Egyptian Prosthodontic Association
(EPA Newsletter)

INTRAORAL SCANNING ERA

Master the Details

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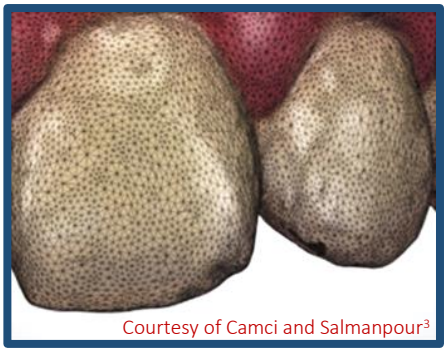
We are currently in an era of digital technological revolution that makes everyday practice more productive. With the objectives of simplifying the prosthetic workflow, reducing the different laboratory errors, together with having the advantage of the many clinical applications in different fields, the use of digital intraoral scanners has widely spread in the past few years[1].

Intraoral scanners (IOSs) are devices for capturing direct optical impressions in dentistry. Simply, they project light onto the object to be scanned, then the images captured by the imaging sensors are processed by the scanning software to create a 3D surface model (mesh)[2].

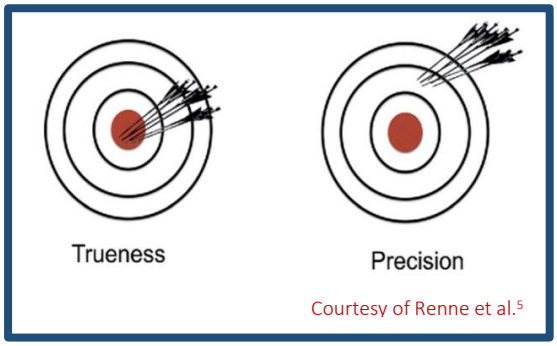
Scanning Accuracy

Accuracy of an intraoral scanner has been defined in terms of trueness and precision[4].
Trueness shows how truly the scanner can record the actual dimensions. The virtual 3D model should resemble the actual model as closely as possible, with minimal deviation from reality.
Precision refers to the repeatability of measurement i.e., the ability of a measurement to be consistently.
Accordingly, the ideal IOS should possess both high trueness and precision, giving consistent and reproducible accurate scans.

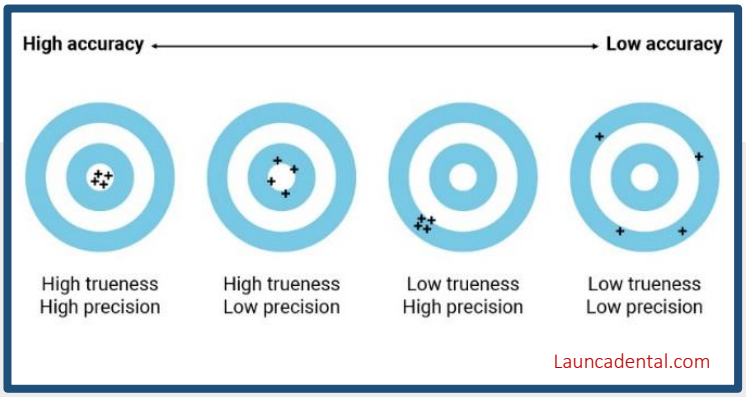
The span length of the prosthesis is inversely proportional to the trueness of the intraoral scanners. Long span prostheses have an adverse effect on the scanning accuracy[4].



Courtesy of Camci and Salmanpour[3]



Courtesy of Renne et al.[5]



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For short-span restorations, one-micron of error won't be clinically significant. However, for long-span restorations, it will accumulate, and the total amount of errors might become clinically significant.

This is clearly evident in Implantology. IOSs show high trueness and precision when scanning for implant supported single crown or a partial prosthesis, however, the deviations increased while scanning for a full arch implant supported prosthesis[6].

The Most Important Properties upon Purchasing an Intraoral Scanner:

1- Powdering

In earlier scanners, it was mandatory to use an opaque powder coating (titanium dioxide) in every scan to provide uniform light dispersion and enhance the accuracy of the scan. Powder could be relatively uncomfortable for patients and increases the scanning time especially when powder is contaminated with saliva during scanning as this requires cleaning and reapplication of powder[7].

Recent scanners do not require the use of powder. Sometimes highly reflective (shiny) surfaces like metal abutments causes uneven light dispersion and adversely reduces the precision of scans so the use powder is inevitable. Powdering itself does not affect scanning accuracy but the non-linear powder application does[7].

2- Size and Weight of The Scanner

Weight ranges from 113 gm to 500 gm[8]. The lighter scanner allows easier handling and is more comfortable to the dentist. However, the size of the scanner's head and the ergonomic design of the scanner have high influence on the easiness of handling of IOSs.

3- Portability

IOSs in the market are either connected to carts, laptops or desktops, or wireless. Definitely getting rid of wires and cables is an advantage and it enhances the use of IOSs.

4- Depth of Field

Depth of field of IOS refers to the maximum depth at which the IOS can record the details with perfect sharpness (focus). It ranges from 12-23 mm.

This property improved greatly the scanning of post spaces, deep subgingival margins and deeply placed implants.

5- Cost

We have to consider the initial cost, subscription fees and update fees. Generally, digital impressions offer many advantages and are considered more efficient and cost effective when compared to the conventional impressions.

6- Additional Features

Features and softwares are incorporated in the scanners to make it a multifunctional dental equipment rather than just an acquisition tool.
Fluorescence Caries Detection, Shade detection and Preparation analysis are considered highly valuable addition to IOSs.

Scanning Path

Scanning path refers to the specific movement of IOS during the scanning procedure to obtain a highly accurate 3D virtual model [7].

Linear scanning even with slight head movements (Zigzag or wave) is the best to get a scan with the least errors and deviations.

Arbitrary scanning will affect the accuracy negatively and can directly influence the occlusion of the final restoration.

It is wise to follow the scanning strategy proposed by the IOS's manufacturer.

Courtesy of Gintaute et al.[9]

Scanning Efficiency

Scanning efficiency is affected by how fast the scanner can be moved before the flow is interrupted (Speed), the amount of data the scanner can acquire in single pass (Acquisition) and the effectiveness of software at fixing interferences (Artificial Intelligence).

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Egyptian Prosthodontic Association (EPA)
Address: 15 Ahmed Abo El-Ela St. – 8th district Nasr City, Cairo Egypt.
Mobile: 010 28203484 (Calls & WhatsApp) Phone: 02 26705035