DOUBLE STEP REVERSE™ (DSR): A NEW PROTOCOL IN POLYVINYLSILOXANES (PVS) IMPRESSION-TAKING PROCESS - TWO CASE REPORTS

Enrico Manca1a, Marco Fazio2b, Riccardo Aiuto2c, Giacomo Derchi1,3d

1Department of Surgical Pathology, Medicine, Molecular and Critical Area, University of Pisa, Pisa, Italy
2Private Dental Practice
3Tuscan Stomatologic Institute, Lido di Camaiore, Italy

-DDS, Professor in University Master Degree in Oral Implantology, Clinical Dentist in Cagliari (Italy)
-DDS, Clinical Dentist in Palermo (Italy)
-DDS, Clinical Dentist in Milano (Italy)
-DDS, MSc, PhD, Assistant Professor, Clinical and Research Fellow

Cite this article:

ABSTRACT

Aim
The aim of this case report is to describe a new protocol which can be useful to the clinician and can lead to a less frustrating process while taking dental impressions for fixed prosthodontics.

Summary
With the “Double-Step Reverse” technique it is shown how it is easier to take excellent impressions, especially in the post-space and in the multiple preparation impressions, without worrying about V-shaped voids and bubbles on the finishing line.

Key learning points
The DSR protocol requires that the wash material (Aquasil Ultimate) is first delivered on preparations, then we wait for its complete setting and later we deliver the tray material, with an impression tray. The DSR technique allows to have a great patient cooperation and a great serenity during the 3 minutes of the setting time. It is time-saving and reduces the waste of polyvinylsiloxanes (PVS) materials.

Keywords: prosthetic dentistry, PVS impressions, accuracy, dental materials, double-step impressions.

Introductions
The impression-taking process has always been a delicate step in fixed and removable prosthodontics; several techniques and materials has been evaluated with varying degrees of success. The scientific papers provide us with comparisons between different impression techniques and different materials, so it is hard to find a unique agreement. On the other hand, the dental supplies offer many types of hydrocolloid materials, polyether, polysulfide and polyvinylsiloxanes (PVS).

The importance of the quality of a dental impression is well known and it is shown by many articles that compare not only the available materials but also the impression techniques. The authors point out that a polyvinylsiloxanes (PVS) move rapidly from a viscous to an elastic phase, then requiring a short working time after mixing. Thus, compared to polyether (PE), PVS have a shorter plastic phase.

On the other hand, the rigidity of the PE, twice as double than PVS, often makes the disconnection difficult. These data are confirmed by the work of McCabe in 1998. A brand new PVS, coupled with a handpiece that is attached to the turbine hose, mixes and dispenses the wash material under pressure. Thanks to the characteristics of this new PVS and method of application it is possible to apply the wash material on preparations, then waiting for its complete polymerization and later on the following application of the tray material, according to the new Double Step Reverse technique (DSR).

The purpose of this paper is to show a new protocol to take impressions in polyvinylsiloxanes (PVS) by means of Aquasil Ultimate system. The Double...
Step Reverse technique wants to overcome the limit of the speed of execution, required by PVS, keeping the same application mode of Putty-Wash 1-step/two-component technique, aiming to manage all the issues related to the hasty procedure of the latter. We then aim to compare the Putty-wash 1 step technique with polyvinylsiloxanes (A-silicone) and the new Double Step Reverse (DSR) with the innovative Aquasil Ultimate impression system. In the first study, we took two impressions of each one of a 10-patient group who needed fixed prosthesis (one or more elements): one for each technique. Our laboratory then made two prosthesis for each patient. The controls were carried out on plaster models and on patient’s mouth, checked through optic microscope, “Fit Checker” and probing of the closing edge. The 30 elements examined were eligible for cementation without any evidence of dimensional differences; the closing edge has shown to be clinically acceptable in the range of 40 - 120 μm as indicated by McLean already in 1971. The new DSR technique has shown to be clinically similar to the traditional one. The advantages are: ease of operation thanks to an easier control of the field that is free from saliva and crevicular fluids during placement of the wash, the respect of the reticulation times even in case of multiple teeth impressions and the elimination of errors due to the proper control of the thrust of the tray material (“V-shaped” voids). Moreover the patient well accepts this technique as shown by the final survey. This work aims to describe a new workflow in polyvinylsiloxanes (PVS) impression taking (Aquasil Ultimate, Dentsply). A handpiece connected to the air circuit of the dental unit mixes and dispenses the “wash” material pressurized. The system involves the use of a PVS provided in two textures: a “Type-3” (Aquasil Ultimate Wash) and a “Type 2” (Aquasil Ultimate Tray) according to ISO 4823. Both chemical and physical properties of the material allow the adoption of a new protocol in impression taking that leaves the clinician enough time to deliver the PVS in compliance with the working time specified by the manufacturer without having to rush the procedure for multiple preparations. As to do so, it is possible to have a precise control of the field and of the single elements. The new protocol is not found in the literature yet, as this new system has been available for a short time. The procedure, called “DSR” (Double Step Reverse), requires the operator to place the intrasulcular tip straight into the sulcus for a direct mate-
rial “wash” placement and leave the material wash to fully set. Exploiting the power of air-pressure, the clinician is able to precisely place the wash material over the margins in a single step without having to retract the tissues with any retraction cord or astringent paste.

Once set, the wash material is ready to be taken away from the mouth, by inserting an impression tray (with a “tray material”) and positioning in patient’s mouth, over the wash material.

After the recommended setting time (3 minutes), the operator removes the tray and performs a visual inspection.

The hypothesis of this work is the clinical verification of the results obtained by applying either the new DSR technique and the well-known protocol (3-6,8-9) Putty-wash 1-step that instead recommends to place the wash material (type 3) on the preparations then the heavy-viscosity or monophase material (type 1 - 2).

Case Report n°1
Tooth #1.3 shows a very old ceramic crown with a considerable misfit, which hides a damaged and aged core structure so that it requires a thorough replacement. (Fig.1)

We removed the metal post by means of an ultrasonic insert and then it is time to take a couple of
impressions. The First one is made following the protocol of the “DSR” technique: the “Wash material” (Aquasil Ultimate Wash), after being left for 3 minutes within the root canal, is covered and firmly bonded by the “Tray material”. These two materials, after their setting time, are ready to be removed from the arch.

The Second impression is made of an eXtra-Light Viscosity (Aquasil XLV) in a monophase technique, where a lentulo is used to push the XLV material deep inside the root canal, gaining more push from the subsequent monophase material, delivered by an impression tray. (Fig.2)

At this time, two dies are made and tagged as “U” (which stands for Ultimate) and as “A’” (for Aquasil Monophase) (Fig.3); then sent to the laboratory where they make two duralay resin posts according to the plaster models.

Through the process of thermocompression, the duralay posts are transformed in two “Bio-Hpp” (Bredent) posts. This material is a “PEEK” (Poly-Ether-Ether-Ketone) and among its characteristics,
it has got a Young module very similar to the one of human dentine. (Fig.4)

The two Bio-HPP are tried into the casts to make sure they are tight-fitting and then coated with composite resin; as to do so we create a so called “Post-Crown” made of a Bio-Hpp core and composite resin on the outer layer.

The endoral x-rays are performed for both the models, in order to radiologically evaluate the spaces beneath the dies. (Fig.5)

The digital x-rays show that the results are almost completely identical, therefore attesting that both...
In this impression the wash material is slightly different from the previous, since it is designed for multiple teeth impression and it has a longer setting time.

The finishing line is checked through an optical microscope and probed through endo files .06.

Further evaluation with Fit Checker Blue GC.

The impressions and the dies are basically very reliable in terms of accuracy. Hence the post-crown, crafted according to the DSR impression, is cemented with a radiopaque resin-based cement and hence an x-ray is taken. Radiographically, we are able to evaluate the equal distribution of the cement all around the post. Once we proceed with the cementation of the Crown-post, the tooth is ready to be prosthetically prepared and then another DSR impression is taken immediately. With such an accurate impression, the laboratory can craft a definitive ceramic crown with a high grade of precision. (Fig.6) The two impressions are very similar, as for the accuracy of the models and for the lack of deformation of the post. (Fig.7) Eventually, thanks to DSR technique, we can easily perform an accurate impression of the root canal in case of a “post-crown” rehabilitation. This wash material has showed a “Shore hardness” of 63 and, once it is set, it does not tear off when it is time to remove the tray from the mouth.
Case Report n°2
To better highlight the advantages of this technique, it is hereby described another clinical case where a PVS impression with Aquasil Ultimate system is carried out within the prosthetic rehabilitation of teeth #1.6 and #1.7 (with juxta-gingival finish line).

Case Description
A patient with a severe wear of superior posterior teeth comes to our observation, showing tooth #1.7 with a massive restoration made of composite resin and #1.6 with a complete fracture of the disto-buccal cusp, so they are both in need of prosthetic treatments (Fig. 8).

We decided, by mutual agreement with our patient, to treat the two elements by milling a core-structure from a block of IPS e.max ZirCAD (Ivoclar), which is a yttrium-stabilized zirconium-oxide, together with a veneering of layering ceramic. Stated the height of the residual preparation, which guaranteed enough stability and retention of the restoration itself, it was chosen a juxta-gingival abutment finish line in order to better control: the marginal trimming, the impression, the visual check of the finishing edge, the cementation and the full removal of the excess cement.

We prepared the two dental elements with a juxta-gingival finish line then we placed a retraction cord into the sulcus to highlight the end of the preparations (Fig. 9).

As for the temporary crowns, we adapted two provisional resin crowns performed in the laboratory through a direct rebasing. (Fig. 10).

We placed a retraction cord (Ultrapack #00, Ultradent) into the sulcus and, without removing the cord itself, Aquasil Ultimate Wash is delivered into the sulcus and on the preparations, letting it set for 3 minutes, as suggested by the manufacturer (Fig. 11).

Elapsed this short time, the tray, filled with Aquasil Ultimate Tray, is slowly seated on the upper arch so that the rest of the impression can be taken. In this stage, we opted for a stiff and smooth steel tray with retentive ridges where PVS adhesive is already applied.

After 3 minutes of setting, as indicated by the manufacturer, the tray was removed from mouth (Fig.12), then controlled under microscope (Leica M400 optical) at 40x of magnification and, at the end, was sent to the laboratory. After the laboratory phase, the finishing line of
the structures on the respective abutments was checked through an optical microscope and probed carefully through endodontic files from 06 to 150 (according to ISO standards) in order to properly assess any hidden gaps (Fig. 13).

In the same way, we checked the closing edge directly in the mouth, by adding the verification with Fit Checker Blue GC before resending the substructures to the laboratory for the ceramic layering. The definitive crowns were again controlled along the closing edge and, stated that there was no more than 120 µm and a maximum gap of 1/10 of the entire extension edge of the crown of 1.6, it was decided to proceed with cementation under dental dam for every single crown (Fig. 14 to 21).

Discussion and Results

By obtaining the absolute accuracy of the impressions, this new protocol allows the clinician to take impressions of multiple preparations without worrying about the setting times of PVS when he combines both wash and tray materials. The Double Reverse Step gives enough ease to the operator, allowing him to dry carefully the preps and apply PVS over multiple teeth in sequence; then double-checking any potential transudation, and the presence of saliva. Furthermore, it must be considered patient’s increased comfort, due to the use of less fluid materials that are not likely to leak down the throat if they are in excess, and to the decreased mouth removal time of the tray (3 minutes).

Conclusions

In our practice, the DSR protocol has become the standard in every clinical situation since it provides us a perfect control of the operative field, a chance of managing any sudden problems (exudation, crevicular fluid, saliva), a drastic reduction of bubbles on the finishing line (which are often related to the delivery mode of the wash material through the syringe), the absence of the V-shaped voids that often occurs when the delivery of the wash material is delayed or due to an incorrect positioning of the impression tray (not parallel to the occlusal surface nor pushed too quickly). Eventually, we have noticed a greater patient cooperation and a greater serenity during the 3 minutes of the setting time.

Acknowledgments

The authors declare no conflict of interest related to this study. There are no conflicts of interest and no financial interests to be disclosed.

REFERENCES


DOUBLE STEP REVERSE” (DSR): A NEW PROTOCOL IN POLYVINYL SILICONES (PVS) IMPRESSION-TAKING PROCESS - TWO CASE REPORTS

CV
Enrico MANCA
DDS, Professor in University Master Degree in Oral Implantology
Department of Surgical Pathology, Medicine, Molecular and Critical Area, University of Pisa, Pisa, Italy
Clinical Dentist in Cagliari (Italy)

He is a clinical dentist, graduated in 1994 from Università di Cagliari (Italy) with a great experience and passion about aesthetic prosthodontics. He is currently a professor in University Master Degree in Oral Implantology in Università di Pisa, (Director Prof. Ugo Covani). He is also a visiting professor at the University of Valencia. (Director Prof. Miguel Peñarrocha) He is an active member of ESCD and Amici di Brugg, and he is often a guest speaker at various conferences and events in Italy and abroad.

Questions

What is meant by “DSR”?
- a. A new kind of diode-laser;
- b. A new impression material;
- c. A technique used to retract tissues;
- d. An impression technique.

What does the acronym DSR mean?
- a. Dynamic Standard Registration;
- b. Digital Standard Records;
- c. Double Step Reverse;
- d. Direct Simple Records.

According to the DSR protocol, which material is first delivered on the abutment?
- a. Extra-Light Viscosity material;
- b. Ultimate Wash material;
- c. Ultimate Tray material;
- d. Both of them together.

When it is advisable to deliver the tray material?
- a. Once the Wash material is completely set;
- b. Along with the Light material;
- c. Before the Light material;
- d. It is not required by this protocol.