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Dental handpieces: Maintenance, repair, and infection control, 3rd edition

A peer-reviewed course by Tija Hunter, CDA, EFDA

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ABSTRACT

Dental handpieces have evolved significantly through the years.[1] While traditional air-driven handpieces are still preferred by many practitioners, electric handpieces are preferred by many due to the constant torque, reduced noise, and improvements in smoothness of final preparations.[2] Regardless of which handpiece is used in practice, proper maintenance and care will elongate the lifespan of the equipment and promote improved functionality. Understanding how to clean and maintain these handpieces and their components properly will help the clinician achieve optimal results. Moreover, it is essential for quality and turnaround times to know when to replace or rebuild handpiece turbines and who to send the handpiece to for repairs. The purpose of this article is to describe protocols for handpiece maintenance, including disinfection, sterilization, and repair.

EDUCATIONAL OBJECTIVES

Upon completion of this educational activity, the participant will be able to:

1. Implement proper cleaning and sterilization techniques
2. Provide proper lubrication of each handpiece and its components
3. Avoid common mistakes
4. Provide proper care for a fiber-optic or LED lens
5. Demonstrate proper sterilization techniques for various handpieces
6. Discuss handpiece turbines and the factors to consider when repair or replacement is necessary

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THE EVOLUTION OF DENTAL HANDPIECES

We have evidence that dentistry was practiced as early as 7000 BC. A tooth dated to be 9,000 years old shows signs that a dental "drill" was used. The history of dental handpieces has evolved over the last 150 years. In 1871, James B. Morrison developed and patented a pedal-powered drill, revolutionizing the dental handpiece world. Also in 1871, an American, George F. Green, received a patent for the first electric "dental engine" with a self-contained motor and handpiece.[3]

Early dental drills were heavy and very slow, typically 3,000 revolutions per minute (rpm). Procedures took a long time to complete and were uncomfortable for the patient. They were also straight, making them cumbersome to use. In the 1940s, an air-driven handpiece, which used air to rotate a cutting bur, was developed by John Patrick Walsh of New Zealand. This handpiece incorporated a contra-angle design, making it easier to position in the mouth.

By the 1950s, air-turbine handpieces were introduced in America by Dr. John Borden, who improved on Walsh's design. This high-speed, air-driven, contra-angle handpiece—called the Airotor—could reach speeds up to 300,000 rpm and launched a new era in high-speed dentistry. Although they have evolved, air-driven turbine handpieces are still most commonly used today. These modern-day marvels can produce speeds unthought of 100 years ago. Today, a slow-speed handpiece can typically operate from 20,000 to 40,000 rpm; high-speed electric handpieces typically at 200,000 rpm; and air-turbine handpieces at more than 400,000 rpm (~6,600 revolutions per second). The average preferred range is 180,000 to 330,000 rpm. Handpieces now reduce the time it takes to perform a procedure, cause less stress and trauma to the tooth, and provide greater comfort to the patient and better ergonomics for the clinician.[4]

AIR-DRIVEN, HIGH-SPEED HANDPIECE MAINTENANCE

High-speed handpieces are an essential part of any dental practice. The use, care, and proper maintenance are crucial to preserving their lifespan. Proper cleaning and sterilization will keep handpieces running longer and prevent the spread of infectious diseases. To prevent voiding warrantees, adhere to the recommendations from the manufacturer regarding disinfection and sterilization protocols. The purpose of internal handpiece maintenance is to dissolve and remove dirt, debris, and contaminated oils, leaving clean oil behind for lubrication. The lubrication of any handpiece is essential to its function. When these procedures are done correctly and consistently, the lifespan of a handpiece can be extended.[5]

CONSIDERATIONS WHEN SELECTING HANDPIECES

When selecting handpieces, the design of the handpiece can facilitate improved efficacy of disinfection. Design and maintenance variations exist between handpieces. Some factors to consider include:

1. Is it autoclavable?
2. Does it have a sleek, smooth design? Less detail on the shell of the handpiece will help prevent the buildup of debris.
3. Can the finish on the shell hold up under long-term sterilization? Titanium withstands chemicals and the sterilization process better than chrome plate.

CLEANING AND LUBRICATING

According to the American National Standards Institute (ANSI), ISO 7494-2 requires dental units to include an antiretraction valve on water lines. The Centers for Disease Control and Prevention (CDC) guidelines call for flushing water through the handpiece in the operatory for two minutes in the morning, and 20-30 seconds between patients, to remove potential contaminants from the internal waterline after each use.[6] Antiretraction valves may become compromised by bioburden accumulation, and this is a critical step in properly maintaining waterlines.[7]

Once in the sterilization area, remove the bur and scrub the handpiece under running water with a sponge to remove external debris. Lubrication of dental handpieces prevents clogging of internal debris and increases the functional lifespan.[8] While following the recommendations of the manufacturer is suggested, lubrication can be successfully achieved using handpiece maintenance stations. Handpiece maintenance stations have become widely used and have gained popularity. They allow the handpiece to be housed in a unit with a cover while running the handpiece to prevent lubricant from expelling on the operator's hands.

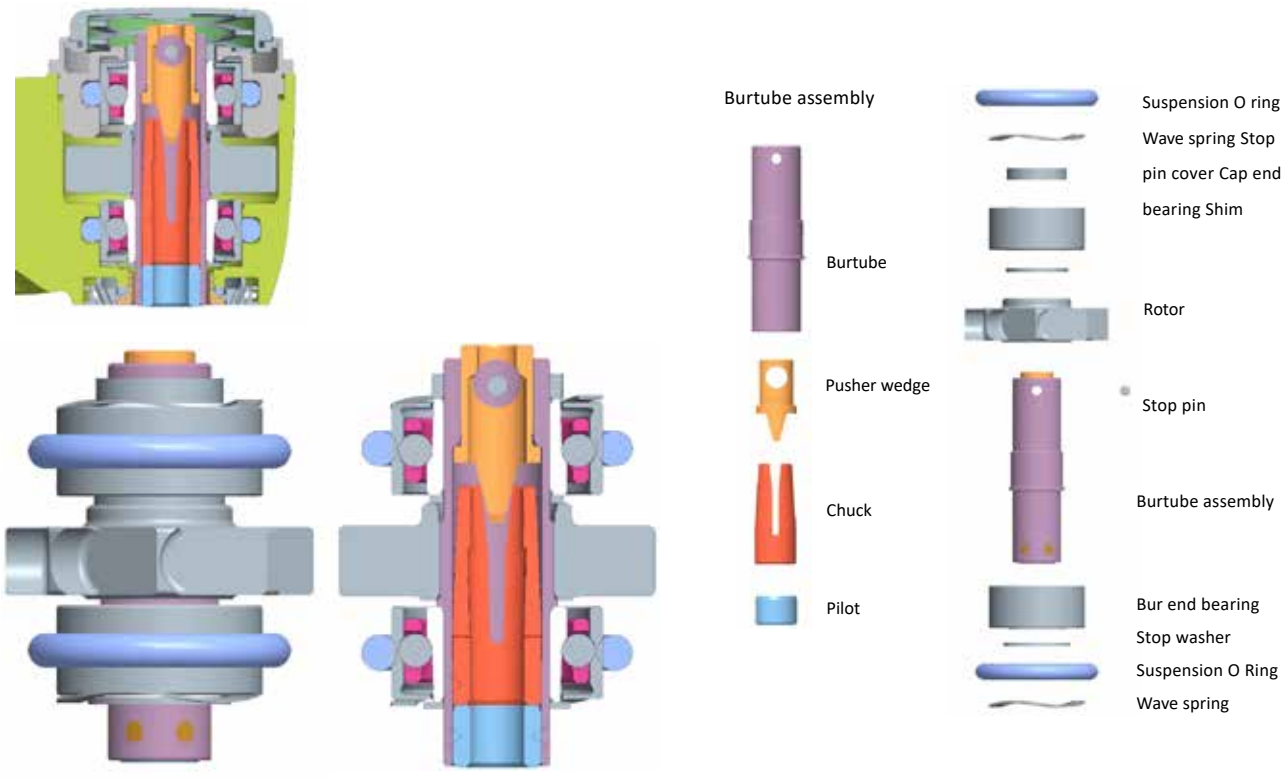
There are two types of handpiece stations. The first system calls for the operator to clean and lubricate the handpiece with the manufacturer's recommended aerosol maintenance spray for one second. If a large amount of debris is expelled from the handpiece, the aerosol spray is repeated. The second type of system doesn't require lubrication before being placed on the station. When ready, the handpiece will be placed onto the station and turned on. The station applies cleaner and lubricant. It then runs the handpiece for at least 20 seconds to purge all excess debris and oil. Running the handpiece is an important part of the process as it clears all debris before being autoclaved. Removal of excess lubricant is important, as residual lubricant can impede sterilization[9]. Excess lubricant is removed from the outside of the handpiece with a clean towel. There are many commercially available lubricants; some are synthetic, some indicate they are a cleaner and lubricant in one, and some use a separate cleaner and oil.

An overlooked but easily performed maintenance procedure is the cleaning of the chuck. Once a week, a few drops of handpiece lubricant or maintenance spray are placed into the chuck opening on the high-speed handpiece. An interproximal brush or microbrush can be placed into the handpiece chuck opening to remove debris. This will dislodge any residue, ensuring proper retention of the dental bur. Following these steps will help extend the life of your handpiece and save on repair costs. Expressing all the lubricant from the handpiece is imperative. If this step isn't followed, oils can be introduced onto the tooth prep and may reduce bond strength of resin-based composite.[10]

STERILIZATION

Once the handpiece is cleaned and lubricated, sterilization must follow. Failing to

FIGURE 1: Stylus ATC STD turbine



Cross-sectional view of turbine

sterilize the handpiece can result in a significant source of cross contamination. In 2008, the CDC, in its Guidelines for Disinfection and Sterilization in Healthcare Facilities, indicated that "handpieces can be contaminated internally with patient material and should be heat sterilized after each patient. Handpieces that cannot be heat sterilized should not be used."

Proper steps in sterilization must be performed after every patient. Use of a steam heat autoclave or chemical vapor sterilizer is required, at a maximum temperature of 135 degrees C or 275 degrees F per sterilizer manufacturer's recommendations. When using a chemical sterilizer, the handpiece must be completely dry. Handpieces must be sterilized to the validated time and temperature parameters per the instructions for use. Make sure the handpiece is dry before pouching so only deionized water enters the autoclave. Make sure the drying cycle is complete as excess water will cause oxidation of the handpiece in the pouch, resulting in corrosion. If using a plastic/paper bag, be sure to follow the sterilizer's instructions for proper placement in the chamber to ensure complete sterilization.

Steam heat autoclave is the most widely recommended form of sterilization.[11] Autoclaves should be tested weekly with a biologic indicator to ensure that proper sterilization is achieved with each cycle. A properly working autoclave will ensure all of your instruments are free of infectious and contaminated material. The autoclave should always run through the complete cycle, including dry cycle. Never use a handpiece that has not cooled off. Running a handpiece under cool water can cause the housing and internal parts to crack or warp. It is important to check the handpiece coupler on the dental hose as well, at least once a week. O-rings should all be present and in good condition. O-rings can be obtained from the manufacturer and replaced as needed. Couplers need to be lubricated and cleaned using the lubricant and a towel or gauze pad. The towel or gauze should be moistened with the lubricant/cleaner and then wiped in a circular motion to clean debris and rehydrate the O-rings, making sure the bulb cap stays snug.

12 TIPS TO EXTEND THE LIFE OF YOUR HANDPIECE AND THE MOST COMMON MISTAKES

Handpiece life varies on a number of factors, including maintenance. Here are ways to extend the life of a handpiece through proper maintenance, as well as common mistakes.

1. A handpiece should never be wiped down with a chemical disinfectant or alcohol. When heated, the chemicals may react with the metals, causing a buildup of rust and corrosion. If left unattended, they will shorten the lifespan of the instrument. Use only a chloride-free surfactant when cleaning the handpiece.
2. Apply a sufficient amount of cleaner/lubricant. The cleaner/lubricant should come out of the head of the handpiece to ensure all bearings have been thoroughly covered.
3. Make sure you are lubricating the drive

air line of fixed-back handpieces. Only the drive air hole goes to the turbine. Lubricating the wrong hole will result in improper turbine lubrication.

4. Use the correct cleaner/lubricant. Always use the manufacturer's recommended lubricant with their respective nozzles and expelling maintenance couplers/adapters.
5. Properly clean the chuck to remove any excess debris at least once a week to maintain the mechanism that holds the bur. This helps ensure the bur does not come out during a procedure.
6. Never place the handpiece in the ultrasonic cleaner, unless the manufacturer has a recommended product. The handpiece should never be immersed in any liquid as damage may occur.
7. Properly clean the fiber-optic/LED lens. After use, it is important to run the lens under water and gently wipe with a sponge to remove all outer debris. Failure to do this will result in a buildup on the lens and poor light quality.
8. Unless the handpiece utilizes a wrench-activated chuck, remove the bur when cleaning, lubricating, and expelling. Leaving the bur in the chuck while lubricating prevents the lubricant from flowing where it needs to go to ensure proper coverage of the bearings. Always remove all burs prior to sterilization. In the autoclave, the springs in the chuck are compressed. The heat will cause these compressed springs to weaken under tension. Debris can also accumulate around the chuck, causing it to corrode and shorten the life of the instrument.
9. Expel excess lubricant and debris by running the handpiece after lubricating and before autoclaving. This is important. If the handpiece isn't run to expel the excess debris and lubricant, it can cause a gumming effect around the turbine and the debris will be essentially baked in. Many times, this will cause the expulsion of excess lubricant when used for the first time after autoclaving.
10. Let the handpiece cool down. Never run the handpiece under cold water to quickly cool it off. This damages the turbine.
11. It is important to follow the manufacturer's guidelines on air pressure. Excessive air pressure could cause damage to the turbine bearings unless the handpiece is designed to be run at higher air pressures.
12. Always maintain a properly working autoclave.

ELECTRIC HANDPIECES

Electric handpieces have gained popularity for their quiet presence and can be used at the chair or in the lab. Maintenance of electric motors is limited, and brushed motors are not autoclavable and should not be used according to the FDA. The newest electric motors on the market are brushless. Their design is a contactless magnet system, which keeps the motor quiet and smooth. They have very low vibration and, in most cases, there is no maintenance. In many models, lubricating the electric handpiece attachments is done the same as the traditional air-driven style. Sterilization for each handpiece varies.

It is important to research the different handpieces before purchase to make sure you are acquiring the handpiece that best fits your needs. Make sure to follow proper manufacturer's maintenance procedures to the letter so as to not void the warranty.

When an electric handpiece begins to show signs that the mechanics are slowing down, stop using it immediately. Continued use of the handpiece can result in more costly repairs. The FDA has received reports of severe burns caused by pneumatic and electric handpieces.[12] In most of these cases, burns were caused by overheating of various handpiece components. After research, it was found that overheating was due to failure to service and maintain the handpieces in accordance with the manufacturer's recommendations. When electric handpiece systems aren't well maintained, the handpiece head can overheat very rapidly. As a safety precaution, it is necessary to maintain the handpiece properly. Failure to properly clean and maintain the electric handpiece will also void its warranty.

SLOW- OR LOW-SPEED MOTOR MAINTENANCE

Slow-speed motors must be sterilized between patients. Maintenance of the low-speed motor is similar to maintenance of other fixed-back handpieces. A spray or a couple of drops of liquid oil in the drive air line are necessary. Additionally, oil can be applied as a preventive measure to forward/reverse valves, shift rings, and sheath attachment points. Run the motor to distribute the oil. Wipe away the excess oil with a paper towel. Periodically disassembling the motor and removing buildup and debris will ensure longer life. Straight attachments do not require lubrication. Once external debris is removed from a straight handpiece, it can be placed in a bag and prepared for sterilization. Latch type or right-angle attachments can be maintained similarly; place a few drops of lubricant and run for at least 20 seconds to distribute the oils before autoclaving.

HANDPIECE REPAIR[13]

Fiber-optic light—The fiber-optic light requires very little attention. A gentle scrubbing with a sponge will keep the lens free of debris. Replacement of the light is easily accomplished. Replacement bulbs are commonly sold in sets of two and some require a dental explorer to remove. A bulb is located in the coupler itself while some are in the tubing. Place the explorer in the tiny hole located just under the bulb and gently lift up; the bulb should easily slide out of the socket. Simply place a new bulb back in the socket the same way, securing it with an explorer.

Turbines—One of the most common repairs in the high-speed handpiece is the replacement of the turbine. A turbine is the only moving part and operates at speeds beyond 400,000 rpm. Due to this high speed and the effects of sterilization, a turbine can show signs of wearing and eventually need replacement. Proper cleaning and lubrication will extend the life, but it's inevitable that the turbine itself will eventually require replacement. If the turbine is described as the brain of the handpiece, the bearings are the heart. When bearings wear out, the turbine will no longer rotate, causing it to stall when placed on a tooth. It may emit a loud, high-pitched sound or vibration. Studies show it is usually the bearing retainer that fails. It is said

that the "handpiece itself is just a handle to provide a means of controlling the turbine as well as serving as a conduit for air to drive the turbine and air and water to cool the surface being cut."

There are a number of ways to replace the turbine, including purchasing a new or after-market turbine and installing it in-house; sending it back to the manufacturer to be replaced; or use of a qualified repair service. Sending it back to the manufacturer will ensure the same consistency as the original. Keeping it in-house will save on turnaround time. There are several qualified repair services either locally or nationally that can get your turbine replaced and back to you in just days. Failure to have service provided by a qualified technician has a number of pitfalls, including potential use of parts made of inferior materials and lack of training of the technician, among others, which can lead to a damaged or improperly functioning handpiece. Either way, your warranty will vary from three months to two years. Be sure you follow proper procedures so as to not void the new warranty.

In-house repair—You can choose to purchase a new turbine from the handpiece manufacturer and have one of the dental team install it. There is help available from a couple of different sources. This method ensures compliance with the FDA medical device rules. The handpiece manufacturer sales representative is very knowledgeable and can train a team member on proper installation. Dealer service repairmen are also willing to show the team how to install a turbine. If choosing this option, it is important to recognize if the dental team isn't comfortable performing the replacement; then the handpiece should be sent out. Some of the more sophisticated turbines may be harder to replace, and you may risk damaging the handpiece, resulting in more costly repairs and, of course, longer downtime with the handpiece.

Sending your handpiece out for repairs—Two options exist for this choice. Sending it back to the manufacturer to have a new turbine installed will guarantee the quality and the same consistency you had when the handpiece was new. The warranty is usually best with this option and ensures efficacy and safety as these parts are FDA approved. One drawback is downtime since this option usually takes a little longer to return to the office.

With handpiece maintenance costs rising due to routine sterilization and/or improper lubrication, dental professionals have turned to independent repair technicians to extend the life of the handpiece by rebuilding instead of replacing the turbine. Although there is no industry standard for certification of handpiece repair, there are technicians who have been certified by manufacturers in the repair of their particular handpieces. It is advisable to request the credentials of a certified technician. It is worth noting that none of the manufacturers certify rebuilt handpieces, and it may violate the handpiece's instructions for use as an FDA-regulated medical device. When seeking out a repair technician, ask if they have attended any manufacturer courses and how long they have been repairing handpieces. The big disadvantage with this option is that if you do not have a qualified technician, turnaround time could be longer and quality of repair may vary. This option usually produces fast turnaround time, reduced cost, and a shorter warranty than the manufacturer provides.

An after-market turbine is one that is not produced by the manufacturer and can cost less and may not be FDA approved. Sometimes the cliché "You get what you pay for" applies to this option as these turbines can be inconsistent in quality and have a much shorter warranty, if any at all. A poor quality aftermarket product can result in costlier and more frequent repairs. It is important to know your source and use a trusted technician. It is not only important to trust your source; you must also be aware of what goes into the handpiece.[13]

RESEARCH YOUR OPTIONS

Research your options, and evaluate the impact of the decision on how the handpiece performs during the procedure in a patient's mouth. A satisfied patient refers and returns. The repair decision must be evaluated in the context of impact on the teeth and safety of the patient. Sometimes it is not necessary to replace the entire turbine, but to rebuild it by replacing only certain components such as the bearings and O-rings. It is important to ensure that the manufacturer's tolerance standards are met. A properly trained technician can evaluate the components to determine what needs to be replaced. Rebuilding a turbine consists of removing the broken bearings, making sure not to damage the rest of the assembly. New bearings are then pressed onto the spindle chuck assembly. The suspension O-rings are essential to handpiece performance and are replaced as well. The handpiece should be properly sterilized before it is sent.

There is much debate surrounding rebuilding a handpiece versus replacing it. The "teeth" on the impeller wear down from use and sterilization. If the turbine is rebuilt, only replacing the bearings and O-rings, the lifespan of the impeller may be questionable. In addition, the handpiece chuck has a finite life. A turbine that has been rebuilt might not be able to retain the bur with the same force as a replacement turbine with all new components. This would result in bur walk-out or bur ejection during handpiece operation. Again, a qualified technician will be able to assess and recommend what is best for the life of the turbine. [14]

CONCLUSION

Various types of handpieces have revolutionized dentistry during the last 100 years. They are an essential part of any dental practice, and dentists and expanded function dental assistants rely on them daily for optimal performance. Although they are used in every procedure, little is known about them from the standpoint of the dental team. Understanding how they work and how to properly clean and lubricate them will extend their life and keep repair costs down. When it does come time to repair your handpiece, be sure to be aware of what is best and safest for the patient.

REFERENCES

1. Choi C, Driscoll CF, Romberg E. Comparison of cutting efficiencies between electric and air-turbine dental handpieces. *J Prosthet Dent*. Feb 2010; 103(2): 101-7.
2. Pei D, Meng Y, Fayed AS, et al. Comparison of

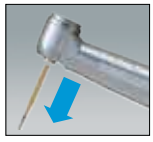
FIGURE 2: Maintenance guide

Dentsply Sirona

Midwest® Maintenance Guide

Air-Driven and Electric Handpieces/Attachments/Motors

Step 1



Flush handpiece water/air lines by running handpiece on unit with water for 20 to 30 seconds. Then remove bur using safe methods.

Step 2

Remove air-driven handpiece, attachment and/or motor from the coupler or hose.

Or...

Remove the electric attachment from the electric motor.

Deliver to central sterilization via approved transport methods.

Step 3

Clean exterior of handpiece/attachment/motor with Midwest® Plus Cleaner (380140*) and scrub under running water using a soft sponge to remove external debris and bioburden. Pay close attention to remove debris from the fiber optic lens to prevent obstruction.

*Midwest® Plus Cleaner is a water-based, handpiece-safe surfactant.

DO NOT spray, wipe, or soak the handpiece in disinfectants or alcohol! Use only water and handpiece-safe surfactant, like Midwest® Plus handpiece cleaner. DO NOT expose handpieces to hand or dish soaps which contain chloride.

Manual Maintenance

Step 4

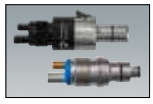
Place appropriate nozzle on Midwest® Plus Aerosol Spray (380080M). While holding can upright, insert nozzle fully into the handpiece/attachment/motor.

For fixed backend handpieces or motors, place the tip of the nozzle into drive air tube.

Cover head with paper/lint-free towel and spray for 2 full seconds. If a large amount of debris appears on the towel, repeat 2-second spray.

Step 5

Connect the handpiece/attachment/motor (without bur) to the appropriate maintenance adapter. Cover head with paper/lint-free towel and expel with air for a minimum of 30 seconds or until no more oil appears on towel.



Maintenance Adapters

A full selection of manual and Automate® maintenance adapters is available. Handpiece should fit snugly on adapter as it would a coupler to ensure best delivery of cleaner and lubricant.

Step 6

Wipe off excess lubricant with a clean paper/lint-free towel. Place the instrument in a sterilization pouch and sterilize in a steam sterilizer (both gravity and dynamic air removal sterilizers are acceptable). Refer to respective Instructions for Use for item-specific sterilization parameters.

Midwest® Automate® Maintenance

Automated Steps 4 & 5

Position handpiece/attachment/motor onto the appropriate maintenance adapter.

Close the door.

Press Start.

Proceed to Step 6 when cycle is complete.

Weekly Chuck Maintenance

Manual

Automate

Use oil dropper (380130) or Midwest Plus Aerosol spray to lubricate the handpiece/attachment chuck and the operatory coupler O-rings once per week. Automate has a dedicated port for chuck maintenance.

Perform chuck maintenance prior to lubrication process (Step 4) to ensure excess oil is expelled.

Warning!

Electric Dental Micromotors generate significantly more power than traditional air turbines and air motors. Due to this increased power and torque —worn, poorly maintained, misused, abused, or damaged handpieces can potentially generate friction-induced heat capable of causing serious burns to patients and staff. The following guidelines should be followed to ensure safe operation of electric attachment:

- Carefully follow Midwest maintenance instructions
- Use only Midwest® maintenance products
- Examine the handpiece for damage before each use
- **NEVER** use chemicals/disinfectants on handpieces
- **NEVER** cool a hot handpiece with water
- **NEVER** apply pressure to the chuck release button or attachments while the handpiece is rotating
- **NEVER** use the handpiece as a cheek or tongue retractor
- Service should only be carried out by an **AUTHORIZED** repair center using genuine Midwest® repair parts **ONLY**
- Direct all questions regarding maintenance and repair to Midwest Air Repair at 1-800-800-7202 or airrepair@dentsplysirona.com

crown fit and operator preferences between tooth preparation with electric and air-turbine handpieces. *J Prosthet Dent.* Feb 2020. https://doi.org.ezproxy.library.tufts.edu/10.1016/j.prosdent.2019.11.001
3. Ring ME. The true discoverer of the dental air turbine handpiece, Sir John Walsh of New Zealand. *Bull Hist Dent*. 1987;35(2):106-109.
4. Namibian dental association. The History of Dentistry. http://www.namibiadent.com/the-history-of-dentistry. html
5. Hayes J, Extend the life of your handpiece: maintenance and sterilization tips. *Dental Assist.* 2005 Nov-Dec;74(6):10-1.
6. Centers for Disease Control and Prevention. Guidelines for disinfection and sterilization in healthcare facilities, 2008. http://www.cdc.gov/ncidod/dhqp/pdf/ guidelines/ Disinfection_Nov_2008.pdf
7. MMWR Recomm Rep. 1993 May 28;42(RR-8):1-12.
8. Smith GW, Smith AJ, Creanor S, et al. Survey of the decontamination and maintenance of dental handpieces in general dental practice. *Br Dent J.* 207 (2009), p E7.
9. Sasaki JI, Imazato S. Autoclave sterilization of dental handpieces: A literature review. *J Prosthdont Res.* 2020 Jul; 64(3):239-42.
10. Knight JS., Draughn R., Evans MD. Effects of handpiece lubrication on resin-based composite bond strength to enamel. *Am J Dent.* 1999 Jun;12(3):116-8.
11. Silverstone SE, Hill DE. Evaluation of sterilization of dental handpieces by heating in synthetic compressor lubricant. *Gen Dent.* 1999 Mar-Apr; 47(2): 158-60.
12. Electric handpiece systems: Severe burns associated with inadequate maintenance. American Dental Association Professional Product Review. Published 2007.
13. Extreme handpiece makeover. *The Bearing Press*. https://www.heavenlyhandpiece.com/docs/TheBearingPressIssue04.pdf
14. Midwest Handpiece Care and Maintenance Guide MK163-0120. Published January 2020.

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NOTES

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QUESTIONS

1. Evidence indicates that dentistry was practiced as early as what year?
A. 6000 BC
B. 6200 BC
C. 7000 BC
D. 7200 BC

2. A tooth demonstrating signs of a dental "drill" being used on it was how many years old?
A. 6000
B. 7000
C. 8000
D. 9000

3. Which of the following inventors received a patent for the first electric "dental engine" in 1871?
A. James B. Morrison
B. John Patrick Walsh
C. George F. Green
D. Dr. John Borden

4. In what year did James B. Morrison develop and patent the first pedal powered "drill"?
A. 1861
B. 1871
C. 1800
D. 1950

5. In the 1940s a handpiece that used air to rotate a cutting bur was developed by:
A. John Patrick Walsh
B. Dr. John Borden
C. Dr. C. Edmund Kells
D. Henry Patrick Walsh

6. Although an air-driven high-speed handpiece can run beyond 400,000 rpm's, typically it is runs at:
A. 200,000 rpm
B. 400,000 rpm
C. Under 100,000 rpm
D. Between 180,000 and 330,000 rpm

7. Electric handpieces are typically designed to run at what speed?
A. 200,000 rpm
B. 250,000 rpm
C. 300,000 rpm
D. 350,000 rpm

8. Which of the following is not true regarding slow-speed handpieces?
A. The viscosity of the oil is different
B. Requires less maintenance
C. Does not need be sterilized
D. Straight attachments do not require lubrication

9. Proper cleaning and sterilization will help prevent which of the following?
A. Cracks in turbine
B. Infectious diseases
C. Loss of lubricant
D. Broken burs

10. After each use it is important to:
A. Autoclave the handpiece before lubricating
B. Place a clean bur in the handpiece before lubricating
C. Remove the bur, scrub the handpiece under running water
D. Wipe handpiece off with a disinfectant before lubricating

11. Which one of the following is not true regarding proper handpiece lubrication?
A. Remove bur from handpiece
B. Use manufacturer's recommended lubricant
C. Run handpiece to express excess oils
D. Replace bur in handpiece while it is being sterilized

12. Wiping down the handpiece with a chemical disinfectant is not recommended due to which of the following?
A. It is redundant if you are rinsing and autoclaving
B. The chemicals can cause a reaction when heated, resulting in corrosion
C. Disinfectants can cause a buildup
D. Chemical disinfectants should never be mixed

13. Which of the following is the most widely recommended form of sterilization?
A. Chemical vapor
B. Submersion in a cold sterile solution
C. Autoclave
D. Ethylene oxide gas

14. Which of the following must be implemented to avoid a manufacturers' warranty violation?
A. Use the manufacturer's recommended burs
B. Use the manufacturer's recommended sterilization methods
C. Use the manufacturer's recommended cleaner
D. Use the manufacturer's recommended lubricant

15. Electric handpieces have gained popularity due to which of the following?
A. Lower cost
B. Quiet presence
C. Portability
D. No sterilization required

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QUESTIONS

16. In what year did the CDC recommend that handpieces should be heat sterilized after each patient?

A. 2000
B. 2003
C. 2007
D. 2008

17. A what temperature should a handpiece be sterilized in a steam heat or chemical vapor sterilizer?

A. 123 F
B. 210 F
C. 257 F
D. 275 F

18. Why is it necessary to run biologic indicators on your autoclave weekly?

A. It is required by the CDC
B. To ensure proper sterilization is achieved with each cycle
C. Patients will want to view the results
D. It is required by OSHA

19. When using a chemical sterilizer, which of the following statements is true?

A. Excess water will allow oxidation in the chamber, resulting in corrosion
B. Excess water will trap debris in the chamber
C. Excess water will trap bacteria, making it impossible to properly sterilize
D. Excess water will dilute the chemicals used, resulting in improper sterilization

20. Which statement is true if using the handpiece while still warm?

A. It causes it to overheat
B. It will cause it to lock up
C. It will cause stress to the turbine
D. It will cause stress to the ball bearings

21. Which of the following statements is not true when caring for a handpiece?

A. Properly clean the chuck
B. Use the correct lubricant
C. Run the handpiece after lubricating and before autoclaving
D. Use the manufacturer's recommended burs

22. Which of the following is not true regarding brushed electric handpieces?

A. Must be taken apart and lubricated weekly
B. Produce a carbon dust that can build up in the motor
C. Carbon brushes can wear down and need to be replaced over time
D. Oil from the motor can mix with the dust, producing black grease

23. The FDA has received reports that burns have been caused by?

A. Slow-speed handpieces
B. High-speed handpieces
C. Hygiene handpieces
D. Electric handpieces

24. The only moving part of a high-speed handpiece is the:

A. Sheath
B. O-rings
C. Turbine
D. End cap

25. Which of the following components are not found in a turbine?

A. Impeller
B. Chuck
C. Bearings
D. Coupler

26. What repeated function shortens the life of a turbine?

A. Running higher than normal rpm's
B. Failure to use manufacturer's recommended burs
C. Sterilization
D. Multiple uses

27. Which of the following is the most common repair encountered in a high-speed handpiece?

A. Replacement of the coupler
B. Replacement of the fiber optic light
C. Replacement of the end cap
D. Replacement of the turbine

28. Which of these is not true in an aftermarket turbine?

A. Shorter warranty
B. Inconsistent quality
C. Guaranteed work
D. Lower cost

29. What is the most important consideration when rebuilding or replacing a turbine?

A. Lowest cost
B. Best warranty
C. Fastest turnaround time
D. A qualified technician

30. When caring for your handpiece, which of the following is true?

A. Always use manufacturer's recommended lubricants
B. Always ensure a properly working autoclave
C. Always use a trusted technician to service your handpiece
D. All of the above

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ANSWER SHEET

Dental handpieces: Maintenance, repair, and infection control, 3rd edition

Name: Title: Specialty:

Address: Email: AGD member ID (if applies):

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EDUCATIONAL OBJECTIVES

1. Implement proper cleaning and sterilization techniques
2. Provide proper lubrication of each handpiece and its components
3. Avoid common mistakes
4. Provide proper care for a fiber-optic or LED lens
5. Demonstrate proper sterilization techniques for various handpieces
6. Discuss handpiece turbines and the factors to consider when repair or replacement is necessary

COURSE EVALUATION

1. Were the individual course objectives met?

Objective #1: Yes No Objective #2: Yes No

Objective #3: Yes No Objective #4: Yes No

Please evaluate this course by responding to the following statements, using a scale of Excellent = 5 to Poor = 0.

2. To what extent were the course objectives accomplished overall?	5	4	3	2	1	0
3. Please rate your personal mastery of the course objectives.	5	4	3	2	1	0
4. How would you rate the objectives and educational methods?	5	4	3	2	1	0
5. How do you rate the author's grasp of the topic?	5	4	3	2	1	0
6. Please rate the instructor's effectiveness.	5	4	3	2	1	0
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8. Please rate the usefulness and clinical applicability of this course.	5	4	3	2	1	0
9. Please rate the usefulness of the supplemental webliography.	5	4	3	2	1	0

10. Do you feel that the references were adequate? Yes No

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12. If any of the continuing education questions were unclear or ambiguous, please list them.

13. Was there any subject matter you found confusing? Please describe.

14. How long did it take you to complete this course?

15. What additional continuing dental education topics would you like to see?

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9.	Ⓐ	Ⓑ	Ⓒ	Ⓓ	24.	Ⓐ	Ⓑ	Ⓒ	Ⓓ
10.	Ⓐ	Ⓑ	Ⓒ	Ⓓ	25.	Ⓐ	Ⓑ	Ⓒ	Ⓓ
11.	Ⓐ	Ⓑ	Ⓒ	Ⓓ	26.	Ⓐ	Ⓑ	Ⓒ	Ⓓ
12.	Ⓐ	Ⓑ	Ⓒ	Ⓓ	27.	Ⓐ	Ⓑ	Ⓒ	Ⓓ
13.	Ⓐ	Ⓑ	Ⓒ	Ⓓ	28.	Ⓐ	Ⓑ	Ⓒ	Ⓓ
14.	Ⓐ	Ⓑ	Ⓒ	Ⓓ	29.	Ⓐ	Ⓑ	Ⓒ	Ⓓ
15.	Ⓐ	Ⓑ	Ⓒ	Ⓓ	30.	Ⓐ	Ⓑ	Ⓒ	Ⓓ

AGD Code 250

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