Comparative examination of the cleanability of dental instruments in dependence on the handle design

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Objective

Prior to sterilisation, dental instruments have to be subjected to a cleaning process [1], since soiling would adversely affect the sterilisation success. The design of these instruments classified as medical devices is thus essential not only for their handling but also for the cleaning success. This paper compared the two handle designs “knurled handle” and “TRINOVO® handle” of dental instruments developed by the company Kohler Medinzintechnik, Stockach, to examine the influence of the design on their cleanability.

Aim

The aim of the paper at hand was to examine the influence of the design of dental instruments on their cleanability*. The cleaning of surgical instruments is described in DIN ISO 15883 [2]. For this reason, this standard was taken as a basis for the subsequently described works.

Material and methods

Test soil

As described in Part 5 of DIN ISO 15883-5 [2], heparinised sheep blood of the company Acila AG, Mörfelden, was used as test soil. An additional component was protamine, which serves to coagulate the sheep blood. At first, the sheep blood and the protamine were mixed. Subsequently, the mixture was applied to the instrument handles to be examined by means of a brush. Finally, the instruments were dried at room temperature.

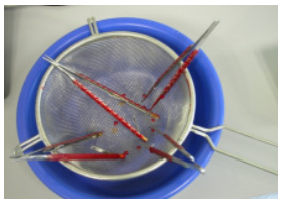


Fig. 1: Soiling of the instruments

Cleaning

The soiled instruments were put into a disinfection bath (20 ml of the disinfection concentrate Ventisept M Plus Neu and 1 litre of cold water) for the period of 1 hour. At the end of the exposure period, the instruments were cleaned manually by means of a rinsing agent and a brush. In doing so, great care was taken to ensure that the cleaning process is identical for both handles. After this, the instruments were rinsed with deionised water and subsequently dried at room temperature.

Fig. 2: Needle holder with standard handle

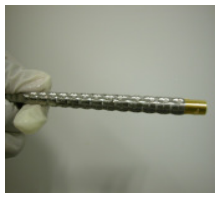


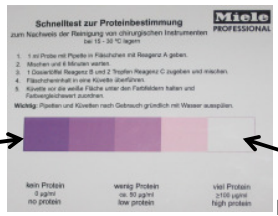
Fig. 3: Needle holder with TRINOVO® handle

Verification of residual protein

Attachment C of DIN ISO 15883-1 [2] describes the application of the semiquantitative Biuret/BCA method to verify the existence of proteins. Test kits for this method are commercially available. The quick protein assay by the company Miele was used to conduct the tests described. The test kit included a rinsing solution, into which the cleaned instruments were put. Using a colour scale, this rinsing solution was subsequently examined for the existence of proteins by means of a colour reaction. As illustrated in Figure 4, the dark purple colour indicated that no proteins were detected; the white colour indicated the presence of many proteins. For statistical foundations, the test was conducted 5 times with needle holder and pliers, respectively.

Results

By way of example, a needle holder and a pair of pliers, each of them with the two different handle designs “TRINOVO® handle and “knurled handle”, were subjected to a cleaning verification. A visual difference regarding the cleanness could be determined as early as after the first rinsing process. This difference was confirmed by the residual protein determination of the last rinsing water. The deposits could be removed more easily from the TRINOVO® handles than from the “knurled” handles. Figure 5 shows this result following the protein determination test. The protein test used also provided insights concerning the cleaning status of the visually hidden instrument sections. This is a clear evidence that great attention has to be paid to the design of reusable sterile medical devices so that the sterilisation success and the patients’ safety are ensured.



No proteins

Many proteins
≥ 100µg/ml

Fig. 4: Colour scale

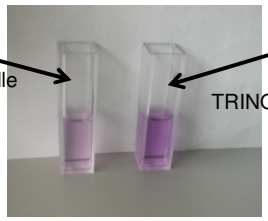


Fig. 5: Result of protein test

Bibliography

[1] DIN 17644:2004, *Sterilisation of medical devices*
[2] DIN 15883-5:2006, *Test soils and methods of verifying the cleaning efficiency*

*The examinations described have been conducted by Mrs. Margaret Njanyeu within the scope of a bachelor thesis.