAM restorations.

Galliano GA, Pelizzer EP, Mazzaro IV.

The digital impression is reported to be less uncomfortable to the patient, particularly the ones with previous experiences with the conventional technique, with no discomfort or gagging. A study used both techniques in 122 patients and showed that 75% preferred the optical impression.

Digital vs. conventional implant impressions: efficiency outcomes

Lee SJ, Gallucci GO.

OBJECTIVES:
The aim of this pilot study was to evaluate the efficiency, difficulty and operator’s preference of a digital impression compared with a conventional impression for single implant restorations.

Conclusions:
Digital impressions resulted in a more efficient technique than conventional impressions. Longer preparation, working, and retake time were consumed to complete an acceptable conventional impression. Difficulty was lower for the digital impression compared with the conventional ones when performed by inexperienced second year dental students.

Lee SJ, Gallucci GO.