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Cleaning microsurgery instruments: which method to use?

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Cleaning microsurgery instruments: which method to use?

J. Mareville[*1], *J.F. Allart*[2], *J. Boyer*[1], *Y. Inghels*[1]

Since microsurgery instruments are very fragile special care must be taken when cleaning them. We tried cleaning them in a washer-disinfector using fixation supports and thus eliminating any manipulation at the operating theatre exit.
Instruments were placed in trays equipped with silicone spikes, soiled and then compared with instruments that had been manually cleaned and with others that had undergone automated cleaning on a silicone mat. The cleanliness and integrity of the devices were then inspected.
Visual inspection revealed that instruments cleaned on silicone spikes were dirtier than after manual cleaning, but were 3.8 times cleaner than those cleaned on the silicone mat. None of the instruments was damaged.
Surgeons and nurses in the operating theatre approved of this cleaning system, facilitating instrument recognition and handling. Using silicone spikes was an effective means of cleaning, decreasing damage to instruments and blood exposure. Moreover, this system saved time so cleaning personnel could engage in other tasks.

KEY WORDS
- microsurgery
- cleaning
- silicone
- cataract
- sterilization
- washer-disinfector

Introduction

The Valenciennes Hospital Centre (1,950 beds) performs almost 550 ophthalmologic interventions per year, of which around 330 are cataract surgery procedures, thus accounting for around 60 % of the ophthalmologic surgery interventions. There has been a sharp rise in this activity in recent years with the arrival of new surgeons (Fig. 1).
The well-known fragility of ophthalmologic microsurgery instruments is often the reason for their premature and accelerated alteration. Unlike other surgical instruments, the sterilization personnel have a habit of cleaning them manually rather than in an automated washer-disinfector, and then placing them on a silicone mat. Despite that, we have often noticed alterations in these instruments, especially at their distal end, probably due to handling. This is why the ophthalmology department and the sterilisation unit had to think about a new approach that eliminated all forms of manipulation outside the operating theatre.
We therefore placed the instruments on silicone spikes to secure them better and replace the manual cleaning step with automated cleaning in a washer-disinfector (WD) and thus avoid having to directly handle the instruments.

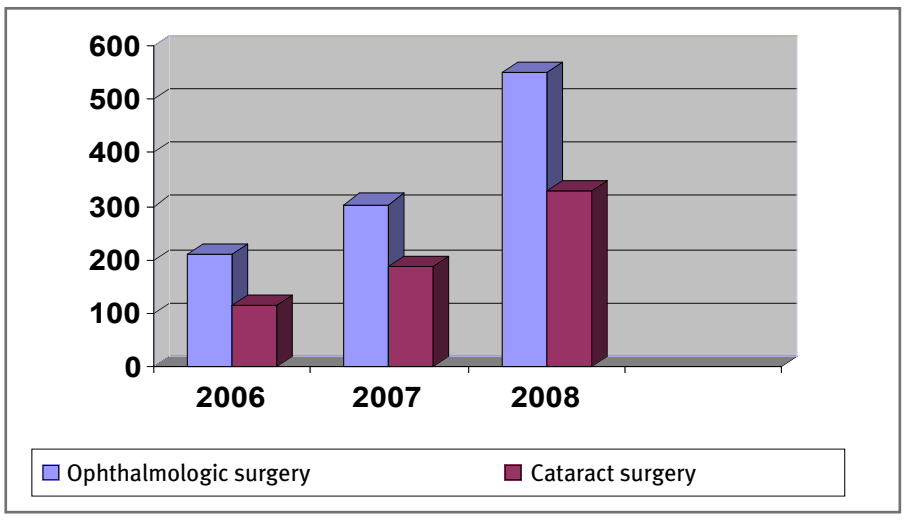


Fig. 1: Trends in the number of procedures since 2006

* Julie Mareville, Service Stérilisation, Hôpital Jean Bernard, Avenue Desandrouins, 59300 Valenciennes, France
E-mail : julie.mareville@wanadoo.fr
1 Service Stérilisation, Hôpital Jean Bernard, Valenciennes
2 Service Ophtalmologie, Hôpital Jean Bernard, Valenciennes

Photo 1: Tray equipped with silicone spike with lid

Photo 2: Instruments placed on silicone spike

Photo 3: Instruments placed on silicone mat

Photo 4: Instruments smeared with Soil Test® and placed on silicone mat

Photo 5: Instruments smeared with Soil Test® and placed on silicone spike

Photo 6: Washer-disinfector loading trolley

The aim of our study was therefore to control alteration of the instruments, while at the same time assuring optimal cleaning, reduce the time spent by cleaning staff on manual cleaning, a very time-consuming activity, and to increase satisfaction levels among operating theatre personnel. This study turned out to be all the more interesting in that it increased the scope of ophthalmologic activities in the general multidisciplinary operating theatre composed of nursing teams who were not specialised in ophthalmology.

Materials and Methods

At present, the instruments used for cataract surgery are placed on a silicone mat positioned in a tray which, in turn, is put into an anodised container measuring 300 × 300 × 150 mm. We dispose of eight «cataract surgery» containers with between 13 and 22 instruments.

First of all, to test the effectiveness of cleaning in a WD, we carried out a two-arm comparative study:

- 37 instruments were placed in trays fitted with silicone spikes (Aesculap, reference JF 11 7R), which provided for secure fixation of the instruments, were fitted with a lid (Photos 1 and 2) and permitted cleaning in a WD.
- 35 other instruments were placed in an anodised tray on a silicone mat without a lid (photo 3); the latter support was used routinely before the study after manual cleaning.

Next, to compare the effectiveness of these supports during automated cleaning we carried out a second two-arm comparative study:

- 37 instruments were positioned on the same trays fitted with silicone spikes
- 46 other instruments were placed in an anodised tray on a silicone mat; all instruments were then cleaned in a WD.

After use the instruments were predisinfected in basins for at least 15 min in a detergent/disinfectant solution. They were then sent to the sterilisation unit for reprocessing in accordance with the study protocol (Figs. 2 and 3 for the 1st study; Fig. 4 for the 2nd study). The containers were washed in separate WDs. After cleaning each instrument was visually inspected for cleanliness and integrity in the packing area. If an instrument was dirty, it was returned to the cleaning zone. If it had been altered, it was sent for repair or replaced. The instruments were then repacked according to a computerised packing sheet that ensured that the quality and quantity of the contents were in order. Trays were placed in their corresponding containers. They were then closed, sealed and sterilised in autoclaves of WESA make. They were then dispatched to the operating theatre.

At the time of these studies all instruments examined were smeared with a soil test (Soil Test® Laboratoire Phagogène, Ref. 51833301 et 2304) pursuant to standard NF EN 15 883-5 [1], which had already been used in other studies [2, 3 et 4], while paying attention to sites that were difficult to clean such as the joints of forceps, internal lumens or jaws. Then the instruments were positioned on the supports designed for the study: on a silicone mat (Photo 4) or on a silicone spike (Photo 5) and left to dry for around 17 hours at ambient temperature, which determined the degree of adhesion and desiccation of the soil on the instruments. They were then cleaned

in automated washer-disinfectors (Laboratoire Miele, Ref. PG8528) (Photo 6) [5 ,6]. Based on good hospital pharmaceutical practices (BPPH) [7] the aim of cleaning is to «eliminate soils through the physicochemical action of a suitable product such as a detergent, in conjunction with mechanical and thermal action based on a fixed time (Sinner Circle), so as to obtain a functional and clean medical device».
The washer-disinfector cycle entailed four successive phases: precleaning or preliminary rinsing to prevent protein fixation, using a water temperature < 45 °C; cleaning with a detergent to eliminate traces of blood, prevent redeposition of protein residues (Laboratoire Dr. Weigert Neodisher Mediclean forte®); rinsing and thermal disinfection and drying with a drying accelerator (Laboratoire Dr.Weigert Neodisher Mediklar®) to eliminate residual water.
On completion of each cycle all instruments were subjected to meticulous visual inspection so as to detect any residual soils. Any detection of soils was equated with unsatisfactory cleaning.
To detect any alterations in the microsurgery instruments, the integrity of the instruments was also visually inspected after cleaning, while checking thoroughly the most delicate parts, in particular at the distal end.
To evaluate the time saved on eliminating manual cleaning, we measured the time needed for manual and automated cleaning of one «cataract surgery» container and its contents.
The operating theatre staff were asked to pay special attention in order to detect any signs of alterations or premature ageing. A survey of satisfaction levels conducted among surgeons, interns and operating theatre nurses helped collect and collate data on the various perceptions after using this new instrument presentation. The number of blood exposure accidents due to different manipulations was recorded for the operating theatre and sterilisation unit.

Results

Following the first study, on visual inspection none of the instruments (0/35) positioned on the silicone mat and cleaned manually was soiled, and 1/37 of instruments positioned on a silicone spike and cleaned in a WD was soiled.

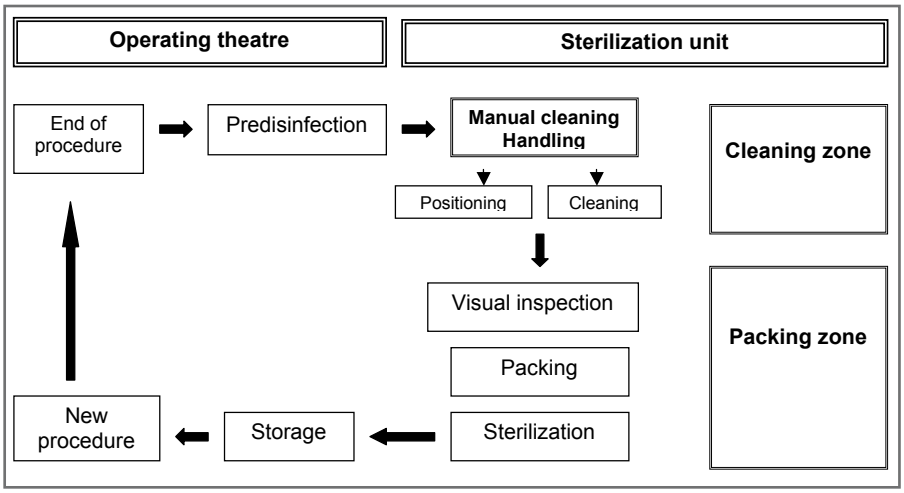


Fig. 2: Method used to reprocess 35 instruments that had been manually cleaned and placed on a silicone mat: first study

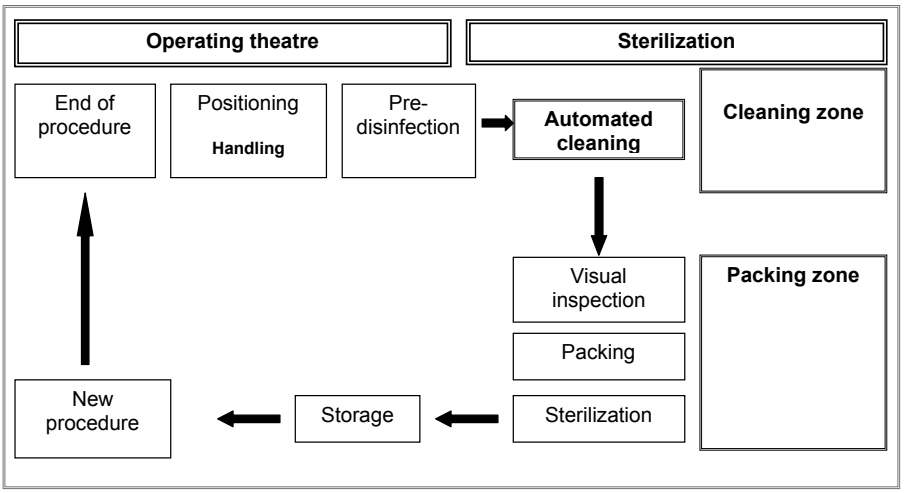


Fig. 3: Method used to reprocess 37 instruments placed on a silicone spike and washed in a WD: first study

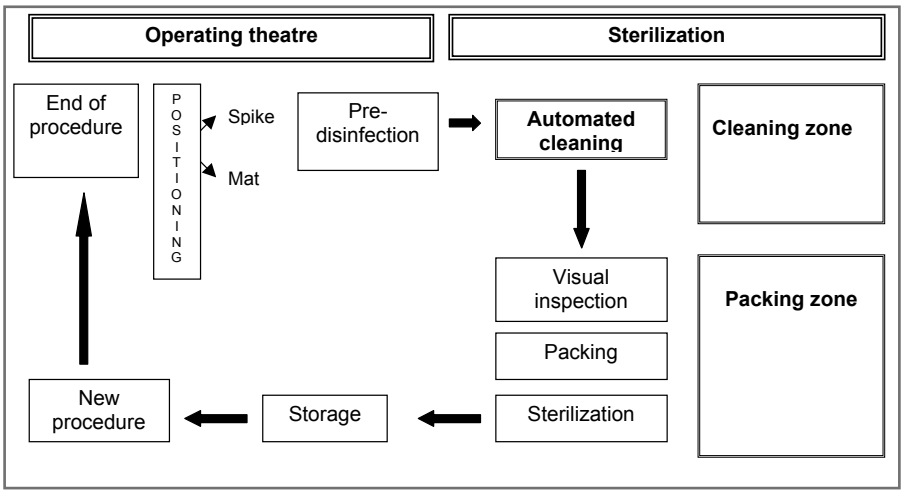
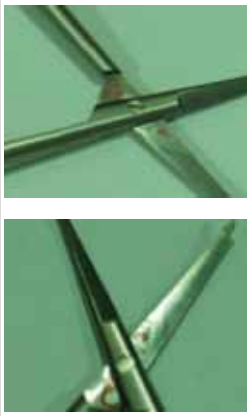
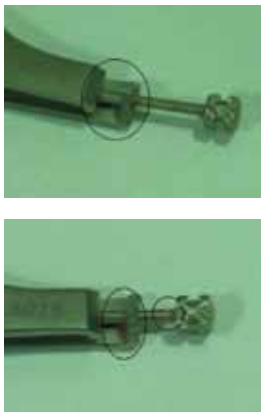


Fig. 4: Method used to reprocess instruments placed on the two types of support then cleaned in a WD

Table 1: Site where soils found on instruments during 2nd study

Type of support used	Mat			Spike
Site where soil applied	Castroviejo scissor joint	Barraquer needle holder joint	Barraquer scissor threaded shaft	Internal side of Sourdille's caliper
Photos des souillures				

Following the second study, on visual inspection of automated cleaning results 6/46 instruments on the silicone mat were soiled versus 1/37 on the spike. Details of the sites where these residual soils were found are given in Table 1. Visual inspection of each instrument before and after each cleaning cycle did not reveal any alteration regardless of the support or method of cleaning used.

The operating theatre staff did not report any alternation or specific shortcomings due to possible premature ageing of the instruments.

The mean time investment for manual cleaning measured for the first study was 22 min for the trays with 13 instruments and 26 min for the trays with 22 instruments. As regards cleaning in a washer-disinfector, each trolley had a maximum capacity of 6 trays per loading level, i. e. a total capacity of 24 trays (Photo 6). Each automated cleaning cycle took 64 min. Table II gives a summary of the time difference between manual cleaning and automated cleaning based on the number of trays placed in the trolley.

No blood exposure accident was recorded.

Discussion

We noted that the number of soiled instruments after positioning on a silicone spike followed by automated cleaning was not higher than after manual cleaning. The areas that were difficult to clean such as openings, jaws and cavities were cleaned properly. The supports helped to achieve a satisfactory quality of cleaning in conformance with standard NF EN 15883. Indeed, optimal cleaning is crucial prior to sterilization because «only something that is clean can be properly sterilized». Besides, there is the problem of reproduc-

Table 2: Theoretic time saving for automated cleaning based on the number of containers simultaneously cleaned

Number of containers simultaneously cleaned	Time taken for automated cleaning of each tray [min]	Time taken for manual cleaning of tray with 13 instruments [min]	Time difference between the two types of cleaning (for 13 instruments cleaned)	Time taken for manual cleaning of tray with 22 instruments [min]	Time difference between the two types of cleaning (for 22 instruments cleaned)
1	64	22	+ 42	26	+ 38
2	32	22	+ 10	26	+ 6
3	21.3	22	– 0.7	26	– 4.7
4	16	22	– 6	26	– 10
6	10.7	22	– 11.3	26	– 15.3
12	5.3	22	– 16.7	26	– 20.7
24	2.7	22	– 19.3	26	– 23.3

ibility because manual cleaning is subject to bias related to the respective reprocessing staff member.

Based on the results of the second study we noted that the number of soiled instruments was less for the spikes than for the silicone mats. Indeed, the few perforations in the mats do not appear to provide for adequate circulation of water and cleaning products to assure satisfactory automated cleaning. The prospect of using them as a routine measure for automated cleaning was therefore rejected.

Good fixation of the instruments on the spikes reduces the risk of alterations since this eliminates impact between the instruments and reduces manipulations. There is therefore less need to replace instruments, with attendant cost savings. On the other hand, we had contemplated switching to single-use instruments but that option was discounted because the quality of the instruments continues to be unsatisfactory. Besides, it is reasonable to believe that such an alternative would generate considerable extra costs.

The silicone spikes assure optimal time management in the cleaning zone. Indeed, manual cleaning is a time-consuming activity involving a mechanical (brushing) and chemical detergent step. The microsurgery instruments are manually brushed in a basin containing a predisinfectant detergent (Laboratoire Anios, Salvanios PH 7®), rinsed (to eliminate all traces of detergent) in a rinsing basin and then dried with medical compressed air. For a container of 13 or 22 instruments a time saving is noted as from three containers placed in the same trolley (Table II). This time saving is around five min for three containers of 22 simultaneously cleaned instruments and amounts to around 23 min for 24 containers of 22 simultaneously cleaned instruments. The vacant spaces in the trolley can be occupied by containers belonging to other surgical disciplines. Besides, since the instruments are opened after use by the operating theatre staff before being placed on the spike, no time is wasted in the sterilization unit for opening each instrument. This also makes it easier to assemble a container in the packing zone and eliminates the risk of possibly mixing up or losing instruments. Hence productivity is boosted throughout the entire reprocessing chain.

Following this stage of the study surgeons and operating theatre personnel are satisfied and have approved this cleaning approach. This new arrangement of instruments in the containers facilitates visual inspection and handling of instruments, thus also helping to save time during the procedure. A survey of satisfaction levels revealed that the use of spikes was favourably viewed. The arrangement of the instruments provides for rapid visual inspection, making it easier to check them for alterations, integrity, cleanliness and, in particular, their handling. The only drawback noted was that operating theatre staff had to place the devices on the spikes after use.

Personnel in the sterilization unit also deemed the new supports favourable as they cut down on the number of manipulations needed. Indeed, they no longer handle the instruments between each intervention except if visual inspection in the packing zone has revealed that instruments are not correctly positioned on the spikes.

Moreover, despite effective personal protective equipment (gloves, goggles, gown) manual cleaning poses risks of contamination to personnel and the environment because of discharge of contaminated droplets when brushing the instruments. It also exposes staff to chemical risks of allergy or irritation linked to contact with detergent products. As can be expected, omission of manual cleaning reduces the number of manipulations and, in turn, curtails the risk of exposure to blood accidents. Therefore occupational safety is enhanced.

Conclusion

These studies conducted in close cooperation between the sterilization unit and ophthalmology department have helped to devise a new system for cleaning microsurgery instruments, which confers the dual benefits of enhanced effectiveness and protection. These were the principle arguments put forward in favour of silicone spikes. Their incorporation into all microsurgical containers has meant that the demands of both departments have been met. This system has helped save time (up to around 23 min) for cleaning staff and has reduced the risk of alterations, loss or mixing up of instruments as well as potential risks of exposure to blood. It helps to essentially reduce the number of manipulations and therefore the risk of alternations, which is the cause of poorer performance of the instrument at the time of use and of the additional costs incurred for repairs and replacement of instruments.

It also facilitates visual inspection and handling for state-registered operating theatre nurses who are not routinely accustomed to working in a multidisciplinary operating theatre. As such, it meets the demands to assure the care and safety of patients and personnel. This study could therefore lead to real discussions between the ophthalmology department and the pharmacists responsible for sterilization in order to optimize positioning/packaging and permit better management of cataract procedures. ■

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