

Handpiece decontamination survey



Is a validated cleaning and lubrication process used to sterilise handpieces in dental practices? Find out what **Andrew Smith,¹ Gordon Smith,² Siobhan Creanor,³ David Hurrell,⁴ Jeremy Bagg⁵ and David Lappin⁶** discovered with their survey. Adapted from a *BDJ* article.¹

What methods are used by general dental practices to decontaminate their dental handpieces? What procedures are in place for purchase and maintenance of handpieces? The authors of the following article carried out an observational survey of general dental practices in Scotland between January 2003 and March 2004. They collected data through interview and observation in 179 surgeries. This article outlines the investigation and their results.

Handpiece evolution

The introduction of both high and slow speed dental handpieces has revolutionised dental treatment, allowing for significant improvements in restorative dentistry and patient care. There have, however, been significant controversies regarding their potential for cross-infection and the methods available for their effective disinfection or sterilisation.

Although autoclavable handpieces became more readily available in the 1980s, the main method for decontaminating handpieces continued to be disinfection (of the external surfaces) rather than sterilisation. In the 1990s, particularly following the highly publicised case of HIV transmission in a Florida dental practice, attention was drawn to the potential for cross-infection by dental handpieces. Laboratory studies demonstrated aspiration of both dye and micro-organisms into the air and water

lines and the handpiece chamber, and their subsequent recovery following re-use of the high speed handpiece.

Contamination concerns

Concerns over handpiece contamination relate to the accumulation of particulate matter (debris from restorative materials and dental hard tissues), micro-organisms from the oral cavity (bacteria, fungi and viruses), micro-organisms from the water and airlines and collection of human tissue (blood, saliva) within the handpiece chamber, turbine blades, gearing, air and water lines. Dental handpieces are extremely difficult to clean, inspect and sterilise due to the small size and length of lumens, intricate working parts (which require lubrication) and their inability to be readily dismantled.

Current recommendations are that dental handpieces should be sterilised between patients.²⁻⁴ For sterilisation to be effective it should be performed following cleaning which, if inadequately performed, will compromise the sterilisation process. Efficient cleaning and lubrication also determine handpiece functionality and longevity.

THE SURVEY

The survey population comprised all general dental practitioners in Scotland with an NHS list number. The list was used for randomly selecting practitioners to survey. A total of 184 surgeries were surveyed, with usable data obtained from 179 surgeries.

Data collection

Each surgery was surveyed by an infection control/decontamination expert and an experienced dental practitioner. The surveying team interviewed both the dental practitioner and a dental nurse. The survey was concerned with collecting data relating to dental handpieces, in particular:

the selection, procurement, cleaning, lubrication, sterilisation, maintenance and replacement of air turbines and air rotors. The decontamination processes undertaken by the surgery nurse were viewed directly by a member of the survey team.

RESULTS

Dental handpiece purchasing and maintenance

Of the 179 dental surgeries surveyed, 170 (95%) had no written policy for purchasing handpieces. The member of staff with responsibility for handpiece purchase was the principal/partner of the practice in 174 of the surgeries (97%), 102 (59%) of whom did not seek information on handpiece decontamination prior to purchase. In the vast majority of surgeries (172 or 96%) all new handpieces were decontaminated prior to first use.

The most common air turbine brand held by the dental surgeries surveyed was Kavo. Most surgeries (138) had purchased a new air turbine handpiece within the last 12 months and the majority of surgeries (111 or 62%) had serviced their air turbines within the last 12 months. The most common brand of slow speed (contra-angle) and straight handpiece was NSK. Most surgeries (157 or 88%) had no written maintenance policy for handpieces and only a minority (49 or 27%) performed their own handpiece maintenance.

Handpiece cleaning

Virtually all surgeries cleaned handpieces prior to disinfection or autoclaving (177 or 99%). The most common method of handpiece cleaning used was to wipe the external surface with a cloth impregnated with disinfectant (Table 1). In a small number of surgeries (5 or 3%), irrigation of the internal lumen of the handpiece was undertaken. Following cleaning, the majority of surgeries (165 or 92%) inspected the

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external surface of the handpiece for cleanliness and 44 (25%) of surgeries dried the handpiece prior to sterilisation, usually by wiping with a paper towel or leaving to air dry in the surgery.

Lubrication of handpieces

Staff in some surgeries (36 or 20%) lubricated their handpieces following use and prior to cleaning. Most lubricated handpieces after cleaning but prior to sterilisation (162 or 91%), although a number lubricated again after sterilisation (42 or 24%). Most surgeries used the handpiece manufacturers' recommended lubricant, none of which were water soluble.

Handpiece autoclaving

The policy in virtually all dental surgeries (174 or 97%) was to autoclave all handpieces after use, with most (160 or 89%) reprocessing handpieces in a bowl and instrument steriliser. Staff in some surgeries (38 or 21%) were placing their handpieces in paper pouches prior to sterilisation in a bowl and instrument steriliser.

Storage and use of handpieces

Within the surgeries most handpieces were stored in a dry and secure location, although 55 (31%) were stored on open work surfaces. Prior to use, dentists in 127 surgeries (71%) discharged their handpieces to dissipate excess lubricant and 55 (31%) discharged their handpieces for several seconds after use on each patient to reduce the likelihood of aspiration of patient material into the handpiece. A minority of surgeries - 36 (20%) - had a dedicated handpiece for surgical procedures.

DISCUSSION

It was reassuring to discover with this survey that the vast majority of dental surgeries now autoclave dental handpieces after use. Prior to intense media coverage of handpiece sterilisation in the early 1990s, large numbers of dentists disinfected rather than sterilised their handpieces.

Dental handpieces present a particular problem for decontamination because they have both external and internal surfaces that become contaminated during clinical use. When the air and water delivered to the handpiece during operation are switched off, the temporary negative pressure induced is likely to result in retraction of contaminated fluid and air along the air and water lines into the handpiece. As a result, the lumen and the turbine blades of the handpiece become decontaminated with oral secretions, which may include restorative materials and biological debris such as microorganisms, saliva, blood and tissue debris. In addition, the air and water lines, turbine and drive shafts can be contaminated from the

Table 1 Methods reported for cleaning handpieces

Method	Number (%) of surgeries*
Wipe external surface with cloth	33 (18.4%)
Wipe external surface with disinfectant impregnated cloth	85 (47.5%)
Place in 'Assistina'	5 (2.8%)
Place in washer disinfector	1 (0.6%)
Place in ultrasonic bath	10 (5.6%)
Other (unspecified method)	62 (34.6%)

*Some surgeries used more than one cleaning method.

source of the compressed air and water supply. Dental handpieces are used for a wide variety of dental interventions and as such should be sterile when used.

Effective cleaning

Effective cleaning is critical in the decontamination process to facilitate handpiece sterilisation and improve the longevity of the handpiece. At present there do not appear to be any validated cleaning processes for dental handpieces. Further challenges of handpiece decontamination include the necessity for air removal from the lumens to allow steam penetration, necessitating use of a forced air removal stage during the sterilisation cycle, for example using a vacuum steriliser. The wrapping of dental handpieces and processing in a non-vacuum steriliser will also impede the penetration of steam into the device - this practice was identified in a number of practices in the survey. At present, vacuum steam sterilisers are not widely used in dental practice in the UK.

Lubrication confusion

The stage at which handpiece lubrication was undertaken in the decontamination cycle varied considerably, suggesting some confusion in this area. The manufacturers recommend lubricating *after cleaning and prior to sterilisation*, although the data from this study indicate that lubrication with a non-water soluble lubricant is quite commonly supplied by the manufacturer. The use of non-water soluble lubricants can impair steam penetration into the surfaces of the handpiece and there is the possibility that such oil-based lubricants could prevent the steam from killing bacterial spores.

A positive development

In conclusion, the policy in the majority of dental surgeries examined is to autoclave handpieces between patients as a routine element of the infection control protocol. This is a very positive development in recent years and one which significantly enhances patient safety.

Despite this, a number of technological issues do need to be resolved before manufacturers' claims that handpieces are sterile can be substantiated. Foremost among these is a validated cleaning process coupled with appropriate lubrication of the internal components, development of which are the responsibility of handpiece manufacturers. An effectively cleaned handpiece would then require to be sterilised under vacuum conditions to satisfy criteria for such devices to be labelled as sterile. Use of a vacuum steriliser would have additional advantages of allowing handpieces to be wrapped prior and during sterilisation, thereby preventing the possibility of environmental recontamination and clearly distinguishing processed from unprocessed instruments.

The widespread introduction of vacuum steam sterilisers into general dental practices remains a contentious issue due to increased capital, revenue costs and technical requirements for periodic testing.

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