Implant impression techniques comparative review: Transfer impression versus direct abutment level

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The inaccuracy in dental implant impression is a vast and unsolved problem. It is so serious that the high rate of osteointegration of the majority of implants is absolutely meaningless. Knowing that traditional transfer impression techniques seldom deliver a passive fit of a framework means that most bridges will end up with a failure (Fig. 1).

Different studies show that transfer technique is almost four times worse than the official requirement. Therefore, besides the mechanical issue, it is also a patient’s right to know that impression transfer method is extremely inaccurate, and requires at least a warning and a legal consent. Patients are often misled by widely accepted sources that state: “Success rates of dental implants vary depending on where in the jaw the implants are placed but, in general, dental implants have a success rate of up to 98 percent. With proper care (see below), implants can last a lifetime” (WebMD.com).

Numerous in-vitro studies have examined implant restoration accuracy. There is no doubt about the fact that the transfer impression is to blame for the misfit of the framework, but what exactly causes the distortion has not yet been pointed out.

What is wrong in the transfer impression?

The first problem is that the transfer, which is mechanically caught in the impression material (such as PVS), does not become an integral part of the impression. In fact, it can be easily moved. However, due to the friction between the surfaces of the transfer and the impression material, it does not return back to its original position (Figs. 2, 2a, 2b). That displacement cannot be avoided when the technician engages analogs into the impression. In other words, forces in form of torque or pressure dislocate and mobilize irreversibly the imbedded implant parts.

Fastening in the screw into the analog should be done avoiding any contact with the tray, however, that cannot be always guaranteed. The shift of the transfer can take place even due to the gravity forces of the impression tray, especially in the molar areas. A tray that weighs 100 grams generates in the molar area a torque of 5.8 Ncm by only its own weight, that’s enough to rotate the transfer. The polyether impression materials are characterized by a serious amount of expansion, making the transfers lose and mobile in the impression (Figs. 3, 3a, 3b). The implant manufacturers should indicate that polyether impression materials are not suitable for the techniques using impression transfers.

Splintering transfers with acrylic resins may lead to displacement of the transfers due to the shrinkage of the acrylic materials. Even a splat splinted complex of impression transfers does not become an integral part of the impression. The second problem is due to the uneven amount of the stone around the analog. The expansion of the dental stone during its setting causes a serious inclination of the abutment from its original position. The third problem is also related to the dental stone expansion. Unlike the stone, the analog does not have any expansion. The analog becomes lose and mobilis. Gripping firmly a one-piece analog with a hemostat, one can see with a naked eye how it rotates in the model around its own axis (Fig. 4, 4a).

Almost always, sectioning of an implant stone model is very difficult to perform because of the presence of the hard steel analogs in the body of the model. Additionally, a small amount of the dental stone around the analogs often leads to breakage of the die and requires either a redo of the dental model or working on an unsectioned model. These difficult working conditions prevent precise fabrication of the restoration.

Implant manufacturers have invested a lot of resources in the implant improvement but very little in the improvement of the impression accuracy. Many dentists become so frustrated by the results of the implant restoration that they stop restoring implants and refer the clients to prosthodontists.

Finally, more and more dentists today have come to the conclusion that a simple direct impression of the abutment is much better than the traditional transfer impression. The accuracy of the PVS material is very high, it has high volumetric stability and a good resistance for tearing. Additionally the PVS by its slight rate of shrinkage can partially compensate the expansion of the dental stone and with aid of a rigid impression tray provides fabrication of accurate restoration. The main concern with the direct impression is the abutment’s subgingival area registration. In 2008 JADA Dr. Vincent Bennani published a review called Gingival retraction techniques for implants versus teeth. Bennani covered most gingival retraction means for natural teeth and discussed the possibility of applying them in the impression of the implant restoration. His conclusion was that there is no existing device or method for gingival retraction that practically can be used for direct impression of the implant abutment.

Aluminum Chloride Expasy™ was recently tested for use with the titanium endosseous implants and was found as a harmful material for the polished surfaces of the implant and implant parts. Implants™ uses overstated healing abutments or custom oversized temporary abutments to expand the surrounding tissue. This method has little predictability because the rebond of the tissue varies from patient to patient.

Recently, a Canadian company, Stomatotech, came up with a simple idea to retract the gingival tissue using a disposable plastic collar that is inserted on the apical end of the abutment before the abutment is engaged to the implant (Fig. 5).

The plastic collar creates a perfect gingival retraction with a valve factor preventing the liquids from contaminating the area of the finish line of the abutment. It is undeniable that the plastic collar eliminates the need of the impression transfer and the analog. However, the main advantage of that device is the fact that it does not impact the accuracy of the final restoration (Fig. 7).
The greatest advantage is for optical impressions users, because it allows scanning the abutment exactly the same way as a natural tooth. The digital impression is an extremely accurate method for taking impressions, and it is gaining its place in the dental general practice very fast. Still, its use in implant prosthodontics is limited.

A comparative study by J. B. Da Costa published in JOD, shows that there is no difference between direct oral scanning and indirect scanning of a stone model from PVG impression, which confirms the high accuracy of both methods.

**Summary**

The passive fit of the prosthetic framework is extremely important, especially for longevity of an implant. Every implant, even the cheapest one, can last many years in the patient’s mouth if only it is correctly loaded and properly restored. Lack of the passive fit usually leads to serious bone loss and implant failure.

The practitioner has to do everything possible to keep the restoration in the zone of 50 μm of the marginal fit. An implant, unlike a natural tooth, does not have periodontal mechanism that gives the natural tooth a resilience of 50-80 μm.

Splitting as many crowns as possible divides evenly the load between the implants but can compromise the passivity due to the poor accuracy. To achieve 10 μm level of accuracy, every single negative cause should be eliminated from the impression procedure.

The only recipe for implant-supported restoration success is an accurate impression. Currently, the alternative to the transfer impression is the silicone or optical direct impression of the abutment with G-Cuff™ by Somatotech or with an optical impression with an aid of scannable bodies. These two methods deliver a substantial passive fit that assures longevity of the implant.

**References**

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