Internal and external cleaning of dental handpieces : a method to test its efficiency

D. Offner, L. Brisset, A.M. Musset

Faculté de Chirurgie Dentaire – Hôpitaux Universitaires de Strasbourg – Inserm UMR1109

Context and objectives

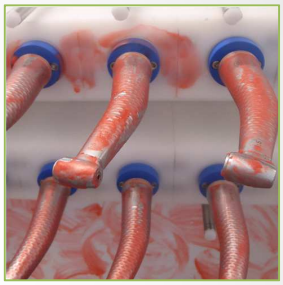
Dental handpieces (HP) are reusable semi-critical medical devices according to the Spaulding classification. Since they are working in the patient's mouth, the phenomenon of backflow which can occur leads to an external and internal soiling and contamination of the HP, especially in the narrow air/water pipes associated therewith. The HP needs then to be sterilized. That must be preceded by a thorough cleaning. Workers in the sterilization field need a method for testing the effectiveness of the cleaning of the HP. Indeed, there is a methodological gap concerning the validation of their cleaning because of the complex internal architecture of these devices.

Method

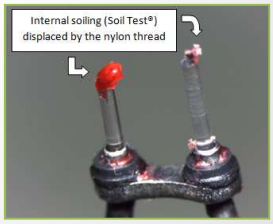
1. Dismantle the HP.
2. Stain the outside (body of the HP) and inside (air/water pipes, gears) using Soil Test® (chosen because of the good adaptability of the form in which it is presented, and its adequacy with biological fouling).
The head of the HP is stained using a Soil Test® syringe. The air/water pipes are stained using a Soil Test® syringe whose mouthpiece is suitable for their diameter. The pressure on the plunger of the syringe will be made until the Soil Test® comes out by the other side of the pipe.
3. Reassemble the HP.
4. Connect the HP in the automaton, run a cycle with inactivation of the disinfection phase (as specified in the standard NF EN ISO 15883-1 for washing tests).
5. Visually observe the presence/absence of soiling residues on the outside of the HP. Perform a test with Ninhydrin (CleanTrace®) in case of absence.
6. Dismantle the HP.
7. Visually observe the presence/absence of residues of soiling. Push a 0.7mm diameter nylon thread through the air/water pipes over a clean plate. The thread is adjusted to the diameter of the pipe and will displace any eventual residual soiling that will be observable upon its release. Observe the presence of soiling on the end and/or on the body of the thread under the microscope. Observe the presence of deposits on the plate. Perform a test with Ninhydrin (CleanTrace®) on the thread in case of absence.
8. Reassemble the HP / or start again at point 2. for a new cycle.

Soiling of the inside of the air/water pipes

Soiling of the inside of the HP head



Connection of the soiled HP in the automaton



Control test : highlighted interest of pushing a nylon thread through the air/water pipes

Demonstration of the cleanliness of the HP air/water pipes

Results

The tests were performed with a washer-disinfector-lubricator-dryer (Bioda© from the brand vr2m) within 2 cleaning cycles with each 6 HP and after control tests. After the cleaning cycles, the HP were externally clean. Our method showed and internal cleanliness too and an absence of proteic residues : Ninhydrin tests were performed on these soilless surfaces, and were negative.
When HP are not put into an internal rotation, a residual soiling is apparent on the half of the surface of the gear, the other half appears clean.

Highlighted soiling on the half of the same gear, due to the non-internal rotation of the HP (halves separated by blue spot)

Discussion

This protocol is original because it is the first ever proposed to control the internal cleaning of the HP without having to destroy them. Though, since it appears to be meticulous to achieve and the manipulations very delicate, it seems hardly applicable to periodic requalification of these automata in a routinely dental practice. However, the results make the method a good candidate for the initial steps of an operational qualification and a qualification of the performances concerning the cleaning of the HP, according to the standards NF EN ISO 15883.

This validation method of the cleaning of the HP fits with an approach of improving the infection control in dental care procedures, both for patients and for the healthcare team. It fills the methodological gaps concerning the cleaning of the HP and allows to assess the HP cleaning that offer dedicated washer-disinfectors. The tests performed demonstrate the need for the HP to be put into an internal rotation during the cleaning phase. Regarding these tests, the Bioda® from the brand vr2m shows a demonstrated external and internal cleaning efficiency of the HP.